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A Functional Analysis of Building Procurement Systems and Strategies in an International Context

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Volume 1

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Abstract

This thesis has focused upon building procurement systems, how these can be compared across a range of countries, and the competencies upon which they depend for effective operation. The study focuses upon dominant procurement systems which exist in the UK, the USA, France, Japan, as major construction exporters and India and Malaysia as major importing countries in terms of construction.

The aims of the research include:

1. the development of a functionally based Procurement System Model (PSM) for the dominant procurement systems adopted in each country, enabling the comparison of roles, risks and formal relationships irrespective of job titles, laws or language.

2. the development of schedules of key competencies and resources which need to be in place to ensure that any adopted procurement system can operate effectively.

3. the identification of institutions upon which the competencies (and consequently the systems) depend for their sustainability.

This study illustrates how building procurement systems may be modelled in an objective way by using functional analysis. The modelling of procurement systems using the PSM allows countries to objectively identify and comparatively analyse the use of systems between countries. For countries which are pursuing rapid or sustained economic growth this facility will allow them to consider the potential array of procurement systems which may be suitable for them.

It has been established in this study that the effective use of a particular procurement system relies upon the availability of key competencies. In order to deliver a particular procurement system effectively within any country the supply chain of key competencies and resources must be in place.

The existence of construction industry specific and non-specific institutions is identified as encouraging the array of generic, common and specific key competencies to be established, developed, disseminated and sustained within the construction industry of a particular country. The dissemination and sustainability of competencies is crucial in maintaining the indigenous supply of competencies which facilitates the effective operation of the various procurement systems.

The examination of primary institutions illustrates that where they are absent or where their structure is inappropriate (in relation to their operating environment) key competencies do not seem to be established, developed, disseminated or sustained to a recognised standard.

It is acknowledged however that if institutions do not exist indigenously or are unable to supply the array of competencies required for the operation of a particular procurement system then the unavailable competencies may be imported from countries which possess the particular key competencies (usually countries which are major exporters of construction services).

The overall consequence of the thesis has therefore been to identify how procurement systems may be operated more effectively within a country to meet the economic demands of that country. By developing institutions indigenously, the supply of competencies is encouraged and sustained - thereby allowing the effective use of a particular procurement system which will allow economic growth targets to be achieved.

Acknowledgements

I would like to express my most grateful thanks and appreciation to the Department of Surveying at The Nottingham Trent University for funding this research project and for providing the major part of the resources necessary for the work. The willingness and cooperation of a wide range of people currently or previously involved in the construction industries in the UK, Japan, France, the USA, India and Malaysia is gratefully acknowledged. I would like to express my thanks for all the time and interest afforded to me by all who allowed me to conduct interviews or who completed the questionnaires.

I would also like to express my thanks to the staff of the Department of Surveying for their support over the course of this project. In particular I am indebted to Professor Roy Morledge and Professor John Moohan at The Nottingham Trent University and Professor Peter Hibberd from the University of Glamorgan for their support, criticism, advice and encouragements over the years.

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Abbreviations

AACE	American Association of Cost Engineers
ABC	Associated Builders Contractors
ACA	Association of Consultant Architect
AGC	Associated General Contractors
AIA	American Institute of Architects
AIS	Accelerated Implementation System
AMT	Assistance Marche des Travaux
APO	Asian Productivity Organisation
ARCUK	Architects Registration Council of the United Kingdom
ASCE	American Society of Civil Engineers
B of Q	Bill of Quantities
BAI	Builders Association of India
BCA	Bumpitra Contractors Association
BCAM	Bumiputra Contractors Association Malaysia
BEC	Bureau de controle
BEDC	Building Economic Development Committee
BET	Bureau d'etudes techniques
BIPE	Bureau d'Informations et de Previsions Economiques
BMP	Building Materials Producers
BOOL	Build Operate Own Licence
BOTB	British Overseas Trade Board
CAPEB	Confederation des Artisons et Petitas Enterprises du Batiment
CBRI	Cental Building Research Institute
CCM	Commission Centrale des Marches
CCMI	Centre for Construction Management Information

CDA	Contractors Development Agency
CFEC	Compagnie Francaise des Exports Construction
CIC	Construction Industry Council
CIDB	Construction Industry Development Board
CIOB	Chartered Institute of Building
CIRIA	Construction Industry Research and Information Association
CISC	Construction Industry Standing Conference
CISC	Construction Industry Standing Conference
CITB	Construction Industry Training Board
CMAA	Construction Management Association of America
CMF	Construction Management Forum
CPD	Continual Professional Development
CSCS	Construction Skills Certification Scheme
CSIFBS	Construction Specification Institute Format for Building Specifications
DATAR	Delegation a l'Amenagement du Territorire et al Action Regionale
DCE	Dossier de consultation des entrepreneurs
DLS	Davis Langdon and Seah
DTI	Department of Trade and Industry
ECC	Engineering Construction Contract
EGCI	Export Group of Constructional Industries
ENR	Engineering News Record
FBCIG	Franco British Construction Industry Group
FIDIC	Federation International des Ingeniers Conseils
FNDB	Federation National du Batiment
FNDB	Federation National du Batiment

FNTP	Federation National des Traraux Publics
GDP	Gross Domestic Product
GIC	General Insurance Corporation
GMP	Guaranteed Maximum Price
GNP	Gross National Product
HDFC	Housing Development Finance Corporation
HMSO	Her Majestys Stationery Office
HUDCO	Housing and Urban Development Corporation
IB	Institution Building
ILO	International Labour Office
IPRG	International Procurement Research Group
JCT	Joint Contracts Tribunal
JFCC	Japanese Federation of Construction Contractors
JIS	Japanese Industrial Standards
JKR	Jabatan Kerja Raya
LIC	Life Insurance Corporation
MBAI	Masters Builders Association of India
MBAM	Master Builders Association of Malaysia
MCAA	Mechanical Contractors Association of America
MCIB	Malaysian Chartered Institute of Builders
MITI	Ministry of International Trade and Industry
MOC	Ministry of Construction
NAHB	National Association of Home Builders
NCA	National Contractors Association
NCB	National Construction Board
NCVQ	National Council Vocational Qualifications

NEC	New Engineering Contract
NECA	National Electrical Contractors Association
NEDC	National Economic Development Committee
NEDO	National Economic Development Office
NICMAR	National Institute of Construction Management and Research
NJCC	National Joint Consultative Committee
NSPE	National Society of Professional Engineers
NTI	New Training Initiative
NVQ	National Vocational Qualifications
OCAJI	Overseas Contract Association of Japan Incorporated
OPC	Ordonnancement Pilotage et Coordination
PEC	Professional Engineers in Construction
PFI	Private Finance Initiative
PSM	Procurement Systems Models
PWD	Public Works Department
QS	Quantity Surveyor
RIBA	Royal Institute of British Architects
RICS	The Royal Institution of Chartered Surveyors
SVQ	Scottish Vocational Qualifications
TNTU	The Nottingham Trent University
UCI	Uniform Construction Index
UDA	Urban Development Authority
UNCHS	United Nations Centre for Human Settlements
UNTEC	Union National Des Techniciens Economists De La Construction

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CHAPTER ONE

INTRODUCTION

Context and Research Themes

One of the fundamental tasks of the building industry in any country is to deliver building projects in a framework which fulfils the needs of its clients. In an endeavour to maintain levels of activity and to achieve growth targets within the industry many countries have considered the use of different project delivery systems. During the last century some countries have experienced expansion and development of their building industries as they have become financially, economically and commercially more sophisticated. The projections of construction industry gross domestic product figures and growth targets have encouraged the utilisation of a range of alternative procurement systems by which buildings are acquired.

The increased fragmentation of the building process in many parts of the world has occurred as a result of the industry being faced with advances in technical knowledge and expertise, the development and availability of new products, materials, methods of construction and the increasing complex nature of modern buildings coupled with the changing needs of clients. Such fragmentation has resulted in the procurement of buildings becoming increasingly difficult.

Procurement may be defined as:

> "The framework within which construction is brought about, acquired or obtained".
>
> (CIB 1991)

In the United Kingdom, for example, the process of Construction Procurement has received an enormous amount of attention is the last 10 years, culminating in a joint Government/Industry sponsored review (known as The Latham Review (Latham 1994)). Consequently the UK Construction Industry has retained its focus in this area of activity and the incentive for change as a recession in the economy eases is immense. In other countries the development of strategies to deliver construction projects has been evolutionary consequent upon changes in the economy and in the socio-political climate as well as upon the advancement of technology.

This thesis focuses particularly upon building procurement systems adopted by major exporting and major importing countries (rather than construction procurement systems which includes building and civil engineering systems). Specifically the study examines these dominant procurement systems which exist in each country under investigation. Throughout the thesis the term dominant refers to the most widely used procurement systems by number of projects rather than by value of projects. The examination of dominant procurement systems in the UK (discussed in Chapter four) identifies the "Contracts in Use Survey" (RICS 1994) which analyses procurement systems by value of projects rather then by number of project. This survey has been used as one source to identify the variety of dominant building procurement systems which exist in the UK. Where the effectiveness of a system is referred to the definition of effective operation refers to the particular procurement system performing its desired effect (see Chapter four organisational charts of dominant systems identified).

Background to the Research

The research discussed here was inspired by the activities of the Conseil International du Batiment pour la Recherche, d'Etude et la Documentation (CIB) which in 1989 established the Working Commission W92 to investigate procurement systems internationally. The CIB agreed a statement in respect of the work of the Commission and the purpose of the research (as in December 1991) as follows:

> "To enable an assessment to be made of the framework within which construction work is obtained, acquired or brought about having regard to those factors which are generally fixed (ie nature of the client economic/social/political and legal conditions ("restrictions")), together with those factors which allow some element of choice or decision (ie the type of project, organisational framework, available resources and allocation of risk ("variables"))".

Three members of the CIB in December 1991 established a compact to attempt to carry out the programme of research to meet the needs of the CIB W92, and formed the International Procurement Research Group (IPRG). The IPRG consists of a collaborative agreement between The Nottingham Trent University, The University of Glamorgan and Liverpool John Moores University.

This research project forms part of a wider portfolio of research into building procurement being carried out by the IPRG, and also has a direct input into the work of the CIB Working Commission W92.

Aims and Objectives

The aims of the research are developed through a range of three hypotheses the aims of which include:

1. the objective modelling of the dominant procurement systems adopted in a range of countries, enabling the comparison of roles, risks and formal relationships irrespective of job titles, laws or language.

2. the development of schedules of key competencies and resources which need to be in place to ensure that any adopted procurement system can operate.

3. the identification of institutions upon which the competencies (and consequently the systems) depend for their sustainability.

The overall objective of this thesis is to produce a conceptual model which will allow the identification and comparison of a variety of dominant building procurement systems which exist in a range of countries under investigation. The dominant building procurement systems which exist in a variety of countries in particular the UK, France, the USA, Japan, India and Malaysia have been investigated.

These countries have been selected for investigation as the latter two countries are recognised as being major importers of construction services whilst the former four countries are considered as major exporters of construction services. The proposition that dominant building procurement systems can be modelled is examined. The intention of developing such a model is to attempt to reconcile the existing problems associated with the comparison of procurement systems between countries using traditional procurement classification techniques.

It has been identified that the use of traditional techniques relies upon the existence of knowledge and understanding of the organisational structure of a country's construction industry as well as the roles of practitioners involved and the dominant procurement systems used. The development of a Procurement Systems Model (PSM) is used to explain the various dominant procurement systems which exist in any country and further to allow the comparison of such modelled procurement systems between countries. By modelling procurement systems using an analysis of generic functions rather than professional titles or role descriptions it is proposed that procurement systems may be compared across countries even where the organisational structure of the industry and the practitioners involved in the procurement process differ.

Having modelled dominant procurement systems using functional analysis the research seeks to identify what range of key competencies are required to be available indigenously in order to operate a particular category of dominant building procurement system effectively. The aim of this element of the thesis is to identify the minimum key competencies which are required to be available in a country in order for a particular dominant procurement system to operate effectively.

Finally the research specifically seeks to analyse how such minimum key competencies are established, developed and sustained within a country, therefore providing the indigenous supply of minimum skills needed to effectively operate a particular procurement system.

The benefits of the work are seen to include:

(a) the ability to give advice to Developing and Newly Industrialised nations regarding appropriate procurement strategies.

(b) the ability to enable exporting countries (such as the UK, France, USA, Japan) to appreciate the background to other construction industries and to be able to identify the frameworks of the other country's procurement strategies. This

is seen as particularly important for the assessment of export potential.

(c) in terms of the potential for exporting countries (such as the UK, France, USA and Japan) to enable them to learn from successful practices in other exporting or importing countries without the disadvantages of differing role titles or language.

Hypotheses

In order to fulfil the aims of this research the following hypotheses will be tested:

Hypothesis 1

Building procurement systems can be objectively modelled by the use of a theoretical functional framework.

Hypothesis 2

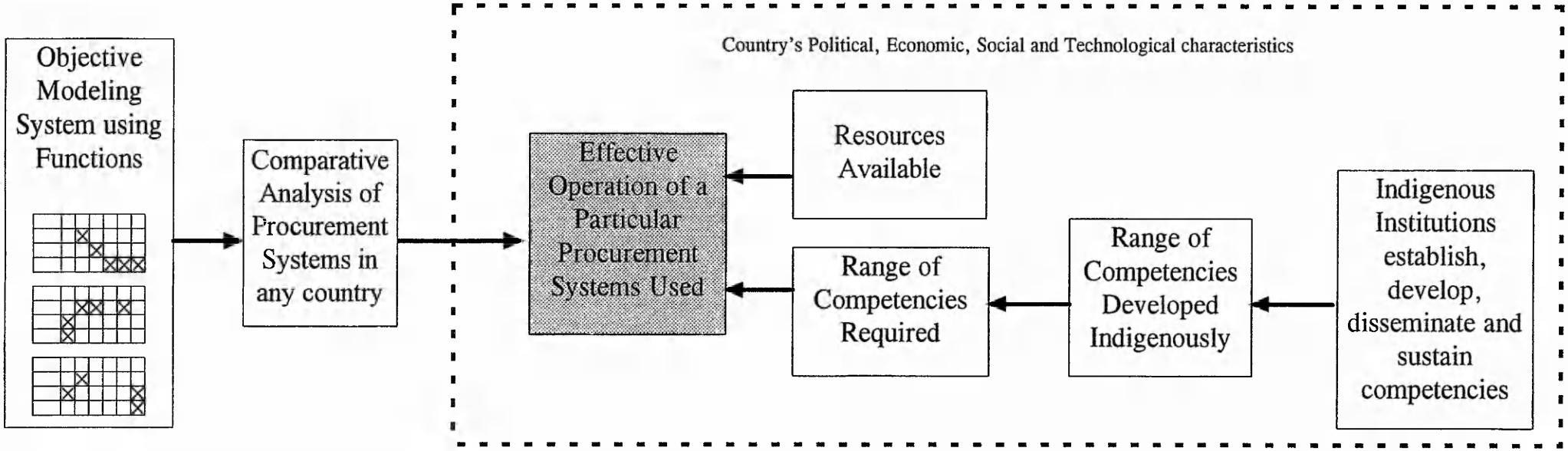
The effective operation of a specific procurement system relies upon the availability of key competencies and resources.

Hypothesis 3

The supply of key competencies are dependent upon the existence of indigenous institutions.

The linkages between the three hypotheses are diagrammatically represented in figure 1.1. It is proposed that the objective modelling of dominant procurement systems in a range of countries based upon functions (which are consistent between countries) will facilitate the comparative analysis of procurement systems in any country. The effective operation of the procurement systems modelled is suggested to rely upon the indigenous availability of adequate resources and a range of key competencies. The indigenous development of key competencies themselves is further proposed to be dependent upon the existence of indigenous institutions which establish, develop, disseminate and sustain such competencies. It is acknowledged in figure 1.1 that the effective operation of a procurement system, the range of competencies developed and the variety of institutions which exist in a particular country are dependent upon the indigenous political, economic, social and technical characteristics of that country.

Figure 1.1:The Linkage of the Hypotheses



Structure of the Thesis

Chapter two consists of a background study of the traditional techniques available to analyse and identify building procurement systems. It is recognised that in order to use existing analytical techniques prior knowledge and understanding is required of both the indigenous participants of the building industry and also the building systems which are used. In order to observe the use of dominant procurement systems in any country, functional analysis has been applied to the procurement process to identify the generic functions which are common to all procurement systems.

Chapter three provides a detailed examination of the research methods available and the subsequent research tools which were used to carry out the investigation. Each of the research methods available is identified and analysed in terms of its application to this research. Survey techniques were considered to be the most appropriate method for data collection and the development and use of the two questionnaire surveys in this investigation are discussed. The use of structured interviews and the various category of respondents which were used in this study is also highlighted and examined.

Chapter four specifically studies the national procurement paradigms of the various countries under investigation which has been carried out largely through the review of secondary data and the analysis of primary data collected through the surveys used in this study. The organisational structure and functions of participants involved in each country are identified, highlighting how professional titles and role descriptions are often inconsistent and misleading when compared between countries. Each dominant procurement system is subsequently analysed to identify who does what, what formal relationships exist between the functional participants involved and how the primary categories of risk are allocated between the functional participants in each particular dominant system. A Procurement Systems Model (PSM) has then been established for each dominant system in each country. Each of the PSM's has been validated by the results of the questionnaire survey, readjusted, and further verified by interviews with respondent from each country.

The analysis of the key competencies required to operate effectively each of the identified procurement systems is examined in chapter five. Each of the verified PSM's are categorised in accordance with the system proposed by Masterman (1992) as either separated/cooperative, integrated or management orientated procurement systems. The competency approach is examined and its application to procurement systems is reviewed. Each of the three categories of procurement system are subsequently analysed to identify the range of generic, common and specific key competencies which are required in order to operate a particular procurement system effectively. The results of the interviews regarding the validation of key competencies and their availability within each country are subsequently analysed. This has highlighted the various competencies which are limited in supply in each country therefore influencing the performance of particular indigenous procurement systems.

Chapter six addresses how the supply of generic, common and specific competencies may be promoted indigenously. The theoretical concepts of Institution Building and Institution Development are discussed and are recognised to be essential in the development, promotion and sustaining of competencies indigenously. It is identified that both industry specific and non specific institutions are needed in the development of generic, common and specific procurement competencies. The variety of competencies and their promotion within a country is recognised to be heavily influenced by the country's political, economic, social and technical characteristics. (Newcome, Langford, Fellows 1992). The broad category of industry specific and non specific institutions are examined in relation to the development and supply of indigenous competencies. The lack of available competencies in each country highlighted in chapter five are further considered with respect to the existence or absence of institutions which promote the development, dissemination and sustainability of such competencies in each country. The results of the structured interviews are examined indicating the modifications which need to be made to existing institutions and/or the need to develop new institutions in order to supply the competencies needed to operate a particular procurement system effectively.

The conclusions to this investigation are addressed in chapter seven with the limitations to the research and possible areas of future study.

Papers in Support of this Thesis

During the course of this study a number of papers have been published and or presented in support of this thesis. The papers and articles which have been published include:

Sharif, A., (1993a) International Procurement Research. *New Builder.*

Sharif, A., (1993b) International Procurement Research. *East Midlands Surveyor.*

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Further work is progressing as a consequence of papers which have been published, including a study of the Czech Republic (Gibson 1996) and Egypt (through the auspices of the American University in Cairo).

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CHAPTER TWO

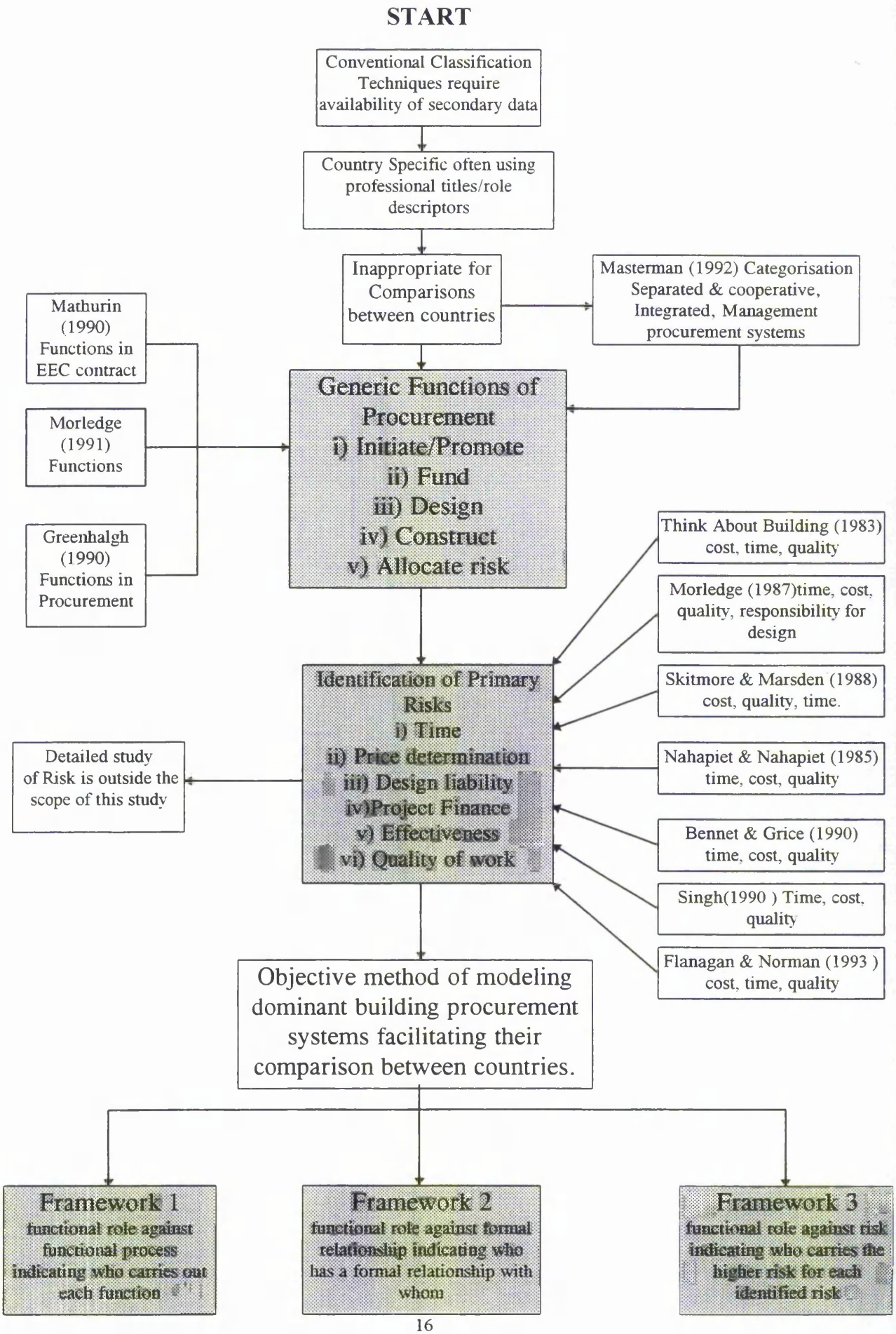
CONCEPT OF FUNCTIONAL MODEL FRAMEWORKS

Introduction

This section begins with the analysis of conventional procurement systems classification methodology. It is suggested that such methodology is often country specific and relies upon the use of professional titles and role descriptors.

The development of functional analysis in the construction industry is examined and its application to the procurement process is discussed. It is suggested that the use of such functional analysis will allow the objective identification and classification of procurement systems internationally. Five generic functions common to all procurement systems have been identified which include: Initiate/Promote, Funding, Design, Construct and Allocation of Risk. Each of these generic functions have been analysed and defined in the context of building procurement systems. Three functional frameworks have been developed to identify who does what in the procurement process, what formal relationship exist between the participants involved and how risk is allocated between the functional participants. The nature and the arrangement of each of the various functions and processes will enable the modelling of dominant procurement systems in any given country. The Procurement System Model (PSM) has been developed (figure 2.5) incorporating the three functional frameworks which will allow the modelling identification and classification of procurement systems in a range of countries. A plan illustrating the development of the functional approach to modelling dominant building procurement systems is shown in figure 2.1.

Figure 2.1: Plan showing the Development of the Functional Approach to Modelling Dominant Building Procurement Systems



Conventional Procurement Classification Techniques

Chapter 4 of the study examines the variety of building procurement systems which exist in the countries under investigation. It is evident that within each country a range of dominant procurement system operate. The organisational structure and participants which take part in the building procurement process in each country are acknowledged to influence the procurement systems which exist indigenously. Hibberd, Merrifield, Taylor (1991 p6) and Hibberd (1991 p3) clearly recognise that although a proliferation of approaches to building procurement have emerged in recent years there is still no generally accepted terminology used in the discussion of such systems. In a detailed analysis of the UK and USA procurement systems Nahapiet and Nahapiet (1985) identified the various systems which exist in the two countries. The authors acknowledge that although many different forms of systems exist, they can be regarded as falling into a number of distinctive classifications. The Nahapiet's (1985 p8) identified the basic classification of systems as; lump sum contracts, negotiated contracts, construction management contracts, management contracting contracts and design and build contracts. They refer to such systems as contractual arrangements (rather than procurement systems) and suggest that various arrangements are adapted as they lead to the creation of:

> "an effective mechanism for bringing together a wide range of design, construction and other project specialisms. Typically, this expertise comes from several different organisations".
>
> (Nahapiet and Nahapiet (1985 p8)

The overall aim of these various arrangements is therefore to determine the relationship of the various design, construction and advisory organisations with the client and one another during the process of obtaining a building (Nahapiet & Nahapiet(1985 p7). Masterman (1989 p7-9) discusses the concept of procurement systems and the difficulties associated in establishing a definition of such systems. He proposes that building procurement systems may be defined as:

> "The organisational structure adopted by the client for the management of the design and construction of a project".
>
> (Masterman 1989 p9)

In order to classify the various methods of procurement available Masterman (1989 p9) draws attention to the conventional methodologies which relate to:-

a) The relationship between the amount of information available and the clients timing requirements.

b) The amount of risk taken by the parties involved.

c) The timings of appointment of consultants and contracts.

d) The extent to which design and construction are integrated in the project.

e) The way in which the contractor is remunerated.

f) Using the classification system provided by NEDO (1985) which examines the methods by which the members of the construction industry are brought together to satisfy the needs of the client into four procurement paths, Traditional, D&B, Management and Design and Management.

g) Adopting the approaches proposed by Bennett (1985) which identifies that project may be classified by the following pattern:- (i) programmed project organisations which relate to standard construction (ii) professional project organisations which relate to traditional construction and (iii) problem solving project organisations which relate to innovative construction.

h) By adopting the approach proposed by Perry (1985) which categorises all procurement methods by the (i) division of management of design and construction, (ii) co-operative management of design and construction, (iii) special emphasis on management, (iv) integrated management of design and construction (Masterman 1989 p9-10)

Upon analysis of each of these categorisation methods, Masterman (1992 p2) argues that issues (a to e) are based on the specific characteristics of a procurement system or a particular project and are therefore too narrow in approach. The system identified by NEDO (1985) however proposes four basic procurement paths and does not attempt to establish grouping of systems based upon common characteristics of each path identified. With regards to Bennet's classification Masterman (1992 p2) suggests that the approach is too academic and does not relate to the accepted characteristics of procurement system analysis. In conclusion, Masterman (1992 p3) recognises that the classification system proposed by Perry (1985) is the most suitable (for the selection of procurement systems) as it relates to the interaction between the design and construction process. The categorisation of procurement systems proposed by Masterman based on the study conducted by Perry (1985) include:-

i) Separated and co-operative Procurement systems: which refer to systems where the responsibility for design and construction are divided between separate organisations.

ii) Integrated procurement systems: which are identified by the design and construction aspects of the project being the responsibility of one organisation.

iii) Management orientated procurement systems which refer to procurement systems where emphasis is placed upon the overall management of both the design and construction process, with the latter process being often executed by work or package contractors (Masterman 1992 p3).

In contrast to the analysis provided by Masterman (1989) the examination of the procurement systems by Franks (1990 p4-23) suggested four classifications of principle types of system. Designated competitive tender, designer led construction work managed for a fee. Package deal or design and build and Project Management/clients representative. Designer led competitive tender is where the designer leads the construction process and design work is completed before competitive tendering procedures are implemented to select a single contractor to undertake completion of the project. Designer-led construction works managed for free: categorises systems where the designer are appointed to prepare designs for the

project, along with a management organisation who offer to undertake the management of the project for a fee. In doing so the management organisation having a similar relationship with the client as the design consultant. All construction work is carried out by specialist contractors who may enter into contracts for the completion of their packages of work either directly with the management organisation or with the client. Package Deal or Design and Build is a category of systems in which a single contractor is responsible for the whole design and construction of the building, (although a range of services maybe offered), as such responsibility is not split between design and construction of the building. Project Manager/Clients representative: is where the appointment of an independent management organisation or clients representative ensures that clients requirements are satisfied and takes the role of managing the whole design and construction process for the clients. As such the project manager takes the role of the surrogate client, acting as a contact point between the client and building procurement team.

Frank's (1990) categorisation of procurement systems predominantly uses the 1985 Think about Building procurement systems classification structure, however, Turner (1990 p43) classifies procurement systems around the key constituent parts of the procurement process. He suggests that these key parts include 'design', 'management' and 'construction'. By identifying the constituent parts of the process Turner recognises that classification of procurement systems may be possible and states that:

> "Whilst the client is always 'the employer', which of the remaining constituent parts he employs, that is, with whom he signs a contract or contracts and for which purpose that contract is made is the variable in the procurement option. The variable of who designs, when the design is carried out, who contracts with whom to construct the building and so on, produce the optional ways of procurement".
>
> (Turner 1990 p43)

Turner (1990 p3) begins his analysis be defining clients as 'customers for building', addressing the fact that clients may be categorised as individuals, groups or partnerships, corporate bodies, private or public clients who build regularly or once, those building for owner occupation, investment or as a development, these who act as agents for those who will eventually occupy the building or a combination of the

above. Turner goes on to identify the parties which represent the design and construction teams in the contract. He identifies that these two processes extensively involve:

> "consultants that offer design and cost control services and are independent of any commercial interest in construction companies or property companies ..... and ..... contractors that are essentially commercial companies that contract to contract building".
>
> (Turner 1990 p29-30)

Turner (1990 p29) proposes that the design function often includes contributions from a variety of participants in the industry including architects, civil engineers, mechanical and electrical engineers, quantity surveyors and other cost consultants. In the construction function specialist firms, subcontractors, suppliers and manufacturers of parts of the building works and main general contractors are involved.

With regards to the third constituent part of the procurement process which Turner (1990 p32-33) identifies as 'management', he refers to the definition provided by The Chartered Institute of Building (1988) which defines management as:

> "..... the overall planning and co-ordination of a project from inception to completion aimed at meeting the clients requirements and ensuring completion on time, within cost and to require quality standards".

The CIOB report suggested that the function of management was a function within its own right in the project delivery process and should be provided explicitly rather than being left up to either the design or construction team to provide. This missing management 'function' was regarded some what as the panacea for the industries ills. Turner (1990 p31) identifies that the management function is frequently executed by the project manager, however he acknowledges that architects, engineers, quantity surveyors and construction advisors frequently proport to offer such management skill arguing that the skills required to manage are not exclusively held by a single professional or consultant in the construction industry.

The Functional Approach

Turner (1990) begins to identify the three constituent elements in the procurement process and 'design', 'management' and 'construction'. In analysing these elements Turner begins to examine functions within each element and identifies the titles of the participants involved in executing each function in the UK context.

The issue of identifying functions rather then professional titles has also been discussed by Mathurin (1989) and Greenhalgh (1990). In an examination of the construction industry in the European Community, Mathurin (1989 p2) identifies the benefits and possibilities of the harmonisation of the framework within which the various parties involved in construction in each member country carry out their activities. The study particularly refers to functions of professionals and practitioners involved in the construction sector of each of the member countries. Mathurin (1989 p34-35) identifies the functions in the building process as (i) the Clients, (ii) Designer, (iii) Director of Works, (iv) Principle contractor and (v) Inspector.

Mathurin (1990) further discusses the harmonisation of construction law and responsibilities within the European Community particularly discussing the importance of economic and social cohesion, each countries political and social environment, research and the monetary capacity of each of the member states (Mathurin 1990 p1). He identifies the previous study conducted on the 12 member states within the European Community (Mathurin 1989) between 1987 and 1988 presenting the indigenous arrangements of each of the 12 countries in terms of laws and regulations of construction, controls on construction, access to public and private markets information on construction regulations, general conditions and standard clauses, the guarantee systems which apply to construction insurance systems and liability after construction. In conclusion Mathurin suggests that a present there are too many rules, regulations and numerous forms of legislation. Mathurin (1990 p3) proposes six objectives in order to achieve harmonisation of the European construction industry which include: a) the define at community level the principle functions of the participants involved in the act of construction, b) the harmonise the control of construction, c) to institute unified responsibilities and functions of the participants in the construction process d) to create a minimal guarantee of the standard of quality

and workmanship, e) to generate the use of systems for protection of owners or vendors and f) to improve the contractual and operational relationship between the parties involved within the construction process.

Hamilton (1991 p3) commenting on the issues raised by Mathurin concludes that the harmonisation of procurement systems within the European context is an important way forward. He identifies Mathurin's assertion that understanding should be promoted of the construction industries of member countries by standardising the meanings of essential concepts and terms. In order to achieve such objectives, Mathurin proposes the need for the identification of the main functions of those involved in construction in each of the european community and the subsequent standardisation of their respective responsibilities.

Functional analysis was also used by Greenhalgh (1990) who examined procurement systems in the UK construction industry based upon a classification of functions and responsibilities of construction professionals. The aim of his study was to inform upon the harmonisation of construction within the European Community and concluded with the consideration of developing a single generic form of contract based on responsibilities. Greenhalgh (1990 p91) begins his analysis by discussing the traditional systems of procurement in the UK which has evolved alongside its respective participants becoming aware of their functions and responsibilities in such a system. In discussing the use of alternative procurement systems in the UK, Greenhalgh (1990 p92) identifies that alternative systems have been developed by observing upon systems which operate in the USA and Europe. He suggests that the problems with such an approach has however been that clients, construction professionals and practitioners from both the USA and Europe have different requirements and have developed along different routes, which has resulted in the existence of certain procurement routes. In discussing such inconsistencies across nations in terms of construction professionals and practitioners, Greenhalgh (1990 p92) suggests that:

> "..... a common factor to all construction projects, however procured, is that responsibility for carrying out certain functions.....".

By recognising that professional titles differ between countries Greenhalgh identifies functions which are consistent. These responsibilities and functions include:-

i) Financing,
ii) Design,
iii) Design Management,
iv) Construction,
v) Construction Management,
vi) Cost Control,
vii) Supervision and
viii) Control of Construction (Greenhalgh 1990 p92).

Greenhalgh (1990 p98) examines the variety of procurement systems which operate within the UK against these identified responsibilities and functions concluding that:

> "All construction work, in whatever country and under whatever procurement system have the same basic list of responsibilities and functions, ... the construction professionals of the various European countries have developed their specialisations along quite different lines depending on the requirements and nature of their indigenous industries. However, this list of responsibilities can be used to determine the extent of the input of project participant as well as the risk which each participant bears".

In analysing the range of responsibilities and functions which Greenhalgh proposes are common to all procurement systems, a number of generic functions can be identifies. These included:-

i) Fund (financing for the project)

ii) Design (which will incorporate design management and cost control as the latter is recognised as being a consequence of design)

iii) Construct (which includes the process of physically constructing the project or part of the project, as well as the management of the construction production process itself).

Hanna (1991) and Morledge (1991b) address the need for the development of an objective method of identifying and classifying indigenous procurement systems in any country, and recognise the use of the functional approach as being of value. Hanna (1991 p2) in examining problematic issues in the identification of influential criteria for the comparison of procurement systems in a European or International context suggests that procurement systems have either evolved concurrently with their environment or have been imported, in which case they have been developed and evolved within the environment of their parent country and are subsequently operated in a foreign environment. As such if a range of indigenously evolved procurement systems exist then comparison between these systems can be carried out. In the instance of comparing indigenously evolved procurement systems with imported ones, Hanna argues that a much greater problem of comparison is created. In conclusion Hanna (1991 p7) proposes the establishment of an "independent base" for the comparison of procurement systems between countries, identifying the influential criteria in the procurement process. He suggests that the independent base is a mechanism:

> "against which any procurement system can be tested, in any defined set of circumstances".
>
> (Hanna 1991 p7)

Morledge (1991b) further endorses the establishment of criteria for the comparative analysis of procurement systems across countries. According to Morledge (1991b p1):

> "Across different countries the process, roles, responsibilities and risk associated with construction procurement may be very different, but there are some common criteria which are immediately apparent and which can form the basis for comparison, for example all projects are initiates by clients, whether corporate or individual, they are designed and they are constructed. The conceptual relationships and functional roles between these participants can be established as can the appointment of risk".

Morledge (1991b) goes on to propose that objective factual qualitative data is required regarding the features of particular procurement systems which are extensively being used in a country. The comparative analysis of procurement systems function is

expected to allow the objective classification and examination of dominant procurement systems between counties.

In the study of Risk Management Flanagan & Norman (1993 p5-7) also recognises that the construction process involved a variety of organisations and participants. They recognise that descriptive terminology which is often used to identify professional skills along with the title of the client is often not uniform and can be misleading. The authors suggest that the construction process comprises of

i) the investment decision which will involve participant such as the client/owner, funding bodies, users and advisors,

ii) the design process involving a variety of designers particularly the architect, engineers, surveyors, building inspectors for building code/regulations approvals,

iii) the construction process, which involves the contractor, design team, specialist contractors, subcontractors, supplies and manufacturers and finally,

iv) the process of occupancy or use which involves the owners, user and advisors.

In recognising that there are a variety of participants with different professional titles involved in the process the authors concluded that the processes in construction are constant while the people involved are heterogeneous. Flanagan and Norman (1993 p5) conclude however that the common characteristics amongst such participants is their exposure to risk.

The Functional Approach to Procurement Systems

Having analysed the various classification systems which are used to discuss building procurement systems, the functional approach should be analysed. It is contended that the use of existing reliable classification systems depend upon the availability of knowledge and understanding of the individual procurement system being classified and also the participants involved in the building procurement process. Existing

classification systems are particularly useful when knowledge or information about a countries construction industry is available and there is knowledge and understanding of the participants and their respective roles in the process. The availability of such data allows dominant procurement system in a country to be analysed in terms of existing classification systems such as the one proposed by Masterman (1992). Where there is insufficient understanding and/or knowledge of the organisational structure of a countries construction industry and the participants and their respective roles in the procurement process, functional analysis is suggested to be of use. Increasingly due to the language and cultural barriers and the inconsistency of professional titles and role descriptors across countries, procurement systems may be classified inaccurately.

Functional analysis when applied to the procurement process allows the generic functions which are common to all procurement systems to be identified and defined. It is contended that the five generic functions in any procurement system include: Initiate/Promote, Fund, Design, Construct and Allocation Risk amongst the above functions. From the identification of the generic functions in the procurement process it is possible to identify the Primary roles of the participants in each procurement system. The Primary roles include:

i) Initiator/Promoter,
ii) Funder,
iii) Designer (Schematic, Detailed and Specialist) and
iv) Constructor (Manager and Producer).

The use of such functional terminology allows the identification of the generic functions carried out by each participant in the procurement process, irrespective of professional titles which are often country specific and inconsistent when compared between countries.

In further examining the existence of formal relationships between the functional participants and the risks allocated to each participant in a particular procurement system a model emerges of the particular dominant procurement system. The use of such functional analysis will allow the objective modelling and subsequent

identification of a particular procurement system in any county. This will be particularly useful in providing information as to what dominant procurement systems are being used, along with which functions are available in any country, without relying upon traditional professional titles and classification techniques which may be misleading.

At present in order to compare the procurement systems between countries depending upon knowledge and understanding of the roles of professionals and participants in each country. It is clearly revealed from the literature review of the six countries under examination in this study that professional titles are often country specific and inconsistent when compared between countries. For instance, each country has a professional known as an architect, however the specific role of the architect vary in each country. Although the roles of such professionals may be inconsistent, the generic primary function is contended to be consistent. By analysing procurement systems in terms of functions we are able to compare systems from a range of countries. The identification of the functional participants in the procurement process, their roles, risks and formal relationships with one another allows models to be produced of dominant procurement systems in each country. As such models have been established using generic functional terminology which is not country specific, the comparison of procurement systems from a range of countries can be undertaken. It is acknowledged that where information currently exists on the exact role of the participants and the various procurement systems which operate in a country the functional analysis of procurement systems may seem unsuitable, however where comparisons are required of procurement systems across countries such analysis is useful. Additionally, where there is little information available on the procurement systems being employed in a country, the functional approach will allow the identification and future comparison of the dominant procurement systems being used.

Procurement Functions

In identifying the functions which are involved in all procurement systems the work of Turner (1990), Greenhalgh (1990), Mathurin (1990), Morledge (1991b) and Flanagan and Norman (1993) has been used. The five generic functions common to all procurement systems includes Initiate Promote, Fund, Design Construct and

Allocation of Risk. The definitions of these functions is provided in table 2.1, which have been establish through analysing the above literature and also by examining the functions of the main participants in the construction industries of the countries under investigation (Chapter 4). Although there is no claim for these functions to be exhaustive of the array of processes which are undertaken in the acquisition of a building it is suggested that the five functions identified are essential in order to operate any procurement system. As highlighted earlier, the use of generic functional terminology allows the objective identification of the key processes and key practitioners involved within the procurement process of any country.

From the work of Mathurin (1990), Greenhalgh (1990) and Ferry (1991 p18) it is clear that professional titles are often inconsistent. For instance, Flanagan and Norman (1993 p5) clearly recognise that the term 'client' does not refer to a homogeneous group or entity. They identify that the client may be an organisation, and individual, public or private, and owner occupier, an investor or a developer, each having their own specific needs and expectations from a building. They also suggest that the priorities and experiences of the various client groups will be different, and as such clients will have very different objectives (Flanagan and Norman 1993 p9-13). Even though it is clear that the 'client' is made up of a heterogeneous group of individuals and organisations, all having different needs, expectations, objectives, priorities and experiences of the construction process their generic key function is considered to be common that of the initiate or promote the process of acquiring a building. The title of the initiator/promoter therefore refers to the function of initiation/promotion which is the process of recognising that the need for a new building is required for owner occupation, as an investment or as a speculative development and being able to initiate the process of obtaining a new building. This function is considered to be common across all types of clients irrespective of their individual titles or groupings, objectives and experience of the procurement process.

In order to obtain a building the availability of finance is an essential prerequisite. Greenhalgh (1990) identifies the second function of the procurement process is to obtain funding. The acquisition of finance may be from a variety of sources in a particular country, however the generic function remains common; that of the

provision of the finance required in order for the building project to be undertaken.

The third function of the procurement process is that of Design, which involves the translation of verbal or written requirements of the initiator/promoter into drawings and specifications prepared to facilitate construction. The analysis of the countries under investigation clearly identifies that the participants involved and their distinctive roles varies between countries, however their function remains consistent. The design function is composed of three key elements which are identified to be concept/schematic design, detailed design and specialist design involves the process of translating the requirements of the initiator/promoter in to basic design form, indicating the general design in terms of shape, size and function of the building. Detailed design comprises of the production of detailed drawings and specification from the concept/schematic designs, describing and detailing each element of the building so that it may be constructed. Specialist design involves the development of detailed drawings and specifications for a specific component or element within the building which requires specialist technical knowledge to design and construct.

The role of the estimator (or the Quantity Surveyor as known in the UK) is an integral procedure carried out during the design function. Seeley (1987) suggests that the generic activities of project cost control occur during the design and construction stages of a project. The estimator is often engaged at the design stages of a project to advise the designers on the likely cost implications of their design decisions. From this point onwards the role of the estimator becomes of increasing importance, providing a variety of service including the generic tasks of the quantification of the design in terms of cost, and other general cost control processes. Seeley (1987 p214) proposes that:

> "During the design stage, advice is needed on the capital costs and on the cost implications of design variables and differing construction techniques. The cost control process should be continued throughout the construction period to ensure that the building is kept within the agreed cost limit. Building cost can be considered as a medium relating purpose and design and it certainly forms an important aspect of design".

The fourth function in procurement systems is construction. This involves the physical process of fitting the various components of the building together to form the final structure. This function consists of two elements, the management of the construction and the physical construction production process.

Finally, allocation of risk is recognised a fifth generic function common to all procurement systems. The allocation and susceptibility of each of the above generic functions to varying degrees of risk must be identified. The examination of literature on the various dominant procurement systems in each country has identified that of the various functional participants in the procurement process are assumed to carry varying primary risks under each procurement system.

The definition for the generic functions of procurement used throughout this investigation are identified in table 2.1.

Table 2.1: The five generic functions of any procurement system

Generic Function	Definition
1. Initiate/ promote	The process of recognising that a new building is required for owner occupation, as an investment, or as a speculative development.
2. Fund	The provision of the finance required in order for the project to be undertaken.
3. Design	The translation of the verbal or written requirements of the initiator/promoter into drawings and specifications, prepared to facilitate construction. This process is sub-divided into concept/schematic design, detailed design and specialist design.
Concept/ schematic design	The process of translating the requirements of the initiator/promoter into a basic design form, indicating the general design in terms of shape, size and function of the building.
Detailed design	The production of detailed drawings and specifications, from the concept/schematic designs,detailing and describing each element of the building so that it may be constructed.
Specialist design	The development of detailed drawings and specifications for a specific component or element within the structure, which requires specialist technical knowledge to design and construct such as Mechanical, Electrical, Heating and Ventilation systems.
4. Construct	The process of physically fitting the various components of a building together, to form a final structure. This process may be divided into the management of construction and physical action of the process.
Management of Construction	The management of the construction process for the initiator/promoter
Construction production	The physical construction of all or part of the structure for the initiator/promoter, in accordance with the detailed designs.
5. Allocation of Risk	The susceptibility of each of the above generic functions to varying degrees of risk. The degree of risk is dependent upon the type of procurement system implemented and the individual functional roles.

Primary Risks

The detailed investigation of the variety of risks associated with procurement systems is a difficult process and beyond the scope of this study. It is however recognised that there are a number of inherent primary risk categories common to all procurement systems identified. The risks associated with Cost, Time and Performance/Quality have been considered as being applicable to all procurement systems (NEDO 1985, Morledge 1987, Franks 1990, Masterman 1992, and Flanagan and Norman 1993). Flanagan and Norman (1993 p13) examine these three major headings of risk and suggest that time often refers to both the need for rapid construction and completion to a stipulated data, cost refers to obtaining the building within budget, and performance/quality refers the functionality and standards of workmanship of the building. This trio of risks associated with all building delivery systems has subsequently been used to establish client's key criteria in the selection of the most appropriate building procurement system.

The studies conducted by NEDO (1985), Nahapiet and Nahapiet (1985), Morledge (1987), Skitmore and Marsden (1988), Singh (1990), Bennet and Grice (1990) recognise that the selection of a particular procurement system should be considered in relation to the "clients priority questions" in each system. The authors identify that amongst other criteria, time, cost and performance/quality questions are key features of all procurement systems and need to be recognised and analysed before a particular procurement system is selected. Each of the selection systems identifies a range of clients key criteria or performance requirements which are then prioritised against the various procurement systems available. In the identification of the clients key criteria or performance requirements generic categories of risks associated with each procurement system may also be distinguished. Although a variety of procurement selection systems exist, all of the systems acknowledge that clients main selection criteria are associated with issues concerning time, cost and performance/quality of the building. Each selection system attempts to identify which of the procurement systems available provide the best match with the clients criteria of project costs, project time and project performance/ quality. Morledge (1987 p121) attach a further criteria to his model, identifying that "responsibility of design" is a significant issue for clients in the selection of procurement systems. The ELSIE expert system

Brandon (1990) also identifies the importance of specialist design and independent design input as criteria to be considered in the selection of procurement systems.

Flanagan and Norman (1993 p8) also analyse the array of typical risks which can apply to building projects, and state that:

> "Ultimately, all risks encountered on a project is related to one or more of the following: a) failure to keep within the cost/budget/ forecasts/estimate/tender, b) failure to keep within the time stipulated for the approvals, design, construction, occupancy, and c) failure to meet the required technical standards of quality, function, fitness for purpose, safety and environmental preservation".

Raftery (1994 p17) also analysing risks in construction identifies the work of Hayes et al (1986) suggesting that the major categories of risk sources include client/ government regulatory agencies, funding risks, risks associated with definition of the project, project organisation, risks associated with design, local conditions, construction related risks, logistics and estimating data. Table 2.2 summarises these sources of risk and provides examples of each as identified by Raftery.

List of Major Categories of Sources of Risk	
Source	Example
Client/Government/Regulatory agencies	Bureaucratic delays/ changes in local regulations
Funding/Fiscal	Changes in government funding policy, liaisons between several funders
Definition of Project	Change on project scope
Project Organisation	Authority of project manager, involvement of outside bodies
Design	Adequacy to meet need, realism of design
Local Conditions	Local customs, weather windows
Permanent Plant Supply	Degree of novelty, damage/ loss during transport
Construction Contractors	Experience, financial stability
Construction Materials	Excessive wastage, reliability of quality
Construction Labour	Industrial relations, multiracial labour force
Construction Plant	Resale value, spares available
Logistics	Remoteness, access to site
Estimating Data	Relevance to specific project availability
Inflation, Exchange rates	
Force *Majeure*	

Table 2.2: A List of Major Categories of Sources of Risk.
Source: Raftery (1994 p17)

Raftery (1994 p15) recognises that the major risks indicated in table 2.2 are a combination of project based risks and external risks. He suggests that the former sources of risks comprise of issues which relate directly to the project and include: project size, complexity, novelty, speed of design and construction and physical location. External risks are recognised however to relate to sources which are outside or not directly influenced by the project and include such issues as inflation, market conditions, cost escalations on input resources, materials and labour availability, political uncertainty and weather.

From analysing secondary data relating to building procurement systems the five primary risks common to all procurement systems have been identified. These include the risks associated with construction time, product price, design apportionment liability, project finance, effectiveness of the building in operation and quality of workmanship. These risks are contended to be applicable to all procurement systems and are defined in Table 2.3. Each procurement system will display a distinct distribution in terms of which of the functional participants will assumes the highest level of each of the risks identified. By distinguishing which of the functional participants carries out each of the functions, and combining this with which of the participants carries the highest level of each of the primary risks identifies, a distinctive pattern begins to emerge which assist in the process of modelling, identifying and comparing procurement systems used indigenously.

Having identified the key functions in the procurement process, the functional participants involved and the primary risks common to all procurement systems, the next process in modelling procurement systems is to identify how the participants are formally linked with one another in the procurement process. Each procurement system has a mechanism by which formal relationships are established between the participants involved. It is recognised that such formal relationships are frequently established through the use of contractual documents based on legal systems and which create a formal bond between the participants. The review of the national procurement paradigms identifies the variety of formal agreements which are used in each country.

Primary Risks	Definition
Construction Time	Risk to the party who gives certainty of the completion date for the project. Timing of the project is considered in terms of the building being completed before the completion date, or on the stipulated completion date, or after the completion date. One of the generic roles identified will bear the risk of the project being completed on or before the completion date. (The overall programme time of the project will often have a premium on the price/cost and quality of the product).
Product Price	Risk in terms of total building price and price escalations. (The use and certainty of cost estimates is significant in the allocation of this risk).
Design Apportionment liability	The responsibility for design and design standards in the project. (Issues such as the reliability and durability of the designs will be considered).
Project Finance	The risk involved in providing the funding for the proposed project and the potentiality for loss.
Effectiveness of Building in operation	Risks associated with the completed project not fulfilling the requirements stated in the brief. These risks are considered in terms of whether the project meets the stated requirements, can perform its proposed function, and is suitable for its intended purpose.
Quality of Product	Risk of the project being of unsuitable construction quality. Quality is a very subjective issue, and for the purpose of this study the risk has been assigned to the party who is responsible for the quality of workmanship and materials in the construction process.

Table 2.3: Definition of Primary Risks Common to all Procurement Systems

The Functional Frameworks

Three frameworks have been developed based upon the generic functions of procurement previously discussed. This process has been carried out by reviewing secondary data relating to the organisational structure and dominant procurement systems of each country under investigation. The secondary data has been supplemented by the collection of primary data obtained through a questionnaire survey and interviews. It is contended that by establishing which functional participant carries out each of the generic functions, what formal relationships exist

between the various participants and how the primary risks are distributed between each of the participants involved, will facilitate the objective modelling and identification of a particular dominant procurement system in any country.

The three frameworks show the relationships which occurs in a particular dominant procurement system between:

i) the primary functional role and each functional process indicating who carries out each function (Framework 1),

ii) the functional role and formal relationships indicating who has a formal relationship with whom (Framework 2) and

iii) the functional role and primary risks indicating who carries the higher risk for each identified risk (Framework 3).

As procurement systems are being modelled using the three frameworks the configuration of each system will be unique. It is intended that each dominant procurement system will display a distinctive pattern within the three frameworks which when examined collectively will indicate the modelling of a particular procurement system. Although this study concentrates on dominant procurement systems it is acknowledged that within each particular category or group of system (such as design and build or management) numerous procurement systems may exist. As such the aim of this investigation is to model the most widely used variant of each dominant procurement system.

The objective modelling of procurement systems by the functional frameworks will highlight areas of abuse of the particular system being modelled. The modelling of the most dominant variant of a particular category of procurement system and its subsequent comparison with other systems within that category will allow examination of the difference and possible areas of misuse between the systems.

i) The identification of which primary functional participant (role) carries out each of the functions in the procurement process is shown by framework 1 in figure 2.2.

PRIMARY ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
1 Initiate/Promote		✓						
2 Fund			✓					
3 Design	Schematic			✓				
	Detailed				✓			
	Specialist					✓		
4 Construct	Management							✓
	Product							✓

Figure 2.2: Framework 1: Functional Role against Functional Process

As identified there are suggested to be five generic functions in the procurement process which include to initiate/promote, fund, design, construct and allocation of risk. The purpose of framework 1 is to identify 'who does what' in each procurement system. As such framework 1 maps each function process against the functional roles (participants) in a particular dominant procurement system. Each function is required to be carried out by one of the participants in the procurement process.

For the model to be operated in any country, generic functional terminology must be used. The functional roles indicate the various participants which are involved in the procurement process. If such a generic functional terminology is not used then the model has to be constructed using terminology and professional titles which are country specific. As a consequence, the exportable quality of the model would be diminished. For example in the UK the functional role of the Initiator/promoter would be executed by the 'client' and the funder may refer to the government , a bank, building society, insurance company, pension fund etc. The concept designer is often known as the 'architect' with structural and specialist engineers being frequently involved in he detailed and specialist design stage. The quantity surveyor

would also be involved in the design stage. The function of the constructer would be carried out by the contractor (general) and or subcontractors. These professional titles or labels are country specific and can be misleading in identifying the primary functions of the participant and are often open to misunderstanding when completed between countries. There is no common language or structure in terms of the roles performed or titles held by consultants and practitioners when compared internationally. The use of generic functional terminology to describe the role of various practitioners and consultants in the procurement process allows the objective identification and comparison of roles and functions in the procurement process. For example the professional title of the Quantity Survey is particularly used in the UK and commonwealth countries, however the primary function of the QS is conducted in many countries. The literature review of the organisational structure of the construction industry in France, the USA and Japan has highlighted that although these countries do not have a consultant known as a quantity surveyor, there are consultants with different titles which carry out many of the key functions of the UK QS. The benefit of using functional terminology rather than professional titles therefore facilitates the comparison of roles and dominant procurement systems between countries.

Framework one begins by identifying which of the functional participants initiates/promotes the procurement process, followed by which functional participant carries out the function of providing funding for the project. The framework then identifies for a particular dominant procurement system which functional role carries out the design function. The design function has been separated into schematic design, detailed design and specialist design. Analysis of the organisational structure of the construction industry in each of the countries under investigation has shown that the concept design, details and specialist design may be carried out by different participants in the procurement process. In specific procurement systems however the schematic and detailed design process may be executed by the same participants. The identification of which participant executes each of the elements within the design function begins to indicate what dominant system is being modelled. For example, if the constructor producer is involved in the detailed and specialist design function then a particular generic category of procurement system may be identified. The final functional process in framework 1 details which participant carries out the function

of construction. This function consists of two elements: management of the construction and construction production. Each of the models will indicate which participant executes these two elements of the construction function.

The example in figure 2.2 shows that the initiator initiates the process, and the funder funds, whilst the concept/schematic and detailed designers are carried out by the same organisation. Specialist design work is by the specialist designer. The framework indicates that both the management of construction and construction production functions or carried out by the same organisation the constructor producer. The identification of which generic participant carries out each of the functional roles will begin to model a particular dominant procurement system. On completion of framework 1, the first stage of the procurement systems model is completed, identifying who does what in the system. As each subsequent element in the next two frameworks are completed, a model will begin to emerge of the dominant procurement system which is being used in a particular country. The development and use of such PSM's will allow the comparison of dominant procurement systems between countries on a consistent basis, without using professional titles and role descriptors which are often inconsistent and open to misinterpretation.

ii) Frameworks 2 identifies the formal relationships which are established between the functional participants in a particular dominant procurement system.

PRIMARY ROLE FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Det.	Spe.	Constructor Manager	Producer
5 Initiator/Promoter			✓	✓	✓	✓		✓
6 Funder		✓						
7 Designer	Schematic	✓						
	Detailed	✓						
	Specialist	✓						
8 Construction	Manager							
	Producer	✓						

Figure 2.3: Framework 2 : Functional Roles against Formal Relationships

At various stages throughout the procurement process a range of formal relationships will be established. The pattern of formal relationships which began to emerge between the participants will further model the particular procurement systems under investigation. It is recognised that formal relationships are dependent upon the indigenous legal system and may be written or verbal agreements between the participants and is often supported by legal documentation.

Framework 2 details all the functional participants in the procurement process and shows the existence of formal relationships between them. By identifying the pattern of formal relationships which exist between each participant in the procurement system the framework begins to further model the dominant system. Framework 2 begins by illustrating which functional participants enters into a formal relationship with the initiator/promoter, followed by the funder, designer (schematic, detailed and specialist), and constructor (both manager and producer if separate).

Figure 2.3 provides an example of framework 2 indicating that the formal relationships in the procurement system being modelled exist between the initiator/promoter and funder, the initiator /promoter and the schematic designer, the initiator and the specialist designer and between the initiator promoter and the constructor producer.

By examining framework 1 and framework 2 together, the dominant procurement being modelled may begin to be identified in terms of who does what and how formal relationships have been established with one another. The completion of the second framework in the PSM further allows the particular dominant procurement system to be modelled. The exact pattern of how formal relationships exist between the functional participants will provide further clarification of what system is being modelled.

iii) Framework 3 illustrates which of the functional participants (roles) carries the higher of the primary risks identifies in a particular dominant procurement system.

PRIMARY ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
9 Time								*
10 Product Price								*
11 Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		
12 Project Finance			*					
13 Effectiveness of Building in operation		*						
14 Quality of Product								*

Figure 2.4: Framework 3: Functional Role against Risk.

The dominant risk which apply to all procurement systems have been identified in Framework 3 shown in figure 2.4. Framework 3 of the Procurement system model illustrates how the primary risk is allocated between the various functional participants in a particular system. An asterisk (*) has been used to indicate which of the functional participants carries the highest level of each of the primary risks identified. The pattern of risk allocated between each of the participants is influenced by framework 1 and framework 2 (who does what and the arrangements of formal relationships).

The primary risk considered in Framework 3 include: time (in terms of which participant carries the risk of giving certainty of the completion date of the project). Project price (the participant which assumes the risk associated with giving certainty of the building price or price escalation. Design liability (who is responsible for design and design standards at each of the stages of design), project finance (which functional participants assumes the risk associated with providing finance for the project and the penalty for loss). Effectiveness of building in operation (the participant which carries the risk of the proposed building meeting its stated requirements, proposed function and being suitable for its intended purpose) and

quality of the product (which identifies the participants which carries the risk of the project being of unsuitable construction quality).

The example of framework 3 shown in figure 2.4 illustrates that the primary risks associated with time and product price and quality of the product reside predominantly with the constructor producer under this particular procurement system. The concept designer is responsible for both schematic and detailed design liability, whilst the schematic designer is responsible for the schematic design. The risk of project finance resides with the funder whilst the risks associated with the effective operation of the building lies with the initiator/promoter and the concept designer.

The configuration of which of the generic participants carries each of the above primary risks in a particular dominant procurement system will finally allow the model to be produced. By identifying which functional participants is associated with each of the elements in the 3 frameworks a model of the procurement system begins to emerge. The completion of each framework in isolation will not identify which system is being modeled. The completion of all three of the frameworks and their collective analysis will allow the modelling of a particular procurement system in any country. The combination of frameworks 1, 2 and 3 clearly begin to illustrate the type of procurement system which is being modelled, allowing its comparison with various dominant systems in other countries. By using this approach PSM's may be produced for dominant procurement systems in a range of countries with varying construction activity, and organisational structure, allowing comparisons to be made between them. This is particularly beneficial to emerging countries which have a desire to increase their construction output. By identifying the variety of procurement systems which exist in similar countries, an emerging country may be able to identify new procurement systems which would facilitate increased construction activity in their own country.

The Procurement Systems Model (PSM)

These frameworks will exemplify the pattern of functional responsibilities, formal relationships and Primary Risks inherent in the various dominant procurement systems. Each procurement system identified will have a particular arrangement in terms of the above frameworks. An amalgamation of the three will produce a 'Procurement System Model' (PSM), illustrating the dominant procurement systems in a country. It is envisaged that an array of models will emerge and these may then be classified.

The Procurement Systems Model (Figure 2.5) illustrates the three frameworks in the model. The model comprises of three frameworks which are each made up of a number of elements (numbered 1 to 14). Each framework also shows the generic functional participants (roles) which are involved in all procurement systems. The identification of which of the functional participants is associated or responsible for each of the fourteen elements in the model will allow a particular procurement system to be modelled and further facilitates its identification and comparison. At each point (or element) of the model various options are available to show which participant is associated with or responsible for that particular element. As each element is traced to one of the functional participants the model of the particular procurement system begins to emerge. Once all of the elements in the three frameworks have been completed, the model of the procurement system is established.

Figure 2.5: The Procurement Systems Model

Framework 1: Functional Role against Functional Process: indicating who carries out each function

PRIMARY ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
1 Initiate/Promote		✓						
2 Fund			✓					
3 Design	Schematic			✓				
	Detailed				✓			
	Specialist					✓		
4 Construct	Management							✓
	Product							✓

Framework 2: Functional Roles against Formal Relationships.

PRIMARY ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
5 Initiator/Promoter			✓	✓	✓	✓		✓
6 Funder		✓						
7 Designer	Schematic	✓						
	Detailed	✓						
	Specialist	✓						
8 Constructor	Manager							
	Producer	✓						

Framework 3: Functional Role against Risk.

PRIMARY ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
9 Time								*
10 Product Price								*
11 Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		
12 Project Finance			*					
13 Effectiveness of Building in operation		*						
14 Quality of Product								*

Summary

The application of functional analysis has been used to develop a model to identify and compare procurement systems in any country. This chapter intended to provide a background to the conventional classification methodologies used to identify dominant procurement systems and illustrates their dependence upon the existence of knowledge and understanding of the countries construction industry and their use of professional titles and role descriptors. This investigation proposes that the use of functional analysis in the examination of dominant procurement systems will overcome the problems associated with inconsistent terminology which is used to describe the dominant function of a particular participant in the procurement process. It is contended that the Procurement Systems Model is unaffected by role descriptors and professional titles which are neither consistent nor recognised in all countries. The use of the PSM will therefore facilitate the objective modelling, identification and comparison of procurement systems in various countries which have dissimilar organisational structures and involve a variety of professional practitioners as the model concentrates on generic primary functions rather than titles or role descriptors.

Having established the three functional frameworks which recognise which functional participant carries each of the generic functions, the existence of formal relationships, and how the primary risks are distributed between the participants under a particular procurement system, the PSM may be used to model and inform upon dominant building procurement systems in a range of countries. It is acknowledged that although various procurement systems may exist in each category of system (for instance design and build) the study specifically seeks to model the most widely used variant of each dominant system.

Chapter four identifies the national procurement paradigms of the countries under investigation. A detailed literature review has been carried out on each countries construction industry indicating the organisational structure of the industry on examination of the dominant procurement systems and finally the PSM's of the various dominant procurement systems in each country. The PSM's have been primarily established through the examination of secondary data, and have subsequently been validated and readjusted by the results of a questionnaire survey.

The accuracy of the validated PSM's were further verified through interview surveys. The analysis of secondary data and the verification of the PSM's facilitated the establishment of charts which represent the organisational structure of each dominant building procurement system modelled. Each chart identifies the title of the procurement system, illustrates the functional roles and what formal relationships exist between the participants and finally the advantages and disadvantages of each system.

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CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

The aim of this investigation is primarily to establish and validate a method of modelling building procurement systems in a range of countries, from this model to identify competencies upon which effective operation of the systems depend and the institutions upon which these competencies may rely.

The range of available research methods were evaluated to identify the suitability of each method and to select those appropriate for this investigation. Consideration was given to sample size, the selection of respondents and the limitations associated with this type of research.

In order to obtain factual, objective and qualitative data on the characteristics of the building procurement systems in the countries under investigation it was necessary to conduct a study of the literature available on the construction industry and procurement systems in each country. Analysis of such secondary data including texts, articles, journal and conference papers, special papers and reports which allowed preliminary Procurement Systems Models (PSM's) to be established for each dominant procurement system in each country and subsequently facilitated the identification of procurement competencies and institutions in each country.

The validation of each of the procurement models was through questionnaires and verification subsequent to any amendments was through interview. The competencies related to each procurement system and the existence of institutions in each country from literature reviews and were also verified through interviews with respondents from each country.

Research Methodology Available

Following the analysis of published sources of secondary data various research methods were employed in order to collect primary data. In the selection of the most appropriate methods to use for this investigation a variety of methods were considered. Gill & Johnson (1991 p8-9) illustrate that the traditional classification of research methods has been laboratory experimentation, ethnographic methods

(observation) and in between these, survey methods.

Experimentation research methodology is suggested to be:

> ".... the general label applied to methods developed for the specific purpose of testing causal relationships".
>
> (Dane 1990 p75)

Nachmias & Nachmias (1992 p100-101) discuss how experimental research methodology involves an experimental group and a control group and is often associated with physical sciences rather than the social sciences. The authors conclude that experimental research methodology creates a rigid structure making it often unsuitable for social science research.

Gill & Johnson (1991 p8) suggest that under experimental research methods emphasis is placed on "deduction which is firmly based on what is known as positivism which relies on the highly structured methods employed in the natural sciences". The process thus results in the use of controls, standardised methods and the collection of quantitative data, making it often inappropriate for studies related to the social science.

Observational (or ethnographic) research methodology involves the analysis of subjective accounts, often involving 'getting inside situations' and frequently results in the investigator becoming involved in the everyday life of the respondent. Burrell & Morgan (1979 p5-6) and Gill & Johnson (1991 p9) suggest that in this approach:

> "....emphasis is on theory grounded in empirical observation which take account of subjects meaning and interpretational systems in order to explain by understanding".

In contrast, survey methodology has been defined by Dane (1990 p120) as obtaining information directly from a group of individuals usually by the means of posing questions. Dane (1990 p20) proposes that this research method is most suited for research involving "description and prediction" with the former being the most frequent use of survey methods.

Gill & Johnson (1991 p123) illustrate that surveys often involve the random selection of samples and enable the results produced to be generalised to wider populations with relative confidence. Nachmias & Nachmias (1992 p125) confirm this view by stating that:

> "....survey research usually involves asking a random sample of individuals to respond to a set of questions about their backgrounds, past experiences and attitudes. Survey research yields data that are used to examine relationships between property and dispositions ..... and/or ..... to describe the pattern of relation before any attempt at causal inference is made".

Under the broad heading of survey methodology there are three main research methods (Nachmias & Nachmias 1992 p215). Peterson (1988 p160) identifies that primary data may be collected from any of the following survey methods; (1) mail questionnaires: where data is collected through mailed communication between the researcher and study participants, (2) personal interviews: face to face communication is undertaken between the researcher (interviewer) and the study participant, and (3) telephone interviews: where data is collected by the means of telephone communication between the researcher (interviewer) and the study participant.

1 Mailed Questionnaires

The features and advantage of mailed questionnaires have been analysed in relation to the common aspects of this research project. Issues such as the wide geographical spread, limited finance and time resources are important considerations when deciding on the most suitable research tool to use. Nachmias & Nachmias (1992 p216) have observed upon the advantages of this approach which include:-

i) Low Cost. This method is particularly useful when the population under investigation is geographically widely spread (Nachmias & Nachmias 1992 p216) . The mail questionnaire has low administration costs and is considered to be the most cost effective and practical

method of collecting primary data from the range of countries to be studied in this investigation.

ii) Geographical Accessibility. Due to the number and range of countries under investigation the use of questionnaires is considered to allow wide geographical accessibility at minimal costs.

iii) Reduced biasing error. Mailed questionnaires are recognised as reducing the potential problem of biasing error because there is no personal contact with the questionnaire respondents during data collection.

iv) This system of data collection is considered to be least disruptive and the most flexible for participants and the best with regards to respondent convenience (Parasuraman 1986 p288).

The mail questionnaire however suffers from a number of disadvantages. Nachmias & Nachmias (1992 p216-217) have highlighted the following limitations of this approaches:

i) The questions used have to be simple and straightforward and not too long.

ii) There is no opportunity for probing when mailed questionnaires used.

iii) The mail survey suffers from a low response rate (Berdie, Anderson & Niebuhr 1986 p17). It is however recognised that measures can be taken to increase the possible response rates. Many authors including Kanute & Berenson (1975), Berdie, Anderson & Nieburh, (1986 p5) and Nachmias & Nachmias (1992 p217-218) have discussed factors which affect the response rate of such survey techniques and have suggested that follow ups and reminders are essential for increasing the response rate to mailed questionnaires. The methods used to increase the response rate in this study are discussed later.

iv) There is considered to be no control over who fills out the questionnaire.

v) Absence of an interviewer results in a large number of variables which are inadequately controlled (Aaker & Day 1990 p209-210). These include:-

a) Identity of respondent
b) With whom the respondent consults during answering the questions
c) Spread of response
d) Order of answering questions
e) Respondents understanding of the questions

2 Personal Interviews

Aaker & Day (1990 p201) illustrate that personal interviews allow face to face contact between the interviewer and respondent, and result in a higher degree of flexibility. Peterson (1988 p162) argues that because the participation rate is high for personal interviews they are contested to yield the largest quantity and highest quality of research data of the three survey methods.

Focused interviews are considered to have four main characteristics:-

i) The interview is conducted with known experienced respondents

ii) The interview is conducted with regards to a previously analysed situation

iii) It is based on an interview guide specifying topics related to the investigation

iv) It focuses on the respondents experience regarding the topic under investigation (Nachmias & Nachmias 1992 p224-225).

Nachmias & Nachmias (1992 p225) state that under this method:

> ".... although the encounter between the interviewer and respondents is structured and the major aspects of the study are explained, respondents are given considerable liberty in expressing their definition of a situation that is presented to them".

The personal interview however does suffer from a number of limitations which have been highlighted by Nachmias & Nachmias (1992 p228-229). These include:-

i) Interviews are considered to have high costs

ii) Due to the flexibility of this approach, there is the possibility of the interviewers personal influence and bias affecting the results

iii) This approach is considered so lack of anonymity as all of the respondents are known to the interviewer

iv) Interviews may be difficult to analyse. This is particularly the case if the interview is unstructured where the respondent is asked to discuss a topic with not specific questions being asked by the interviewer.

3 Telephone Interviews

Peterson (1988 p178) suggests this technique is most suited to closed ended questions as opposed to open questions. Nachmias & Nachmias (1992 p231-232) identify the traditional criticism of this approach as being a "high likelihood of a serious sample bias" primarily due to lack of respondents who have access to telephones. This is however no longer considered to be a major limitation of the approach due to wide availability of respondents with telephones. It is further suggested that such techniques should be used in conjunction with personal interviews in specific situations. Nachmias & Nachmias (1992 p232-233) have identified the major advantages of this survey

approach as:-

i) It is a moderately cheap method of data collection.

ii) It is a quick method.

iii) Telephone interviewing increases the quality of data collected as they are monitored by supervisory staff.

iv) Allows access to geographically dispersed respondents.

In contrast, the main disadvantages of this technique include:-

i) The potential for "non-responses or broken-off" interviews where respondents terminate interviews before their completion.

ii) This technique produces less information in terms of quantity as respondents are usually reluctant to go into in depth detail.

iii) Respondents often feel uncomfortable about discussing certain issues over the telephone (Dane 1990 p133).

Consideration of Countries to be Studied

The original framework of the research methodology included the selection of a range of countries from the broad categories of 'Developed', 'Developing', and 'Underdeveloped'. It was anticipated that the range of countries selected from each category would provide a cross-section of countries of different size, population density and construction industry development. It was acknowledged at an early stage of the investigation that this classification criteria was too broad and highly subjective. The task of establishing a list of countries and their development classification recognised to be difficult.

The main source of information came from the World Bank's classification system.

Most classifications of 'development' status of a country are based on GNP/per capita (Gross National Product). Such classification methodology was considered to be subjective as no account is taken of social factors which do not have a monetary value such as the literacy level of the population. The issue of country classification was further complicated by the recognition that the process of development is a continual and dynamic one, therefore theoretically, all countries should be classified as 'developing'.

Following discussions with Dr Skelton (Department of International Studies at The Nottingham Trent University) it was established that no universally accepted classification table exists. Consequently, the IPRG made an attempt to develop their own classification framework which included such factors as the countries general development classification (as identified by the World Bank), geographical location, land area, population, birth rate, death rate, education statistics, working population, construction employment, national GDP, and construction GDP. The information was gained from a variety of sources including the Europa World Year Book 1991-1992, National Account Statistics: Main Aggregates and Detailed Tables 1989 Parts 1&2, Price Waterhouse Information Guides, Foreign and Commonwealth Office Country Profiles, the Third World Guide 1991-1992, and The Third World Atlas; Basic Data, Economic and Social Data and Sectoral Distribution of GDP and Labour Tables. This data was used to establish table 3.1 showing the IPRG's classification of countries.

Country	Development Classification	Continent	Land Area	Population	Births/ 1000	Deaths/ 1000	Education Primary	Education Secondary	Education Further	Working Population	Construction Employment	GDP	Construction GDP
Algeria	Developing	Africa	2,381,741	24,960,000	35.5	8.3	4,317,000	1,468,000	831,000	5,341,102	689,586		
Argentina	Developing	S America	2,766,889	32,322,000	20.7	8.4	328,000	253,000	108,000	9,989,190	1,003,175		305
Canada	Developed	America	9,970,610	26,991,600	15	7.3	5,149,000	5,149,000	532,000	13,681,000	923,000	596,244	
China	Developing	Asia	9,571,300	"1,133,682,501	21.1	6.7	123,731,000	47,033,000	2,082,000	553,293,000	24,437,000		
France	Developed	Europe	543,965	56,440,000	13.5	9.4	4,086,000	5,386,000	1,041,000	22,031,300	1,589,000	6,482	322,143
India	Developing	Asia	3,287,263	844,324,222	30.4	10.2	97,318,000	13,789,000	3,426,000	244,604,979	3,565,408	3,951	220
Japan	Developed	Asia	377,815	123,611,541	10	6.7	9,607,000	11,255,000	2,067,000	62,700,000	5,780,000	395,844	37,607
Malawi	Underdeveloped	Africa	118,484	8,556,000	56.3	20.6	1,326,000	29,000	4,000	3,300,198	52,101		44
Malaysia	Developing	Asia	329,758	17,755,900	28	4.6	2,447,000	1,357,000	117,000	7,257,900	455,900	114,683	3,271
Pakistan	Developing	Asia	796,095	112,050,000	46.9	12.6	8,316,000	550,000	150,000	31,818,000	1,966,000	759,349	17,466
Turkey	Developing	Euro/Asia	779,452	56,473,035	29.2	8.4	6,767,000	3,512,000	560,000	20,616,733	1,014,781	251,732	10,091
UK	Developed	Europe	242,533	57,410,600	13.9	11.2	4,040,720	3,038,481	760,728	25,404,000	1,587,000	477,747	36,085
USA	Developed	America	9,372,614	252,626,000	16.7	8.6	34,300,000	12,500,000	14,150,000	126,867,000	7,087,000	4,976,600	220,746

(Sources: Various)

Table 3.1: IPRG Development Classification Table

The Countries Selected for Investigation

The countries to be investigated were to be from a range which may be classified as developed, developing and underdeveloped. In addition to these categories it was considered necessary that the countries originally identified for investigation should be from the four continents of the world, vary in size and population and possess significantly different construction industries in terms of size, level of sophistication and organisational structure. Fourteen countries were originally identified for investigation in this study and included:

> UK, France, USA, Canada, Japan, Turkey, Algeria, Argentina, Malaysia, China, India, Pakistan, Malawi and Ethiopia.

A questionnaire (Questionnaire 1 Appendix D) was developed and used to conduct a pilot study on these countries. The initial questionnaire was developed in order to obtain empirical, objective data regarding the relationships, functions and liabilities which exist in building procurement systems in the range of countries originally under investigation. It was originally envisaged a range of 14 countries would be examined in this investigation. Due to the poor response rate of the questionnaire from many of the countries under investigation it was identified that the number of countries which were to be studied for this investigation should be reduced to a maximum of six. These countries were also to fall within the category of major exports of construction services and major importers of construction services.

Respondent Data Base

A data base of names and addresses was established of practitioners and academics from each of the countries under study. The data base included respondents who were classified as initiator/promoters, funders, designers, constructors and academics. The categorisation of respondents used in this investigation are discussed in detail later in this chapter.

The data base includes contact details of members of the CIB Working Commission W92 and W65 in the related countries. In order to alleviate any potential bias in the

nature of the contacts from the CIB, names of respondents were collected from professional bodies, academic institutions, Government institutions, and published directories from the countries under investigation. The data base has specifically been compiled from the following sources including the CIB W92 & W65 Members List, RICS Overseas Members 1993-94, ICE; Overseas Engineering Institutions, Local Associations & Joint Groups of Professional Engineers, RIBA; Overseas Societies, RICS; Details of Educational Establishments with overseas Degree accredited courses, The Foreign and Commonwealth Office, Embassies of the countries under investigation in the UK, British Embassies in the countries under study, DOE; Overseas Construction by British Firms 1992, Contractors File 1993; New Builder; Top 50 UK companies, Export Group of the Constructional Industries (EGCI); British International Contractors, The European Committee of Construction Economists; Directory of Members; 1992, Japanese Federation of Construction Contractors 1991-92, and CFEC; Compagnie Francaise des Exports Construction.

Methodology Adopted for the Research

During the collection of primary data the use of survey methods was considered to be the most appropriate approach for this investigation as the study is neither a physical science or purely observational in nature. The research specifically seeks to examine and model the dominant procurement systems which exist in a range of countries, to identify the competencies which are required for each procurement system to operate and to observe upon the existence of institutions which allow competencies to be established, developed, disseminated and sustained indigenously. The use of survey methodology has facilitated factual, objective and qualitative data to be collected and analysed. The most suitable method of data collection for this research is therefore by survey techniques.

It was considered that a combination of all three survey techniques should be used in this investigation. According to Dane (1990 p135):

> "....mixing methods, normally not a good idea in research, can be extremely beneficial in survey research. You can, for example, call respondents who have returned a mailed instrument to obtain clarification on incomplete or seemingly inconsistent responses".

Primary data was collected through mailed questionnaires sent to practitioners and academics in the countries under investigation. The main objective of the questionnaire was to validate the procurement systems models which had been established from the literature review of the construction industry and dominant procurement systems in each country (see Chapter 4 National Procurement Paradigms). During the development of the procurement systems models (PSM's) through the examination of secondary data it became immediately apparent that varying amounts and quality of published data existed on building procurement systems in countries which were identified as 'major exporters' and 'major importers' of construction services. The inaccessibility to substantiative secondary data regarding dominant building procurement systems particularly for India and Malaysia, resulted in the PSM's being developed as projected models in these countries. These models were then validated by the collection of primary data in the two countries. The development of such models on limited secondary data highlighted potential concern regarding the accuracy of the PSM's formulated. To reduce such concerns a visit was undertaken to both India and Malaysia in an endeavour to collect and analyse indigenously published data. The analysis of the questionnaire survey allowed the PSM's to be validated and readjusted where necessary.

The verification of the validated PSM's was by personal interviews with respondents from each country. The interviews were conducted in the UK were possible although a series of interviews were also conducted in France, the USA, India and Malaysia. During the verification process an identical set of questions relating to each dominant procurement system were administered to each of the interviewees. For consistency the questions used to verify the PSM's were identical to these used in questionnaire 2 (see Appendix E).

During each interview the respondents were provided with the key competencies tables (indicated in Chapter 5 Tables 5.1 to 5.6) and asked to verify the tables and to discuss the availability of each of the generic, common and specific key competencies in each country. The interview surveys were also used to discuss the institutions frameworks proposed in Chapter 6 Table 6.1, which encourage the supply of key competencies indigenously and to identify the absence of any such

institutions.

Telephone interviews were carried out in conjunction with personal interviews during the course of this study. During these interviews an identical set of questions to those used in the personal interviews were administered to each respondent for congruity. In an attempt to reduce some of the recognised drawbacks of telephone interviews all respondents were contacted and asked for their co-operation in the study prior to the interviews. Where possible named respondents who were identified as having experience or knowledge of indigenous procurement systems were used in the interviews.

The Questionnaire Surveys

Literature relating to the designing of questionnaires was reviewed before establishing the questionnaire format (Nachmias & Nachmias 1992, Dane 1990 and Moser 1985). More specific assistance was provided by members of Trent Surveys (at The Nottingham Trent University) who are involved in the designing and distribution of University and Commercial Questionnaires) and members of the International Procurement Research Group (IPRG) during the designing of the questionnaire. Questionnaires produced previously for both national and international studies on procurement systems by The Junior Organisation of The Royal Institution of Chartered Surveyors, Vernon Marston (The University of Salford), Dr Will Hughes (University of Reading) and Professor Roy Morledge (The Nottingham Trent University) were also analysed for style and content. The questionnaires used for this study was subsequently designed taking into account information obtained from the above sources.

The Questionnaire (1) contained definitions of the various building procurement systems and associated terminology used in the questionnaire to allow respondents to interpret the questionnaire with consistency during answering. The definitions and terminology was established with consultation with members of the IPRG. Specifically, questionnaire (1) sought to collect data relating to:

i) the functions involved in the procurement process

ii) liabilities which exist between the participants involved, and

iii) the category of building procurement systems which exist and their approximate usage (by number of projects) in each country.

A pilot study was conducted on 5 members of the CIB working commission W92; Procurement Systems in June 1993 to validate the form and content of the questionnaire before the main survey. The main objective of this preliminary study was to remove the obvious problematic aspects of the questionnaire although it was recognised that some difficulties would not become apparent until the main survey had been conducted.

The questionnaire was distributed to a random selection of practitioners in the construction industry in each country. Names and addresses were obtained from the CIB members list, Royal Institute of British Architects, Royal Institution of Chartered Surveyors overseas members list, the Department of Trade and Industry and the Foreign and Commonwealth Office. A total of 200 questionnaires were originally sent out and 20 were received back within six months from being sent out. A 10% response rate of questionnaire (1) confirmed the need to modify the research programme by:

i) Reducing the number of countries to be investigated. The initial survey was conducted on an array of 14 countries which were considered to provide a range construction industries at various 'levels of development'. Due to the poor response from many of these countries it was considered necessary to modify the investigation by using a smaller number of countries. After discussions with members of the IPRG and members of the Nottingham Trent University research committee it was recognised that the classification of countries in terms of 'level of development' was inappropriate. Discussions carried out with Professor Tooze and Dr Skelton (Dept. of International Studies, TNTU) indicated that it would be inappropriate to conduct research involving fourteen countries, primarily due to time and financial constraints. It was suggested that the classification framework developed by the IPRG was inappropriate and the categorisation criteria for the selection of the countries

to be investigated was redressed.

ii) Categorisation of countries to be studied. Following discussions with the IPRG, the classification of countries was modified to countries who were identified as major exporters of construction services and countries which are major importers of construction services. The survey produced by Engineering News Record (1994) indicates the names and nationality of the worlds top 250 contractors. The survey contains information relating to the output of each company and companies who are major exporters of construction services. Four countries have been selected from the list of the worlds top 10 contractors for this investigation as major exporters of construction services and include; UK, France, USA and Japan. Countries which are major importers of construction services have been identified to include; Malaysia and India. These countries were identified by examining the workload of the major exporters of construction services, identifying the countries which they most frequently work in.

iii) Increasing the category of respondents involved in the investigation. The respondents to the initial survey included designers, constructors and academics. To allow the sample to be reflective of the range of practitioners in each construction industry and for corroboration the sample included respondents identified and stratified by their generic functional roles of initiators/promoters, funders, designer, constructors and academics.

iv) Producing procurement system specific questionnaires for each country under study. Questionnaire (1) facilitated the identification of dominant procurement systems in the countries studied. The literature review identified the various dominant procurement systems in each country allowing the establishment of questionnaires for each of the dominant procurement systems in each country.

In order to validate the PSM's produced for each country a system specific questionnaire was produced for each identified dominant procurement system in the countries under investigation. These questionnaires (Questionnaire (2) in Appendix E) consisted of an identical format questions but each questionnaire related

specifically to the known indigenous dominant procurement systems. In an attempt to reduce the obstacles associated with mailed questionnaires the following measures were used in the administration of questionnaire (2);

i) The questionnaires were sent to a random selection of named respondents where possible to improve the response rate. Respondents were asked to additionally pass on copies of the uncompleted questionnaire to other academics or practitioners who were informed in the subject area.

ii) Closed-ended questions as opposed to open ended questions, seeking factual responses were incorporated into the questionnaires. Respondents were also given the option to express a non presented alternative to each question.

iii) Where possible the randomly selected named respondents from the respondent data base were sent a personalised covering letter with the questionnaires to induce individual 'ownership' and empathy with the research project.

iv) The Royal Mail postal service were contacted in order to establish the existence of an international free post mailing service. This service is not however available and is considered to be one of the factors which has affected the response rate of the questionnaire survey.

v) Terminology used. Traditionally, much of the terminology used in the analysis and classification of building procurement systems has been formulated using Anglo-American meanings and understanding and associated with the legal, political and socio-economic conditions which are extant in these countries. It is recognised that for the purposes for this investigation it is necessary to move away from such approaches and to attempt to develop an objective method of modelling procurement systems internationally. In attempting to reduce the problems associated with the use of ethnocentric terminology in the analysis of procurement systems, terminology which refers to functions rather than professional titles has been used to identify the participants and relationships which exist in the construction industries in the countries under investigation. It is contended that use of such functional

terminology is able to be interpreted with consistency and universally understood. Functional terminology which has been developed from the work of Mathurin (1990), Morledge (1991) and Greenhalgh (1991) incorporated into the questionnaire.

Analysis of the role of practitioners and the structure of each construction industry under study (see Chapter 4) has highlighted that professional titles are often inconsistent and misleading when compared between countries in terms of the role of professionals. For example, although the "architect" will exists in each country, the role of the architect is specific to each countries construction industry. The role of each professional has indeed often been determined by the cultural and historical development of each country's industry (Ferry 1991 p18). The inconsistency in professional titles has become apparent in the analysis of literature in examining the national procurement paradigms. Although the title of professionals may vary between countries, the primary functions which are carried out in the process of obtaining a building are suggested to be consistent. In attempting to overcome such language and cultural barriers, rather than using professional titles such as Architects or Engineers, the functional term "Designer", was used. As opposed to using terms, and assuming the existence of a 'Standard Form of Contract', the expression 'Formal Arrangements' was incorporated into the questions. The use of such functional technology is considered to be interpreted with consistency and exportable. A list of definitions was distributed with the questionnaires to each respondent to encourage consistency in interpretation.

vi) Style and Language. During the design of the questionnaire advice was sought from Trent Surveys who specialise in the production and administration of surveys (at The Nottingham Trent University) as to the most appropriate layout and style of language to be used for the questionnaire. The use of predetermined, multi-response questions with the option for the respondents to add other non-represented responses was recommended. The questionnaire was written in basic language using functional terminology making it easy for respondents to understand each question minimising the problems of

misinterpretation. Members of the CIB were also asked for assistance during the designing of the questionnaire to ensure its transferability across cultural and language barriers. It was suggested that a possibly greater response rate may be achieved if the questionnaire was translated into Japanese, Hindi and Malay. The CIB members consulted who have experience of the countries under investigation confirmed that English is predominantly used in the commerce in the countries under study and recommended that the questionnaire should further be translated into French.

vii) Follow-ups and Reminders. Reminders were undertaken by means of letters, facsimile transmission and telephone calls to individual respondents where appropriate. This is considered by many as important and necessary part of a questionnaire survey. Berdie, Anderson and Niebuhr (1986 p58) conclude that:

> ".... rarely has a questionnaire survey achieved acceptable response rates without the use of follow up procedures".

The first reminder was approximately six weeks after the questionnaire was originally sent out to the respondents. This consisted of a letter or fax reminding the respondent that a questionnaire had been sent to them. A further follow-up was sent to respondents four weeks after the initial reminder consisting of another questionnaire and a further letter discussing the research and the urgency of a response.

Questionnaire 2

Questionnaire 2 was formulated in order to validate the procurement systems models which had been established through detailed analysis of published data. Questionnaire (1) allowed the identification of the dominant procurement systems and questionnaire (2) was designed to facilitate the validation of the PSM. Questionnaire (2) was designed to specifically relate to each identified procurement systems in the countries under investigation. Non system specific copies of the questionnaire were also sent

to each respondent to allow the identification of any dominant procurement systems which were not represented by the system specific questionnaires.

The purpose of the questionnaire (2) was to collect data from a range of respondents on the following issues:

i) Which of the identified participants in the procurement process undertake the function to initiate/ promote, design, fund, and construct.

ii) How are the primary risks in terms of time, cost, design standards, functionality and quality distributed between the parties involved.

iii) What formal arrangements, if any, are established between the parties involved.

Supplementary information collected by the questionnaire included:

iv) The sector of the construction industry in which the specific procurement system is most widely used.

v) What sources of finance are available to finance building projects.

vi) Is there a single or many constructors involved in the construction production process.

Questionnaire (2) is attached in Appendix E. A pilot study was conducted on eight responds in a range of countries in June 1994 to test the form and content of the questionnaire which was subsequently modified before the main survey was undertaken. The respondents in the pilot included constructors, designers and academics.

Personal and Telephone Interviews

Semi structured personal and telephone interviews were used to verify the PSM's produced for each country. The use of such interviews allowed comparability of responses across interviewees and reduced the potential problem of interviewer bias. The interviews were carried out with a random selection of informed practitioners and academics from each country under investigation from the respondent data base. The types of respondents is discussed in more detail later in this section. Interviews were also employed to verify the key competencies and the existence of indigenous institutions (Hypothesis 2 and 3 respectively).

The sample of respondents which were interviewed included a combination of those who had returned the questionnaire and expressed willingness to assist further with the research and also respondents who had not responded to the questionnaires. Due to the accessibility of secondary data regarding indigenous building procurement systems the number of respondents interviewed varied in each country. The availability of literature from the UK, USA and France and Japan relating to dominant procurement systems resulted in the established PSM's requiring little adjustment as a the results of the questionnaire surveys. The validated PSM's were consequently verified by a small number of interviews. The difficulty in accessing secondary data from India and Malaysia, provided justification for conducting a greater number of interviews to verify the established and validated PSM's. This was largely carried out in the country itself.

No questionnaire or interview surveys were conducted in the UK due to the availability of secondary data analysing dominant building procurement systems, identifying competencies and relating to institutions. The verification of the UK PSM's was carried out thorough the development and subsequent evaluation of the Procurement Guide (Morledge & Sharif 1995) conducted through the RICS by a range of construction industry practitioners.

Due to the geographical dispersion and the number of interviews conducted it was only feasible to collect data by a combination of personal and telephone interviews due to time and cost constraints. Personal interviews were conducted in the UK

where possible. The author was also given the opportunity to conduct a number of interviews in the USA, France, India and Malaysia. Each interview was recorded on tape in addition to notes being taken of the interviewees comments at the time of the interview to ensure that all the data was collected. During personal interviews the respondents were given a copy of the validation PSM for each dominant procurement systems and were subsequently asked to comment upon each of the elements in the model.

Telephone interviews were conducted on a random selection of respondents where additional verification or validation was required. Such telephone interviews were used to access respondents who were in locations outside the UK due to resources constraints.

During the interviews respondents were also asked to verify the summary of predominant responses for each question which were identifies through the questionnaire survey. Where a number of responses were equally represented for a question the interviewees were asked to identify the predominant answer. The results of the interviews were used to verify and subsequently readjust the procurement systems models and are shown in Appendix A. Each of the verified PSM for each dominant procurement system are in Chapter 4.

The interview surveys also allowed primary data to be collected regarding the verification of key competencies and the existence of indigenous institutional frameworks. Each interviewee was presented with the generic, common and specific competencies table and asked to verify the competencies and discuss the availability of each competency. The framework of primary institutions was subsequently verified by the interviewees, who again discussed the availability of such institutions indigenously.

The Sample of Respondents

A method of stratified sampling was used to develop the respondent data base and to randomly select the respondents for the questionnaire survey and interviews. Bryman and Cramer (1993 p100) identify this technique appropriate when the population is

divided into strata or common groups. The sample under study has been stratified according to their country and functional roles in the procurement process. Due to the differences which exist between countries in terms of professional titles and role descriptions and for congruity with the research methods adopted in the analysis of secondary data, the sample has been divided into the following categories; Initiator/ Promoters; the primary category of clients of the construction industries in the countries under study, Funders; primary financial institutions which provide finance for construction, Designers; including members of the indigenous construction industry who are involved with the function of design (including Architects, Engineers, Cost Engineers, Quantity Surveyors etc.), Constructors; those involved in the management of the construction process (including main contractors, project managers, management contractors and construction managers) and involved in the physical production of construction facilities (including main contracts, trade contracts and specialist contractors), and Academics; indigenous academics who have an interest in the building procurement process (identified through published books, journal articles, special papers, conference proceedings and other secondary data).

In all of the survey techniques used in this investigation the respondents have been identified from published sources. A data base was produced of the various categories of respondent by country. From each category every third name was randomly selected for this investigation. All respondents are assumed to be equally informed in terms of the building procurement systems in their respective countries. The categorisation and selection of respondents included:

i) Initiator/Promoters

A random selection of clients who regularly build, and contribute substantially to the overall demand of each countries construction industry were selected for investigation. Public sector bodies, and private sector companies were contacted. This information was gained from Embassy's, The Confederation of British Industry (CBI) and the "Times 1000" 1995 edition, reviewing the worlds leading financial and industrial companies which include UK, French, American, Malaysian and Japanese companies. Practitioners were also contacted in the countries under investigation to identify key clients

(particularly the case for India).

ii) Funders

Public and Private sector funding agencies which provide finance for large building projects were contacted. These agencies were identified through the Banker "Top 1000" (1994) which gave a list of major banks and financial institutions in a range of countries.

iii) Designers

Designers were primarily identified by analysing published data including the CIB W65 and W92 membership list, the Engineering News Record (1994) "Top 200 International Design Firm Survey" (1994) and World Architecture Special Report, "The World Survey of The Top 100 Architectural Practices" (1993). A limitation of the latter two sources of data is the classification criteria used for the classification of 'Top' design firms. The former survey has been carried out using the 'value of work billed' (ENR 1994) whilst the latter survey has been conducted in relation to the "total number of designers" (World Architecture 1993) employed in each practice. Inadequate published information regarding designers in India and Malaysia was found. To overcome this problem, the British High Commissions in the respective countries were contacted to provide data on indigenous design companies/ organisations.

iv) Constructors

Publications including the Engineering News Record (1994) "Top 225 International Contractors", Building (1994) "Contractors European League Tables" have provided the main source to identify key constructors operating within the various countries. The classification of such 'Top' constructors has limitations as the former source classifies constructors in terms of value of international work executed, whilst the latter source categorises them by turnover. Indian and Malaysian contractors were not classified in such tables

so in order to identify major constructors in these countries the British High Commission and the Department of the Environment Construction Export Promotion Division were asked to provide data on indigenous contractors in India and Malaysia.

v) Academics

Those who have indicated expertise and knowledge in the area of building procurement by publishing books, referred papers, journal articles related to management and organisational systems involved in construction, were selected and contacted for assistance. The identification of such respondents was carried out through the CIB Working Commissions, W92 (Procurement Systems) and W65 (Organisation and Management of Construction) members lists.

The Sample Size

In designing the survey methods to be used in this investigation attention was given to the sample size. Koosis (1972 p38) suggests that a population is all the conceivable observations of a particular type and identifies that a sample is:

> "....a limited number of observations from a population, chosen in a way that allows every possible observation an equal chance of occurring".

When considering the sample size for this investigation it was necessary to establish a sample frame (Dane 1990 p289). During the process of establishing the sample frame difficulties were encountered as there was often lack of published data on respondents in certain countries (particularly in India and Malaysia). The respondent data base of names and contact details of respondents from each country was established through a variety of sources. The sample frame was stratified by country into initiators/promoters, funders, designers, constructors and academics. Every third respondent from the stratified sample frame was selected from the data base and used throughout this investigation. A consistent number of respondents were therefore

randomly selected from each strata for each country in the investigation. According to Gill and Johnson (1991 p166) a random sample is:

> ".... a sample in which all members of the specific populations from which the sample is drawn have an equal chance of selection".

Where the PSM's have been established from sources of published data the verification process by interviews was limited to a small sample of informed practitioners and academics in the industry. This has been the case particularly with the UK, France, Japan and the USA. In India and Malaysia where there was limited access to sources of published data the PSM's were developed as projected models. The verification process was carried out using a larger sample size in these countries.

Bryman and Cramer (1993 p101) state that the advantage of this method of sampling is that:

> "it offers the possibility of greater accuracy, by ensuring that the groups that are being created by a stratifying criterion are represented .....".

It is not an aim of the research to be statistically significant, and therefore the sample is not differentially weighted relative to the population. Nachmias and Nachmias (1994 p180) identify this as a "disproportionate stratified sample", where the sample size from each strata is disproportionate to the population size of the stratum.

A major consideration during this international research has been the resource constraint, which has been reflected in the sample size which was restricted to a maximum of 400 possible respondents. In the establishment of the database, the names and addresses of respondents were collected from published information, from the UK, and the countries under investigation. This may lead to problems within the sample frame as not all the population may be equally represented in the documents used to compile the data base of respondents. Due to the nature of such a research project, the sample size of practitioners and academics varies according to accessible sources of data. Whilst there is no claim of the sample size being statistically

significant or representative, the study seeks to:

i) develop, validate and verify a conceptual model which will objectively identify dominant building procurement systems in a range of countries,

ii) to observe upon the existence of indigenous generic, common and specific key competencies and

iii) identify the institutions upon which the supply of these competencies depends.

With this relatively small scale, qualitative rather than quantitative study, the question of access to respondents was one of potential difficulty. Given the sampling constraints the work was largely determined by the good will of various agencies, and the willingness of organisations, companies, individual practitioners and academics to discuss the issues in question.

Table 3.2 indicates the sample size used and the responses to the questionnaire used in to validate the PSM's in each country under investigation. As identified a total of 400 respondents were used in this investigation. In each country 80 respondents were identified which were stratified as 10 initiator/promoters, 10 funders, 30 designers, 20 constructors and 10 academics. Of the total 400 questionnaires distributed 123 were returned giving an overall response rate of 30.75%.

Due to the availability of secondary data, and the high degree of consistency from respondents to the questionnaire, only a limited number of interviews were conducted in France, Japan and the USA. A total of eighty interviews were conducted with respondents relating to France, ten relating to Japan and six relating to the USA. The difficulty in accessing secondary data in both India and Malaysia resulted in a greater number of interviews being conducted relating to these countries. A total of sixteen interviews were conducted with respondents in both India and Malaysia.

Questionnaire	Code	France		USA		Japan		Malaysia		India	
		sample	response	sample	response	sample	response	sample	response	sample	response
initiator/ promoter	1	10	2	10	0	10	1	10	4	10	6
funder	3	10	0	10	1	10	0	10	0	10	4
designer	4	30	13	30	7	30	6	30	10	30	4
constructor	5	20	6	20	13	20	14	20	11	20	10
academic	2	10	2	10	0	10	3	10	3	10	3
TOTAL		100	23	80	21	80	24	80	28	80	27

Table 3.2: Sample to validate the PSM's: Questionnaire Survey

Total questionnaires sent out 400

Total questionnaires returned 123

Questionnaire Design

Questionnaire 1

The aim of questionnaire 1 and its designing have been discussed in the section titled the countries selected to be studied. (Questionnaire 1 as shown in Appendix D).

Questionnaire 2

The aim of questionnaire 2 was specifically to validated the PSM's which had been produced from secondary data relating to dominant building procurement systems in each country. Questionnaire (2 shown in Appendix E) was designed to be answered in accordance with the range of indigenous specific dominant procurement systems. The questionnaires consisted of eighteen questions which relate directly to the various elements of the PSM (Figure 2.5). Each of the questions are discussed to identify their aims and purpose and indicating how they relate to the elements of the PSM.

Question 1 was designed to specifically identify which category of initiator/promoter predominantly used the dominant procurement system under investigation. For ease of response the respondents were given the choice of either Public or Private, and owner occupier, developer, investor or other.

Question 2 was used to identify the source of finance which are available to initiator/promoters in each respective country. Respondents were given the choice of; Government, Individuals, Banks, Pension Funds, Insurance companies and others.

Question 3, 4 and 5 related directly to the PSM and was used to confirm element 3(i) in the model identifying who produces concept designs for the project, element 3(ii) who produces detailed designs and element 3 (iii) who produces specialist design in a particular indigenous dominant procurement system.

Question 6 addresses elements 11(i), (ii) and (iii) (design liability) in the PSM by identifying which of the functional participants are primarily responsible for the specification of design standards for the project.

Question 7,8 and 9 validated elements 7 (i), (ii) and (iii) respectively in framework 2 of the PSM. These series of questions were to identify with whom each of the three categories of designs (concept, detailed and schematic) enter into formal relationships in the specific procurement systems under investigation.

Question 10 was used to validated elements 4(ii) of the model and additionally identified whether a single constructor or a number of constructors were used to produce the construction facility.

Question 12 further identifies whether the management of construction function is separated from the construction production function in the particular procurement system, under analysis thereby identifying element 4 (i) in framework 1.

The answer provided by question 11 further identified the number of constructers which entered into a formal relationship with the initiator/promoter and provided validation for element 4 (i) of framework 1 of the model.

Question 13 was designed to validate element 9 of framework 3, identifying which of the functional participants carried the primary risk of time certainty in the particular procurement system under investigation.

Element 10 of framework 3 was validated by question 14 which identified which participant in the procurement process assumed the risk for completion of the building to a certain price.

Question 15 identifies which party in the procurement process carried the risk of the building performing its proposed function therefore identifying the answer to elements 13 in framework 3.

Element 14 in framework 3 was validated by question 16 which identified which participant carried the risk for the quality of the workmanship in the construction process.

Question 17 identifies the validated answer to element 8 (i) in framework 2 identifying with whom the manager of the construction process enters into a formal relationship with under the particular dominant analysis system.

Finally, question 18 validates element 8 (ii) of Framework 2 by identifying with whom the constructor producer enters into a formal relationship.

The answer provided to each of the questions in questionnaire (2) relates directly to the PSM, and therefore allows the validation of the models which have been produced from secondary sources of data. Summary tables have been produced showing the results of the questionnaire surveys in each country. Each of the questions were coded which are used in the summary tables (see Appendix A).

Coding the Questionnaire

Although each of the questionnaires were designed to be answered with regards to a particular identified dominant building procurement system operating in each of the countries under study, the style and content of the questionnaires were identical. As previously discussed, each of the questionnaires comprised of a series of 18 short questions relating to the operation of each identified dominant procurement system. The various specific questionnaires contained a series of identical questions allowing respondents to select a response for each question, or alternatively they were given the opportunity to add their own particular non-represented response to each question.

Due to the standard nature of the questionnaire and for consistency throughout this investigation a coding system was applied to all questionnaires used in this study. The coding system is illustrated in Table 3.3. Each of the 18 questions were analysed to identify the variety of possible responses which were obtained from all the questionnaires. The same coding system has been used to analyse all questionnaires in this survey.

The summary of results table identifies the responses to each questionnaire and was used to validate the PSM's established from literature (see appendix A). The

summary table indicates the coded response to each of the questions in the questionnaires. The analysis of each summary table allows the identification of the predominant response to each question and further illustrates how each question relates to the various elements of the procurement systems model.

Table 3.3	QUESTIONNAIRE CODING SYSTEM		
Number	**Question**	**Answer**	**Code**
1	**Client using this procurement system**	Public	1
		Private	2
		Private Owner Occupier	3
		Private Developer	4
		Private Investor	5
		Other	6
		Public and Private	7
		Public more than Private	8
		Private more than Public	9
2	**Sources of finance**	Government	1
		Individuals	2
		Banks	3
		Pension Funds	4
		Insurance Companies	5
		Other	6
		All	7
		Government and Banks	8
		Government, Individuals and Banks	9
		Government, Individuals, Banks, Pension Funds	10
		Government, Banks and Pension Funds	11
		Individuals and Banks	12
		Banks, Pension Funds and Insurance Companies	13
		Government, Banks and Insurance Companies	14
		Individuals, Banks, Pension Funds, Insurance companies	15
3	**Who produces concept design**	Designer	1
		Constructor	2
		Other	3
		Designer and Constructor	4
4	**Who produces detailed design**	Designer	1
		Constructor	2
		Other	3
		Designer and Constructor	4
5	**Who produces specialist designs**	Designer	1
		Constructor	2
		Other	3
		Designer and Constructor	4
6	**Who is responsible for the specification of design standards**	Initiator/ Promoter	1
		Funder	2
		Designer	3
		Constructor	4
		Other	5
		Initiator/ Promoter and Designer	6
		Designer and Constructor	7
7	**With whom does the concept designer enter into a formal relationship**	Initiator/ Promoter	1
		Funder	2
		Detailed Designer	3
		Specialist Designer	4
		Manager of Construction	5
		Construction Producer	6
		Other	7
8	**With whom does the detailed designer enter into a formal relationship**	Initiator/ Promoter	1
		Funder	2
		Concept/ Schematic Designer	3
		Specialist Designer	4
		Manager of Construction	5
		Construction Producer	6
		Other	7

9	**With whom does the specialist designer enter into a formal relationship**	Initiator/ Promoter	1
		Funder	2
		Detailed Designer	3
		Concept/ Schematic Designer	4
		Manager of Construction	5
		Construction Producer	6
		Other	7
10	**Number of producers in the construction process**	One	1
		Many	2
11	**Number of producers in a formal relationship with the initiator/ promoter**	One	1
		Many	2
12	**Is the management of construction separat from construction production process**	Yes	1
		No	2
13	**Risk of completing to a completion date**	Initiator/ Promoter	1
		Funder	2
		Manager of Construction	3
		Construction Producer	4
		Other	5
		Construction Producer and Initiator/ Promoter	6
		Construction Producer > Initiator Promoter	7
		Initiator/ Promoter > Construction Producer	8
		Manager of Construction and Construction Producer	9
		Initiator/ Promoter and Manager of Construction	10
14	**Risk of certainty of total building price**	Initiator/ Promoter	1
		Manager of Construction	2
		Construction Producer	3
		Other	4
		Initiator/ Promoter and Construction Producer	5
		Initiator/ Promoter and Manager of Construction	6
15	**Risk of functionality**	Initiator/ Promoter	1
		Concept/ Schematic Designer	2
		Detailed Designer	3
		Specialist Designer	4
		Manager of Construction	5
		Construction Producer	6
		Other	7
		Designers	8
		Initiator/ Promoter and Designers	9
		Initiator/ Promoter and Constructor Producer	10
		Initiator/ Promoter, Construction Producer, Designer	11
		Construction Producer and Designer	12
16	**Risk of quality of workmanship**	Manager of Construction	1
		Construction Producer	2
		Other	3
		Manager of construction and Construction Producer	4
17	**If there is a separate manager of construction with whom do they a formal relationship**	Initiator/ Promoter	1
		Concept/ Schematic Designer	2
		Detailed Designer	3
		Specialist Designer	4
		Construction Producer	5
		Other	6
		Initiator/ Promoter and Construction Producer	7
18	**With whom does the construction producer have a formal relationship**	Initiator/ Promoter	1
		Concept/ Schematic Designer	2
		Detailed Designer	3
		Specialist Designer	4
		Manager of Construction	5
		Other	6
		Initiator/ Promoter and Designer	7
		Initiator/promoter and Construction Producer	8

Limitations of the Research

Attempts have been made to reduce the disadvantages of the various survey techniques selected for this investigation. There are however certain limitations which are beyond the control of the research which include:

i) Willingness to Assist with the Research.

Although attempts have been made to increase the potential response rate of the questionnaire survey difficulties were faced. In the questionnaire (2) survey a total of 400 sets of procurement system specific questionnaires were sent out, and 123 sets of questionnaires were returned giving a 30.75% overall response rate for the investigation. (The individual response rate from each country is discussed in greater detail in Chapter 4 and the results tables in Appendix A). Nachmias & Nachmias (1993 p221) have highlighted that:

> "..... the question of what constitutes an acceptable response rate cannot be answered easily because there is no agreed standard for a minimum response rate".

Due to the degree of consistency of responses which were received back from the wide range of respondents used in the investigation it is contended that the response rate was adequate for the intended purposes of this study. The cultural aspects of the various countries under investigation were also recognised to have influenced the response rate. The number of interviews conducted with respondents in each country was dependent upon the willingness of respondents.

ii) Resource Limitations

Due to financial and time constraints only a relatively small sample of respondents were able to be targeted in the investigation. With greater resources available the project could incorporate a greater sample size for both the questionnaire survey and interviews. A further consequence of the

financial constraints has meant that the questionnaires were unable to be translated into Japanese, Hindi and Bahasia Malaysia. With fewer constraints on resources the study could have been undertaken on a wider selection of countries to verify the research findings.

iii) Ethnocentric Bias

As a consequence of much of the terminology and many of the classification systems used in literature discussing and evaluating building procurement systems being developed from an Anglo-American perspective there was the potential problem of ethnocentric bias being encountered. The use of professional titles are also recognised to be country specific and inconsistent when compared across countries in terms of roles. In an attempt to overcome the potential problem of such bias, the two questionnaires incorporated in this investigation were constructed using functional terminology, developed from the work of Mathurin (1990), Morledge (1991) and Greenhalgh (1990). It is proposed that such terminology is universally exportable and can transcending language barriers caused by professional titles.

iv) Accessibility to Published Data

During the progress of this research project a major problem has been the access to and availability of published data regarding building procurement systems in some of the countries under investigation. This was particularly the case with both India and Malaysia. Attempts were made however to reduce this problem by accessing data directly from these countries. In the case of India, the National Institute of Construction Management and Research (NICMAR) was able to provide some data. In Malaysia, attempts were made to access data through the Master Builders Association of Malaysia, the University Technology Malaysia, and the Construction Industry Development Board. A range of papers, articles, conference proceeding were provided from the above sources on building procurement systems used indigenously, which were subsequently incorporated into this study.

v) Language Barriers

A limitation which was experienced with some published data from Japan, France, India and Malaysia has resulted from language barriers. Particularly in Japan and France, certain published data only exists in national languages and due to financial constraints was unable to be translated into English. Such literature was therefore not analysed and incorporated into this research. As such any potential this material may have for this research is unknown, although attempts were made to analyse data otherwise identified as significant.

vi) Investigation of building procurement systems

The research discussed here has principally concentrated on the variety of dominant building procurement systems which exist in a rage of countries. No attempt has been made to analyse the variety of construction procurement strategies used by each country in the project delivery process.

vii) Modifications to the PSM

A study conducted by Gibson (1996) using the PSM has identified that the model is applicable to capitalist orientated economies and needs modifications if it is to be used in communist orientated countries. The PSM also does not explicitly recognise a separate management function in the design process. A future modification to the model would be to introduce the design management function.

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CHAPTER FOUR

NATIONAL PROCUREMENT PARADIGMS

The Major Exporting and Importing Countries

Introduction

Chapter two provides the background to the development of the functional approach to modelling building procurement systems. It is proposed that conventional classification techniques, although useful are problematic when comparing procurement systems across countries. The use of professional titles and associated meanings has frequently been used to discuss the procurement systems, however it is recognised that in the comparative analysis of dominant procurement systems in a range of countries such a system would be of limited use. It is further acknowledged that professional titles and their associated meanings are often country specific and are inconsistent or misleading when compared across countries.
The use of functional analysis to identify the generic processes and participants involved in the procurement process will allow the identification , modelling and comparison of procurement systems in a range of countries. By identifying who does what or which functional participant carries out which functional process, establishing the existence of formal relationships between the participants involved and by indicating which of the participants carries the highest level of the primary risk categories identified, will facilitate the objective modelling of a particular dominant procurement system in any country.

This chapter analyses literature relating to the organisational structure and dominant procurement systems in countries which are identified as major exporters and major importers of construction services. As discussed in chapter three, the UK, France, USA, and Japan have been identified as major exporters and India and Malaysia have been recognised as major importers of construction services.

The analysis of each country begins with an examination of the organisational structure of the construction industry from the literature review. The organisational structure of each countries industry has been analysed by function, identifying the generic functional participants and also the professional titles which are involved in the procurement process indigenously. In analysing each of the countries in this way it is clearly recognised that although the professional titles may be similar across countries the roles of each of each of the professional is often country specific. It is further recognised that although specific professional titles may only exist in certain

countries, the generic function performed by such professionals is executed in all countries.

Having analysed the organisational structure of the construction industry in each country, the various dominant building procurement systems which operate are examined. The term dominant has been used in this investigation to refer to the most widely used systems by number rather than value. The has been carried out through the analysis and examination of secondary data. Each dominant procurement system is analysed in terms of the organisational structure of the system, how the system operates, the participants involved and its advantages and disadvantages. Finally the generic risks associated with the participants involved are highlighted.

From the analysis of secondary data the Procurement Systems Models (PSM's) have been established for each of the dominant procurement systems which exist in each country under investigation. The PSM's developed from literature have been validated through a questionnaire survey to a range of respondents in each country under investigation. The results of the questionnaires were analysed and used to readjust and further develop the PSM's. Finally, each validated model was verified through interview surveys with a range of respondents from each country. The purpose of the interviews was to clarify any discrepancies which had been highlighted during the validation of the models and to confirm the accuracy of each of the PSM's produced.

The PSM's for each of the countries under investigation are developed in this Chapter, in the order The USA, Japan, France, The UK, India and Malaysia.

SECTION 4.1
USA PROCUREMENT PARADIGMS

Dominant Procurement Systems in the USA

Introduction

Background to the Construction Industry

The USA is a large country, consisting of a variety of climatic and geographical conditions (Flanagan 1980). Each state is governed by its own set of construction and building regulations specific to the state's environmental and climatic conditions each state will have licensed construction professionals qualified to work in such areas.

The speed of construction is of key importance to the industry and can be illustrated by the various tax incentives offered to encourage early occupancy, the high interest rates on short term loans over the construction period and the more attractive long-term loans once the building is in occupation (RICS et al 1979).

This traditional demand for fast construction periods has resulted in the evolution of several characteristics of the construction industry. It has particularly led to the standardisation of components and design detailing which are incorporated into many buildings in the USA (Haenlein, Brookes & Penz 1989 p76 & Lynton PLC 1993).

The use of standardised detailing has resulted in the increased amount of "off the shelf" components, pre-fabrication and off-site production of elements and components used in construction. The approach to building in America is crucially dependent upon pre-fabrication of components and the wide use of standardisation providing an effective and simple approach to the design, manufacturing and construction of buildings (Bennett 1991 p121).

The US construction industry plays a substantial role in the nation's economy (RICS 1979 p4). It is estimated that in 1991 7,087,000 were employed in construction (Europa 1993 p3005) whilst in 1987 construction contribution to America's GDP in current prices was $220,746 million (UN 1994 p1904).

Evidence from the Engineering News Record (1993) illustrates that the USA is one of the world's largest exporters of construction services and is a powerful country in the arena of construction globally.

The Organisational Structure of the US Construction Industry

Initiation/Promotion

The private sector traditionally created the greater demand for construction in the US (Haenlein, Brookes & Penz 1989 p89). Mitchell (1986 p293) acknowledges that public clients are closely regulated by various uniform statutes at a federal level by the Federal Acquisition Regulations, and at state level, which often vary from state to state. US clients tend to invest more in management services during the procurement process of their buildings regardless of the project delivery system which is selected (Nahapiet & Nahapiet 1985 p28). American clients also attempt to minimise their risk exposure on projects which is often reflected in the procurement methods they adopted (Flanagan et al 1986 p19). American clients are very conscious of the need for speed of construction and certainty of the completion date for a project. Therefore, clients in the US usually prioritise this criteria as i) Speed of construction and to an agreed completion date, ii) Cost and iii) Quality (Flanagan et al 1986 p14).

Bennett (1991 p122) illustrates how the nature and culture of people have an influence on a country's construction industry. American society adopts the ethics that profit is the major motivating factor. Clients in the US are stronger, more certain about their requirements and cost limitations than their UK counterparts (Heard 1982a p33). Flanagan et al (1986 p14-15) comprehensively analysed clients in the US and UK highlighting significant differences in attitudes and approaches which exist concluding that the key differences include i) US clients in the private sector are more conscious of speed of construction and certainty of completion dates, followed by cost, ii) contractors are requested to compete on construction durations as well as costs in their bid documents, iii) US clients are more involved in management and decisions making in both the design and construction process, iv) risk minimisation is an important consideration for US clients, v) US clients often utilise individually tailored

contracts to meet their own specific requirements rather than standard contracts, and vi) the life expectancy of buildings in the US is between 25-40 years, whereas in the UK it is often 60-100 years.

Funding

The public sector in America finance an array of construction projects and has a less significant role in the country's construction industry when compared to the private sector. In 1988, the value of public works was estimated to be $67.8 billion. It was further estimated in 1988 that the total value of new construction work in the private sector accounted for $276.7 billion; $174.2 billion for private residential works and $102.5 billion for private non-residential works (Haenlein, Brookes & Penz 1989 p76).

Finance for construction projects in the US is often borrowed from funding institutions. Frequently finance is loaned at high interest rates until the project is constructed, thereafter being converted into a long term debt at lower interest rates. Flanagan & Gray (1980 p5) identify that the sources of finance which are available for the construction industry include banks, insurance companies, pension funds and surety bonding companies as well as internal finance and the sale of stocks and shares. The existence of high interest rates on short term borrowing provides an obvious incentive for project finance to be converted into long term loans as quickly as possible (Flanagan et al 1986 p51).

Design

The design process involves a variety of participants and is frequently suggested to comprise of two main phases

i) preliminary design which involves architectural concepts, evolution of technical process alternatives, size and capacity decisions and comparative economic studies, and

ii) detailed design which incorporates the successive breaking down, analysing and designing the structure to comply with performance criteria and safety requirements into a set of drawings and specifications detailing to the constructor how to build the project.

Involvement by constructors and other specialist's is increasing in the design process (Barrie & Paulson 1992 p16-18). Gray and Flanagan (1984 p154) recognise that the design function involves a variety of consultants including the architect, structural engineer, service engineers and other specialists. Hill (1979 p158) acknowledges that the use of standard components and details in the design process correlates to the issue of fewer drawings and consequently a quicker and cheaper design process. With regards to standardised design the overriding feature being simplicity and ease of construction (Heard 1982b and Flanagan 1982 p33).

The speed of design and construction of projects is predominantly due to a range of issues including:

i) shell and core construction,

ii) extensive use of standard components (and value engineering) throughout the design process,

iii) large buildings facilitates overlapping and the benefits of economies of scale to be realised, and

iv) the competitive environment in which trade contractors operate and their contribution to the design of elements within the building.

The Architect

The architect's involvement in the design of projects results in emphasis being placed on conceptual design and creativity rather than detailed designs (Haenlein, Brookes & Penz 1989 p76). The architect also take one of the key leadership roles in the construction process, monitoring the work during construction function (Flanagan et

al, 1986, p17). Detailed designs and working drawings are usually produced by engineers and specialist sub-contractors respectively. Davies (1983 p32) proposes that the US architect provides fewer drawings containing performance specifications and indicate that the constructors (specialists) should contribute to the design function by incorporating their specialist knowledge through their production of working drawings.

The key issues when considering American architectural practice include:

i) integrated practice of architects and engineers,

ii architects and engineers are registered by each state,

iii) architects have been traditionally responsible for cost management,

iv) detailed specifications and drawings are prepared by architects/ engineers which form part of the tender documentation,

v) drawings are often completed at bid stage,

vi) few change orders are generally issued,

vii) greater use is made of standard components and design solutions, and

viii) designers (architects and engineers) concentrate particularly on schematic design and less on detailed design as standard components are often used, whilst working drawings are produced by trade contractors (Flanagan et al 1986 p19).

Engineer

As the architect produces outline designs of a structure, the detailed designs are often completed by engineering consultants. The detailed engineering and design stage of a project involves several engineering disciplines, with the type of work determining

the category of design engineers required (Barrie & Paulson 1992 p18).

Although engineers and architects will be involved in the detailed designing of the project, trade contractors will take over the design task to produce "shop drawings", which describe every part of the building where necessary (Bennett 1991 p131).

The Cost Engineer

Traditionally the role of estimating was conducted by the architect in the USA (Hill 1979 p159). Early cost advice may be provided to the client by either the architect, CM (if employed) or increasingly by cost engineers. Construction firms are increasingly offering pre-contract and post-contract cost estimating and budget control services on a consultancy basis (RICS et al 1979 p80-81).

Norton (1993 p10) identifies that the architect or CM have often provided the services of estimating, project strategy, tender and contract documentation, post contract cost control, and the general administration of the project. Pomfret (1980 p29) recognises the US preconstruction stage as being distinctive as tenders are requested on the basis of drawings and specifications rather than a bill of quantities. Tendering contractors will often submit design alternatives and working drawings in their tenders, so the use of a B of Q is often unsuitable.

Construction

It estimated that there are approximately 800,000 firms operating within the American construction sector with 80% of the work being carried out by 10% of the firms (Haenlein, Brookes & Penz 1989 p78 & Spons 1988 p259). Details from the Engineering News Record: (1993) Top 250 International Contractors indicates that several American companies are amongst the world's leading construction companies and are additionally major exporters of construction services.

Mathewson (1991 p432) identifies that the US consists of a very large number of small to medium sized contractors and discusses the findings of the 1982 US department of Commerce census which suggested that the industry comprised of 1.4

million contractors, who executed $356 million of work, and who employed 4.2 million individuals. Of the total contractors 50,822 were identified as having gross receipts of $1 million or more and also accounted for 67% of the total industries work by value.

The licensing of contractors although not mandatory across American may be required in certain states or if contractors wish to work on public sector projects. Contractors are categorised into various classes according to the maximum size of the contract that can be undertaken or volume of turnover of the contractor or the contractors type of work.

Pomfret (1980 p30) identifies that on large projects, the general contractor often acts as a manager, employing supervisory staff and a small direct labour force to carry out clearing work, whilst the majority of the construction work is subcontracted. As such the general contractor take the role of managing the construction process.

The incorporation of standard designs and the involvement of the contractors in the design process has been considered by the Lynton Report (1993 p64) which states:

> ".... while in law the (architects and engineers) may not pass on their design liabilities to third parties, in practice they lean heavily on trade contractors and suppliers to fill in details of the design intent using practices and products that are tried, tested and economic".

There are many specialist contractors in the industry who design as well as construct. Much of the work in a project is 'packaged' into work sections allowing the most suitable specialist contractor or sub-contractor is employed to complete each package of work both in terms of design and construction (Bennett 1991 p122).

The clearer definition of trade contracts work packages contributes to the speed and cost of construction in the US. The clear demarkation of work packages results in great efficiency in the coordination of contractors on site (Lynton Report 1993 p47). Ridout (1993 p44) recognises that trade contractors familiarity with their activities and the interface between other packages of work can result in substantial reductions in contract programme times.

The Dominant Procurement Systems

The involvement of contractors in the design process combined with a different business ethic, closer teamwork, greater understanding of the nature of work packages and the interface between them further assists the process. As such the use of standardised components and design solutions contributes to the smoother procurement of buildings in a less claims conscious environment (Lynton Report 1993 p65).

Extensive use of 'fast track' procurement systems is made in America consisting of letting sections of the contract as the design stages proceed (Constrado 1981 p12).

1. Traditional Lump Sum

The lump sum approach views project delivery essentially as a sequential process, whereby first designs are largely completed by the designers and then a contractor is selected and finally construction of the work commences (Nahapiet & Nahapiet 1985 p10). This is the traditional method of building procurement in the USA. In this system although tenders are awarded on the basis of completed drawings and specifications it still allows the contractor or sub-contractors to produce working drawings or specialist areas of working if required (RICS 1979 p67).

The client has little or no responsibility for the coordination and performance of the work and is principally involved in making decisions, securing finance and making payments to the various parties. The system relies upon the design consultants to carry out the design function, and occasionally, to provide an on site construction monitoring service if appointed as the clients agent. As such the role of the general contractor is to construct the project in accordance with the completed drawings and specifications produced by the designers.

Freeman (1981 p11) indicates that the lump sum system is widely used and remains the traditional system of procurement in the USA. Barrie and

Paulson (1992 p28) identify the various arrangements under this system and suggest that it may be implemented by either:

> ".... using the single fixed price or lump sum contract, a unit price contract, a negotiated cost plus fixed fee contract or a guaranteed maximum price arrangement".

Hill (1979 p160) proposes that this approach is particularly used on the majority of small and medium sized projects, suggesting that it is therefore the most widely used system in the US.

The general contractor will often carry out little or no construction work within its own organisation and will subcontract the work to specialist or trade contractors. The general contractor as the single party with a contractual relationship with the client accepts responsibility for the performance of subcontractors to build the project in accordance with the contract documents, within the established cost limits and time frame providing no changes are made to the designs by the client (Clough 1981 p11).
Nahapiet & Nahapiet (1985, p10) and Barrie and Paulson (1992 p28-29) have indicated that the main advantage of this approach include;

i. The system is familiar and 'simple'.

ii. The system offers cost certainty as designs are usually completed before construction commences.

iii. The roles of the parties involved are well defined.

iv. The project is usually awarded on a competitive basis.

v. The contractor assumes the majority of the risks involved in the project in the absence of changes or unforseen events.

This arrangement offers the client a project of a certain quality at a known price before construction commences Clough (1981 p8).

The disadvantages of the system including:

i. Due to the sequential working nature of the system there is a long period before work starts on site and as such designs must be completed before a contractor is appointed and construction commences (Law 1980 p2).

ii. The system precludes heavy involvement by the contractor at the design stage (Ironmonger (1989 p14).

iii. There is considered to be a 'higher chance' of adversarial relationships developing between the parties especially with projects that undergo many changes (Nahapiet and Nahapiet 1985 p10).

iv. The system offers "less flexibility" when compared with other procurement options available as design work is completed before construction commences (Nahapiet and Nahapiet 1985 p10).

v. Changes to the design once the contract has been awarded and construction commenced are considered complicated and result in increases in costs and possible time delays (Law 1980 p2).

vi. The client is required to make a significant investment (and therefore carry the majority of the risk) before a project price can be firmly established as often the design work is completed before the contract for construction is awarded and a firm price is established (Driscoll 1993 p4).

The contractor is required to study the contract documents and report any omissions, errors or inaccuracies to the client, whilst maintaining that the contractor is not liable for any damages resulting from such events. The architect assumes risk for design whilst the contractor assumes risk for the construction of the project (Perlman 1986 p136).

Time and quality risks are placed on the contractor. The contractor is responsible for construction costs, the project delivery period and quality of workmanship, as well as the coordination of subcontractors on site (Barnett 1995 p31).

2. Construction Management (Pure)

The increased dissatisfaction felt by clients associated with the traditional lump sum procurement route and the general problems associated with the separation of design and construction and the lack of contractor involvement in the design stage influenced the introduction of the construction management approach to achieve closer coordination of the building team and result in quicker project delivery within budget (Still 1975 p4).

The beginnings of CM in the USA dates back to the mid 1960's with clients increased desire to reduce the time and costs associated with the successful procurement of their buildings (Driscoll 1993 p7).

The study by Clough (1981 p13) state that:

> ".... there is no universally accepted definition for CM and ..... it is a term which means different things to different people".

The typical CM system involves a construction manager being appointed as part of the design team, with the overall intention of integrating the task of project planning, design and construction, therefore working as a team in an endeavour to meet the clients objectives of producing a project of maximum value within the most economic time frame. The client enters into contracts

with the various trade contractors to execute the various packages of work.

Wallis (1988 p18) acknowledges that in the CM process the client enters into a contract with the trade contractors and as such although the trade contractors contracts are with the client, the construction manager as the clients agent controls the activities of the contractors.

Driscoll (1993 p11) recognises that the "Pure" CM, "Professional" CM or "Agency" CM; whereby the construction manager acts as the clients agent in a fiduciary role throughout the procurement process with the relationship creating a high duty of care and loyalty on the part of the construction manager to the interests of the client. The construction manager carries out no design or construction work and is typically responsible for scheduling and coordination of the project whilst the client contracts directly with designers and constructors for their respective services.

This system provides an opportunity for the client to participate fully in the construction process by entering into direct contracts with the various trade contractors.

Construction management allows the design and construction process to overlap and places the management and control function of the building to an independent participant the construction manager (RICS 1979, p87). During the design stages of the project work will be separated into 'packages' allowing various subcontractors to bid for them.

Jones (1993 p427-429) examines the role of the construction manager and suggests that they are involved in: i) design evaluation, ii) scheduling and coordination, iii) value engineering, iv) contractor selection, v) budget development and cost management and vi) supervision/administration.

Features of US industry which facilitate and encourage the operation of this procurement system including:

a) standard work packages with a clear interface between packages,

b) a trusting and empowered management approach with the various trade contractors,

c) the establishment of long term relationships with trade contractors is encouraged to achieve better management and improvements in technology, and

d) the integration of their technical skills closer to construction.

The advantages include:

i. The client has objective advice and control over the project as the CM is being employed to provide unbiased construction and organisational advice to the design team, providing them with a basis upon which to make their decisions.

ii. The system is recognised to be specifically useful for projects with tight time constraints by allowing design and construction to be overlapped (Barrie & Paulson 1992 p36).

iii. The system is considered to have a high degree of flexibility to allow for delays, variations, changes and the rescheduling of work packages (Masterman 1992 p16).

iv. In theory, the CM approach should allow the formation of a strong cohesive team allowing the quicker and easier resolution of problems and disputes (Law 1980 p5, Nahapiet & Nahapiet 1985 p12).

v. The system allows the benefits of Buildability and value engineering and risk management to be fully utilised.

vi. Price competition can be achieved through the competitive letting of the individual trade packages allowing the client to benefit from trade contractors prices (Barrie & Paulson 1992 p36).

vii. The client maintains authority and control to enforce the contract the advice of the independent construction manager.

The disadvantages of this system include:-

i. In order for this system to work effectively it usually requires an experienced client body.

ii. The system is believed to add an extra risk to the client in terms of no guarantee on the final price of project is given to the client before construction commences on site (Law 1980 p6 and Nahapiet & Nahapiet 1985 p12).

iii. The inclusion of a CM in the design team just adds another "fee" onto the client's budget offering the client few real benefits over other procurement systems (Nahapiet & Nahapiet 1985).

iv. The success of the project relies ultimately upon the skills of the construction manager in terms of planning, scheduling, estimating, and management skills.

v. The majority of risks associated with this procurement system rests with the client.

Jones (1993 p429) and Barnett (1995 p31) confirm that under this system the construction manager assumes no risk for the design or construction of the project, whilst the client assumes the majority of risks in the process. The risk of design failure lies with the designers, whilst the risk of the quality of

workmanship lies with the trade contractors and the client. As cost certainty is not achieved until all of the trade packages have been competitively awarded, the risk of cost certainty resides with the client.

3. Construction Manager/Independent Contractor

Jones (1993 p429) identifies the CM/Independent contractor approach as:

> ".... the construction manager independent contractor approach provides that after pre construction activities the construction manager contracts directly with the subcontractors and guarantees the maximum cost of the project to the employer (client). In that role, the construction manager becomes the constructor and assumes a larger risk".

This arrangement as a tripartite agreement consisting of the client, separate designers and a general contractor (assuming the role of the construction manager) who provide pre construction advice to the client and design team, but also enters into fixed price or negotiated contracts with trade contractors to carry out the construction work. The construction manager will therefore directly employ each of the sub-contractors required for the project (Bennett 1991 p132).

Once the design work has been sufficiently completed (50% designs and 80% specifications) the construction manager prepares an estimate of the costs and proposes a GMP for the project. By the construction manager providing a GMP for the project, he/she assumes the risks of delivering the project on time to the agreed budget and in essence becomes the independent or general contractor for the project.

The advantages include:-

i. The system is 'fast track'.

ii. It creates good working relationships between the parties.

iii. The client is given cost security.

iv. The construction manager/independent contractor creates a single point of responsibility for the client.

The disadvantages include:-

i. The 'loyalty' of the CM to provide the fiduciary role can be jeopardised due to the possibility of conflicting interests of the GMP.

ii. Construction manager/independent contractors assumes a higher risk which will be priced.

iii. Where the GMP is established early in the design process, the design flexibility in this approach is greatly reduced (Driscoll 1993 p15).

The design consultants remain responsible for design efficacy whilst As the construction manager/independent contractor provides a GMP for the project he/she assumes the risk of project delivery increases in time, cost and quality of workmanship (Barnett 1995 p31).

4. Design and Build

Design and build procurement systems are illustrated when the client makes an agreement with a single body, the contractor, who is responsible for the whole project from initial briefing to design and finally to the construction of the building (Driscoll 1993 p5). The contractor may carry out the design function in house or conversely the design work may be carried out by a separate design consultancy which is appointed by the contractor.

The increased use of this system in the industrial rather than general building sector in the USA. The Turnkey approach involves the contractor securing finance, land, design, construction and possibly maintenance of the project after completion. Between these two forms are a range of options with varying degrees of contractor involvement in the design and construction process.

The role of D & B in the USA is continually growing in both the public and private sector. It has extensively been used to build simple structures such as warehouses and retail centres.

The advantages of this system are:

i. It provides a single point of contact and responsibility.

ii. Buildability is inherent.

iii. Early price and time certainty may be reached.

iv. The system provides for the use of fast tracking.

The major disadvantages:

i. Quality may suffer as a consequence of time and price certainty.

ii. Potential risk of reducing the client's control and flexibility over the project.

iii. The client often not being aware of weaknesses which affect the cost and timing of project completion (Barrie & Paulson 1992 p35).

iv. Changes are considered to be more expensive.

The design and build company assumes the risks associated with design efficacy, as well as quality of workmanship, construction time and project price (Barnett 1995 p31).

Contract Documents

There are various forms of contract which are in use in the USA. Most of the standard forms of contract used in America are compiled by the American Institute of Architects (AIA) and recommended by the Associated General Contractors of America (AGC).

The Procurement Systems Models

From the literature review relating to the dominant procurement systems which exist in the USA the Procurement Systems Models (PSM's) have been established. The PSM's have been validated by the questionnaire survey and further verified through interviews with respondents from the construction industry in the USA. The results of the questionnaire and interviews are shown in Appendix A Tables A1 (i), (ii), (iii), (iv), (v) and (vi).

Results from the Questionnaires Regarding Dominant Building Procurement Systems in the USA

As discussed in chapter 2 each of the questionnaires sent to respondents were system specific. From the literature review it has been established that there are four dominant building procurement systems in the USA. Each of the questionnaires were designed to be answered in relation to the identified procurement systems: Lump sum traditional system, Pure Construction Management, Construction Management Independent Contractor and Design and Build. In addition to one of each of the system specific questionnaires a non-specific questionnaire was also sent to each respondent to identify the existence of a non represented dominant procurement system in operation in the USA.

Of the eighty sets of questionnaires originally distributed by mail, twenty one were returned and analysed in this investigation. This gave a response rate of 26.25%. It should be noted that attempts were made to increase the response rate by follow-up letters; faxes; telephone calls and finally by re-sending the questionnaires to respondents who had not replied. The completed questionnaires came from a range of respondents including: 1 funder; seven designers; eleven constructors and two academics. Although attempts were made to collect responses from initiator/ promoter, no questionnaires were sent back from this category of respondent. Due to the qualitative nature of the questionnaire and the degree of consistency from respondents it was considered that the lack of response from some categories of respondents does not substantially affect the results.

The results of the questionnaires have been summarised and were used to validate and readjust the procurement systems models for each of the dominant procurement systems in the USA. The results from each questionnaire are shown in Appendix A tables A1(i), (ii), (iii), (iv) and (v). Each table indicates the number of respondents which returned the questionnaires. The tables summarise the number of respondents which returned completed questionnaire, the category of respondent and the answers provided by the respondent to each of the questions. The coding systems (identified in chapter 2) has been used to code responses to each question in all of the questionnaires in this investigation.

Where either the question was not answered by the respondent or where the question was not applicable to a particular procurement system, an asterisk was inserted into the tables.

A summary of the predominant response to each questions is also indicated in the tables. Such predominant responses have been established by identifying the most often expressed response to each question. Where there are several responses which are equally represented in the summary for a particular question then they have been added to the summary of predominant responses. During the verification of the PSM's, the respondents where were interviewed were asked to identify the predominant answer to the summarised responses collected in the questionnaires survey.

The results from the questionnaire survey have allowed the validation of the PSM which were primarily established through a review of literature on the dominant procurement systems. The questionnaires have also allowed any readjustments to be made to the models before they were verified through the interviews. A summary of the interviews are available in Appendix A A1(vi). The verified PSM for each of the dominant building procurement systems are identified below along with the organisational chart for each system which indicates the formal relationships between the various participants and the primary advantages and disadvantages of each system.

Figure 4.1.1: Model U1

Framework 1; Functional Role against Functional Process: indicating who carries out each function

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist					✓		
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

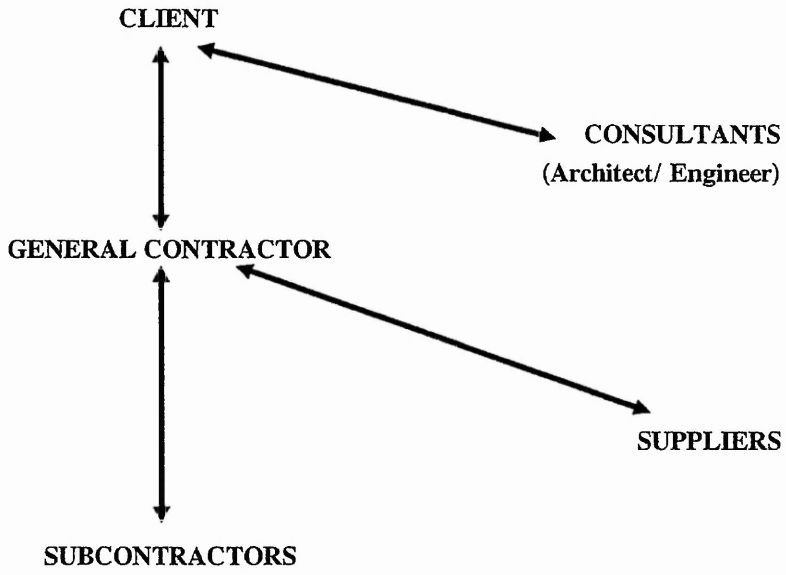
ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓	✓	✓	✓		✓
Funder		✓						
Designer	Schematic	✓						
	Detailed	✓						
	Specialist	✓						
Constructor	Manager							
	Producer	✓						

Framework 3; Functional Role against Risk: indicating who carries the higher risk for each risk identified.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		
Project Finance			*					
Effectiveness of Building in operation				*				
Quality of work								*

Figure 4.1.2: ORGANISATIONAL CHART FOR THE USA TRADITIONAL LUMP SUM PROCUREMENT SYSTEM

CONTRACTUAL RELATIONSHIP



ADVANTAGES	DISADVANTAGES
single point of contact and responsibility	design is often incomplete when contract is awarded
market forces and certainty	slow to start on site (no parallel working)
satisfactory public accountability	contractor not heavily involved in design or planning
procedures well known	process resulting in reduced buildability
easy to arrange and value changes	higher chance of adversarial relationships developing
design should be completed at tender	
stage giving cost certainty	
contract let on competitive basis	

Figure 4.1.3: Model U2

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed							✓
	Specialist							✓
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓	✓				✓
Funder		✓						
Designer	Schematic	✓						
	Detailed							✓
	Specialist							✓
Constructor	Manager							
	Producer	✓			✓	✓		

Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic			*				
	Detailed							*
	Specialist							*
Project Finance			*					
Effectiveness of Building in operation		*						*
Quality of work								*

Country: USA **Model Type:** U2 (Design and Build)

Figure 4.1.4: Model U3

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic							✓
	Detailed							✓
	Specialist							✓
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓					✓
Funder		✓						
Designer	Schematic							✓
	Detailed							✓
	Specialist							✓
Constructor	Manager							
	Producer	✓		✓	✓	✓		

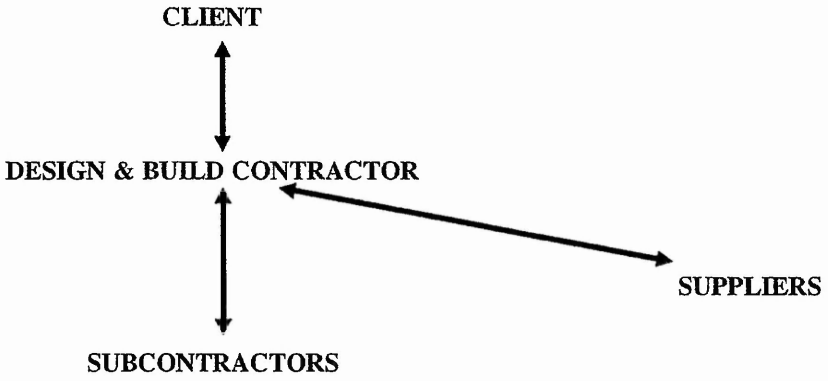
Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic							*
	Detailed							*
	Specialist							*
Project Finance			*					
Effectiveness of Building in operation		*						
Quality of work								*

Country: USA **Model Type:** U3 (Design and Build; Package Deal/ TurnKey)

Figure 4.1.5: ORGANISATIONAL CHART FOR THE USA DESIGN & BUILD PROCUREMENT SYSTEM

CONTRACTUAL RELATIONSHIP



ADVANTAGES	DISADVANTAGES
single point contract and responsibility	quality can suffer as a consequence of cost certainty
inherent buildability	client need to commit himself before design complete
early firm price possible	difficult to assess value for money
reduced total project time	reduced flexibility for design changes
	no design overview unless consultants appointed
	late design changes expensive
	bids difficult to compare

Figure 4.1.6: Model U4

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist					✓		
Construct;	Management						✓	
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

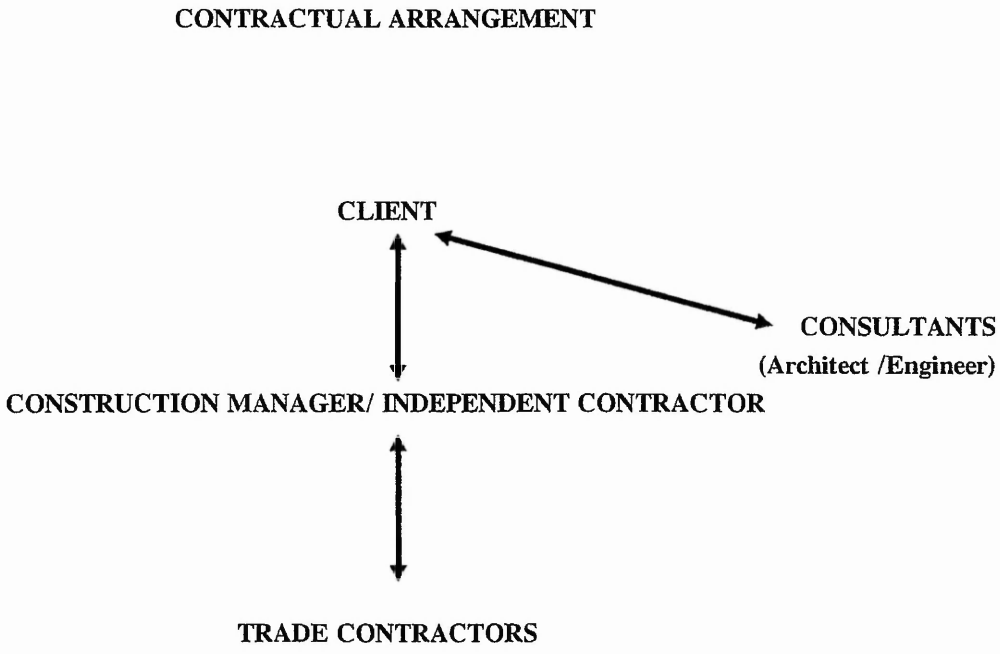
ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓	✓	✓		✓	
Funder		✓						
Designer	Schematic	✓						
	Detailed	✓				✓		
	Specialist				✓			
Constructor	Manager	✓						✓
	Producer						✓	

Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time							*	
Price Determination							*	
Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		
Project Finance			*					
Effectiveness of Building in operation		*		*				
Quality of work							*	*

Country: USA **Model Type:** U4 (CM/Independent Contractor)

Figure 4.1.7: ORGANISATIONAL CHART FOR THE USA CONSTRUCTION MANAGER AS AGENT/ INDEPENDENT CONTRACTOR PROCUREMENT SYSTEM



ADVANTAGES	DISADVANTAGES
time saving potential for overall project time	higher costs than under the CM approach
buildability potential	GMP reduces design flexibility once contractor
breaks down traditional adversarial barriers	appointed
parallel working inherent	potentially adversarial
security provided by GMP given by the CM	exhibits the absence of project control
suitable for complex buildings	GMP at an early stage can jeopardise the CM's
single point of responsibility for client	fiduciary role

Figure 4.1.8: Model U5

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist					✓		
Construct;	Management						✓	
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓	✓	✓		✓	✓
Funder		✓						
Designer	Schematic	✓						
	Detailed	✓				✓		
	Specialist				✓			
Constructor	Manager	✓						
	Producer	✓						

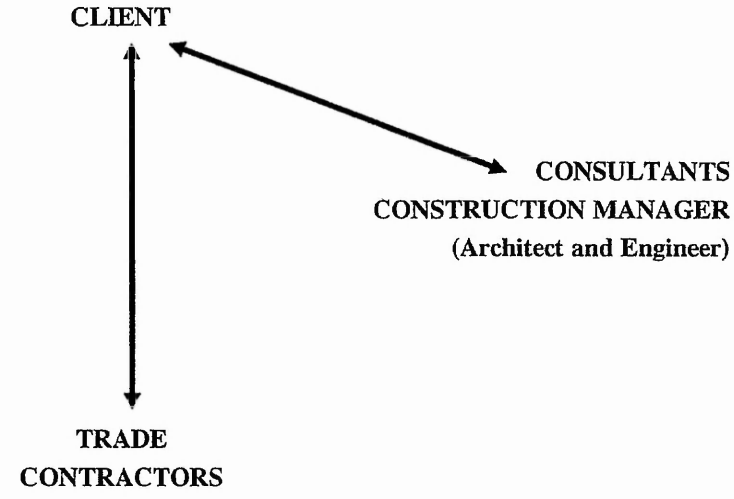
Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time		*						
Price Determination		*						
Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		
Project Finance			*					
Effectiveness of Building in operation				*				
Quality of work								*

Country: USA **Model Type:** U5 (Construction Management (PURE))

Figure 4.1.9: ORGANISATIONAL CHART FOR THE USA CONSTRUCTION MANAGEMENT (Pure) PROCUREMENT SYSTEM

CONTRACTUAL ARRANGEMENT



ADVANTAGES	DISADVANTAGES
time saving potential for overall project time	needs experienced client, able to take an active part
buildability potential	majority of risks rests with the client
breaks down traditional adversarial barriers	CM considered to be just an additional fee
parallel working inherent	success of the project relies on the skills of the CM
clarity of roles, risks and relationships for all participants	little cost certainty offered to the client
CM provides good independent advice to client	
high degree of flexibility	
price competition for each trade package	

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SECTION 4.2

JAPANESE PROCUREMENT PARADIGMS

Dominant Procurement Systems in Japan

Introduction

Japan is located in Eastern Asia and consists of a chain of more than 3,000 islands. It has an area of approximately 377,815 sq kilometres (145,875 sq miles) and a total population of 124 million people. Japan has a mountainous landscape and consequently the access for inhabitance are small. The population density is estimated to be 327 people per square kilometre in October 1991 (Europa 1992 p1541-47). Approximately 10% of the population are centred around the capital city Tokyo. The major religions of Japan include Shinto and Buddhism. It is recognised that Shinto the indigenous religion of Japan has evolved out of the day to day life of the people (Price Waterhouse 1993 p3-4).

Japan primarily depends upon its large domestic market which results in construction forming a large part of G.N.P. Forecasts produced by the NIKKO Research Centre (1993) illustrate that Japans nominal investment into construction was 86 trillion yen in 1992, which represents 18% of Japans G.N.P. The report also indicates that construction investment grew at an annual rate of 11% over the five year period between 1986 and 1990. This was due primarily to expansions in public works investment, private sector capital spending and housing investment.

Bennett, Flanagan and Norman (1987 p10-11) identify the key characteristics relating to Japanese culture which include:

1. The ability to make group decisions. A consequence of this characteristic is that decisions result from long discussions in groups.
2. The importance attached to status. Everyone's status is clearly known to all in society/company/firm due to the common structure within organisations.
3. Concentration of efforts.

The Culture of Japan

Elements of traditional Japanese culture are still present in today's business practices in Japan. The existence of an 'old boy's network', known as *Ningen Kenkei* means that Japanese within their groups are honour bound to help and assist each other. Flanagan (1991 p418) identifies this social relationship as a "web" which binds individuals in everyday life and business practice.

The concept of *Keiretsu* (translated to mean the grouping of companies) may be an illustration of these links which effectively resembles a "massive spiders web" of companies linking the vast number of industrial and financial organisations together into a 'group', with a major Japanese bank often at the centre.

There are four essential inter-related concepts in Japanese business culture:

i) Practice (*Nintai*); in the business context refers to possessing the endurance and intellectual fortitude to uncover carefully and methodically every factor which may impart upon a business decision or the outcome of negotiation.

ii) Face (respect) (*Kao*); refers to the Japanese sense of respectability and self-confidence and the appreciation which is shown to others and as such is a crucial concept to understand

iii) Duties (*Giri*); often in the business environment is expressed as the overriding loyalty to an individual that transcends loyalty or obligation to the firm.

iv) Obligations (*On*); as such the obligations incurred by the giving and granting of favours *On* is reciprocated by the duty or loyalty incurred by the recipient

(Zimmerman 1984 p64-72 & Bennett, Flanagan & Norman, 1987 p13)

Matsushita (1994 p1) identifies that Japanese society is often described as a society neatly woven of the confusion sense of moral obligation. Kashiwagi, Rubin & Harris (1988 p104-105) propose that the cultural characteristics of Japan have traditionally placed great emphasis on harmony and cooperation, within individual rights views as disruptive to group harmony. As such they identify that trust and establishment of long term business relationships is vital. Lam (1990 p13) concludes that Japanese culture affects:-

a) the relationship between parties in the construction process,
b) the commitment and strong sense of responsibility which is manifested by the life-time employment characteristics,
c) the supremacy of groups objectives over those of individuals which enhances team-orientated attitude, and
d) the close relationship between Government and Industry.

Hasegawa (1988 p19) describes this as a corporate management technique based on the concepts advocated by Dr W Edwards Deming on 'quality control' introduced to Japan in the early 1950's. This system was first exercised by the manufacturing sectors of the economy, and by the 1970's it was introduced into the construction industry, with amazing success. The construction industry in Japan was introduced to quality control systems in 1974 as a consequence of the oil crisis.

In a drive to increase efficiency in construction, Japans construction industry heavily invests in research and development programmes. Being a fiercely competitive construction market contractors claim that these departments are established and continually supported as they are a major tool for competition. Between 2.5 - 3% of the Japanese construction workforce are involved in research.

The Organisational Structure of the Japanese Construction Industry

Bennett (1991 p149) identifies that Japan's success is associated to its great dependence upon long term relationships between the clients, general contractors, suppliers and specialist sub-contractors working together for centuries in the construction industry.

Initiation/Promotion

The Japanese Government play a vital and active role in the orchestration of the construction industry. Between 1980-1985 it provided a substantial amount of work from the construction industry with 40-45% of total construction workload coming for the public sector. Paulson & Aki (1980) highlight the role of the Ministry of Construction (MOC) established in 1948, who is responsible for establishing the

contractors law, and contractors licensing system and has the primary aim of development of the construction industry. The Ministry of International Trade and Industry (MITI) performs a similar role to that of the MOC but is larger and more powerful and principally deals with residential developments (Levy 1993 p11). Haley (1994 p153) indicates that the MITI has been a catalyst in the development and implementation of industrial policies in Japan. This encouragement by the Government to develop the industry is because construction is viewed as vital to the nations success and development (Tucker 1992 p30).

The DTI (1995 p15) discusses the role of the government and its implication on the industry, and states that it has been government policy to ensure that the construction industry is maintained at approximately 18% and in doing so the government shows great commitment and support to the industry. The ratio of public and private construction investment in Japan, which is 35% and 65% respectively.

A unique characteristics of the Japanese industry is manifested in the relationship which exists between client and contractors. In Japan's private sector it is traditional for clients and contractors to work together for many years. As a consequence the process of commissioning building is suggested to be easy for clients usually involving the client telling a construction firm generally what they want built, when they want it, and how much they wish to pay (Bennett, Flanagan & Norman 1987 p33).

Approximately 60% of construction contracts in the private sector are based on negotiations rather than competitive bidding strategies due to the traditional long-term relationship between clients and contractors. The aversion to accepting risk is an important characteristic of the Japanese client.

Funding

Investment in construction has increased since the mid 1980's and it is estimated that the amount invested in 1990 was approximately 82.76 trillion yen. By sectors this indicates that the public sector investment is 32% (64% Building, 36% Civils), while private investment is 68% of the total investment in construction (Ministry of

Construction 1992 p3). More recent figures indicate the ratio to be 44% public and 56% private. The high level of public investment is attributed to the relatively underdeveloped state of public sector infrastructure such as housing, sewage systems, highways, bridges and airports in Japan (Kurosari 1993).

There is a great deal of participation between the private and public sectors in providing finance for construction projects. There has been the development of 'the third sector approach' where local business communities have joined with the government and with the assistance of loans from the Japan Development Bank and are investing in projects to upgrade the local community (Levy 1990 p51). Japanese government will offer generous mixed credit arrangements and low interest rates for Japanese contractors working abroad providing them with district advantages (Abdul-Aziz 1994 p477).

Paulson and Aki (1980 p286) maintain that the role of Banking and Trade groups within the industry has profound effects on the operation of the industry. There are over half a dozen major groups or *Keiretsu's*, with roots extending back several centuries and each with a major Bank at the apex of its network of companies. The consequence of having a *keiretsu* which comprises of many powerful companies and finance institutions results in the major contractors securing their position in the market.

A common characteristics of all of the "Big Six" Japanese construction companies is their engagement on a variety of commercial activities and facilitates:

a) cross holding of shares
b) intergroup financing to group companies by nucleus banks
c) joint investment by group companies
d) formation of presidential councils for the group
e) the advantage of using general trading firms as the nucleus trading arm

(Walker & Flanagan 1991 p166)

Design

The long term arrangements established results in the reduced scope for independent consultants.

The Architect

Design and construction are frequently carried out by the same organisation in Japan (Hasegawa 1988 p7-10). Independent architects do exist in Japan as consultants providing design detailing for clients. Matsushita (1994 p175) suggests that only 35% of licensed, class 1 architects (able to design any size and value of building) work for independent architectural firms, whilst 42.4% work for contractors in their design departments. Large contractors in Japan such as Shimizu and Kajima will have very large design departments staffed by up to 1000 architects and other associated design consultants (Hasegawa 1988 p7-10). Paulson & Aki (1980 p284-289) identified that the education of the architect is associated with engineering schools rather than the arts or humanities which can result in emphasis on function at the expense of aesthetics.

Independent design consultants will be used to carry out concept design, whilst the general contractors are frequently involved in producing detailed designs and working drawings. The Japanese architects role is normally limited to just providing the conceptual designs whilst contractors will often produce detailed design drawings.

The Engineer

The Engineer is considered to be the predominant construction professional in the Japanese building industry as the large construction companies recruit mainly engineers for construction related duties. The education of these consultants is more technically orientated providing them with a more extensive theoretical background as compared with their Western counterparts.

Estimators

There is no quantity surveyor in the Japanese industry. As experienced clients, construction firms and subcontractors all know what building costs are due to long term working relationships and the maintaining of data-bases of previous similar project costings, the process of cost control is considered to be an incidental activity (Bennett, Flanagan & Norman 1987 p34). Estimating process used in Japan have been modeled on the systems which exist in the USA (Levy 1990 p136-137). The contractor will often prepare a document similar to a Bill of Quantities indicating qualities and prices of construction items to be incorporated into the project and will also take on the duties of estimating and cost control. The client may appoint an independent cost engineer consultant to also provide cost control service.

Constructors

The Japanese construction industry in 1992, comprises of approximately 510,000 licensed firms and employs 5.3 million people providing employment for 9% of the total Japanese labour force (Ministry of Construction 1993). Recent statistics produced by the Japan Federation of Construction Contractors (1994 p10) indicate that the figures have now reached 530,665 licensed contractors. (Table 4.2.1)

Table 4.2.1: Number of licensed contractors classified by Scale of Capital in 1993 (March)

Category	Number	% of total
Individuals	174,104	82.8%
Under ½ million Yen	35,594	6.7%
2 million - 5 million Yen	105,958	20.0%
5 million - 10 million Yen	87,683	16.5%
10 million - 50 million Yen	115,170	21.7%
50 million - 100 million Yen	6,931	1.3%
100 million - 1 billion Yen	3,974	0.7%
Over 1 billion Yen	1,251	0.2%
Total (March 1993)	530,665	100%

Source: JFCC (1994 p10)

Note: The majority of the more than 530,000, licensed construction contractors are small and medium sized companies or individuals.

The industry is characterised by consisting of a small number of large general contractors and many medium and small sized firms, with the majority of the latter firms being subcontractors. Approximately 30% of the construction work is executed by less than 19% of the licensed contractors, whilst 30% of such contractors undertake 75% of the output of the whole industry (DTI 1995 p11).

A licensing system was introduced for all contractors in 1971 assigned to 28 trades or categories of work. The 3 year renewable licensing arrangement is a framework provided by the construction contractors law which regulates the activities of contractors in the industry (Lam Tsun Ip 1990 p61). The criteria for obtaining a licence include:-

i) 5 years construction experience
ii) the contracting company must be made up of competent professional staff with at least three years of experience (Hippoh 1983 p228).

Both general and specialist contractors are required to obtain a government licence to perform constructor work in Japan. The licences are divided into two classifications depending on whether the contractor can operate nationally or regionally.

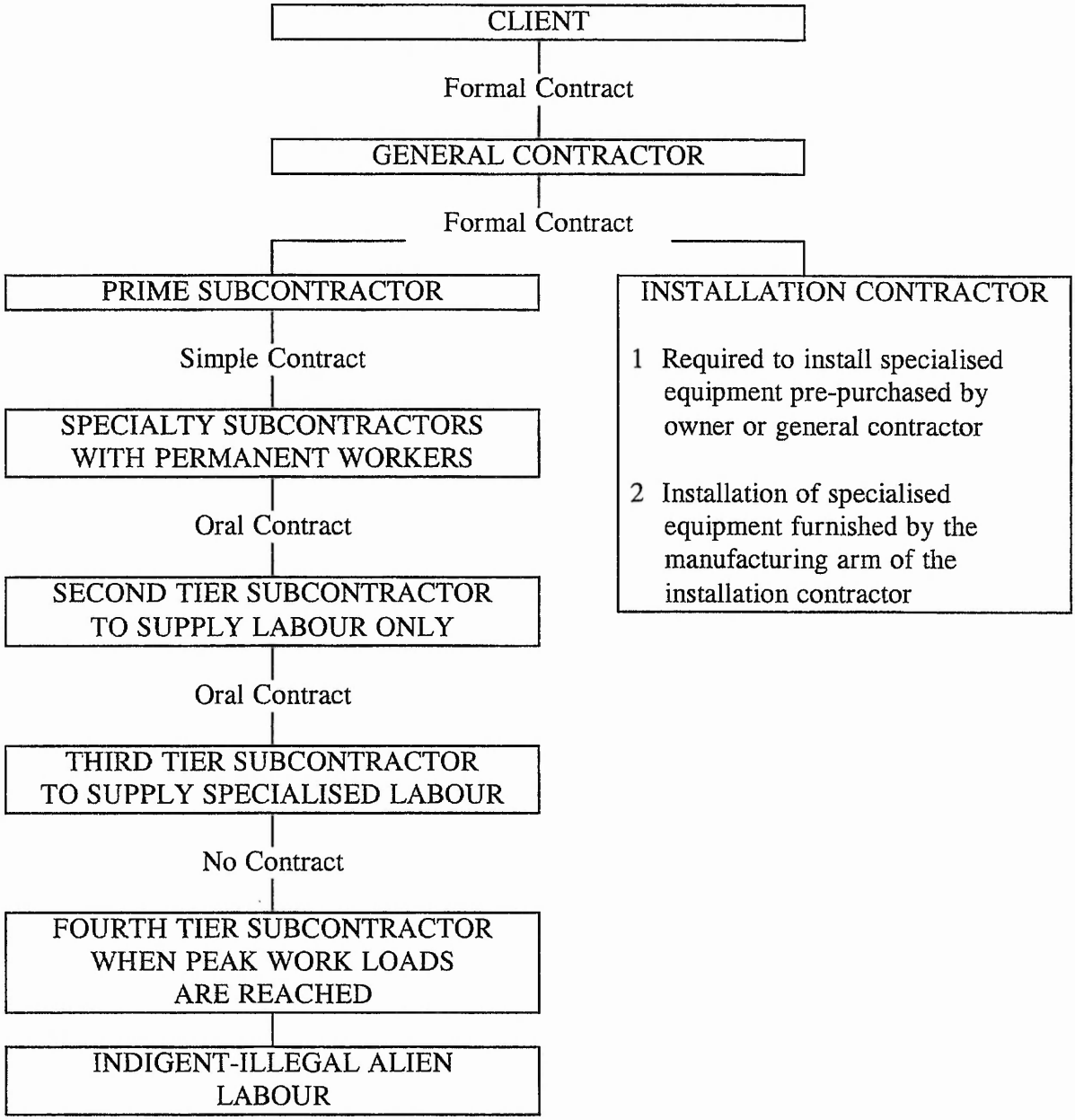
The Construction Contractors Law (1949) stipulates that every contractor (except for general building contracts of less than 6 million Yen, wooden houses buildings less than 150 sq m and speciality contractors less than 2 million Yen) must obtain a licence before they undertake any construction work. Officially the construction industry according to the Japanese Contract Construction Business Law is divided into three segments; (i) general and specialist contractors (ii) specialist contractors (iii) specialised sub-contractors and equipment installers.

The large general contractors are known as the "Big Six" provide a comprehensive range of construction and engineering services assisting the client in terms of site acquisitions, organising project finance, design construction and maintenance of the finished product. These companies describe themselves as being "total construction

companies", as such their clients may obtain all the functions for obtaining a building within a single organisation.

General contractors usually subcontract work to their armies of specialist subcontractors who go on to further subcontract the work to smaller more specialised subcontractors (Bennett, Flanagan & Norman 1987 p4 and Lam Tsun Ip 1990 p15). Their key role lies in design and management activities acting as project organisers, financiers and managers, employing specialist subcontractors to carry out the work.

Figure 4.2.1: How Work Is Subcontracted in Japan



Source: Levy 1990 page 105

There are two broad categories of subcontractors include labour-orientated subcontractors and specialist trade subcontractors. The latter category such as structural steel subcontractors have the ability to produce their own shop drawings, executive plans and co-ordinate and manage their own works. These large sophisticated specialist subcontractors have developed their own methods of construction and management and are therefore appointed by the general contractor to execute the work in accordance with their own developed procedures. Furusaka (1991 p131) identifies four key areas of responsibility which may be designated to a subcontractor by the general contractor. These include the provision to:

a) provide shop drawings/working drawings
b) supply materials/machinery
c) provide labour
d) provide management/control.

Eguchi (1981 p D.2.58) identifies that a key feature of the operating practices of Japanese general contractors is their involvement and participation in the pre-constructional phase. This close connection between clients and contractors results in many benefits in terms of the overall project delivery, such as increased buildability, greater planning and co-ordination, and potential cost savings due to improved design solutions.

The Dominant Procurement Systems

The characteristics of teamwork, mutual trusts and long term relationships between clients and contractors and contractors and their subcontractors encourages the use of traditional contractual arrangements. The dominant use of lump sum contracts divided into either construction only contracts or design and build contracts. Fujita (1988, p15) in discussing the use of these procurement systems recognises that the "Big Six" contractors carry out the majority of their work on a "Negotiation Basis".

The survey conducted by Nikkie Publications Inc. in 1991 and discussed by Matsushita (1994 p180) revealed that 40.4% of clients select contractors who have a good reputation even if their tenders are higher than other contractors. The survey

also revealed that 31.6% of clients will employ the same contractor on a regular basis.

1. Lump Sum: Design, Tender, Construct System.

Under this procurement system the planning, preliminary design work, detailed designs and associated preliminary cost advice is carried out through the clients organisation or by the client commissioning independent consultants (Eguchi 1981 pD.2.55-2.56). Once the design drawings have been produced, either a range of contractors or a nominated general contractor will produce tenders indicating their cost estimate for the construction of the project. It is used predominantly in the public sector (for large industrial projects such as steel mills). This system is particularly preferred as it meets the requirements of public accountability allowing the client to award the contract to the most suitable contractor. A survey conducted in 1991 by Nikkie Publications Inc., which analysed procurement systems selection by a cross section of clients identified that 50.9% of clients prefer to use an independent designer and an independent contractor on projects, whilst 26.5% of respondents preferred to used Design & Build.

2. Design and Build

Large general contractors have maintained and developed in-house design departments, encouraging the use of design and build system. Under this system a single contracting entity (usually a general contractor), provides both services of design as well as construction. Over 50% of all building contracts are let on a design and build basis. The use of this system is encouraged by the existence of long-term relationships between the parties involved, the design capabilities of general contractors, the relationship of the general contractor with subcontractors and the single point of responsibility for the client achieved when using this system.

The dominance of design and build in the private sector is primarily due to the expertise of contractors in the design and construction function, the system providing a single point of responsibility and risk for the project coupled with the general conservative, traditional characteristics of the industry. The survey by Nikkie Architecture indicated that the top 15 general contractors in Japan earn an average of 44.6% of their total income through D & B (predominantly residential and office buildings). The survey by Nikkie Architecture (1994) summarised in table 4.2.2 illustrates the use of this system by the major contractors.

	1992	1992		
Company name	D & B (Million Yen)	Total orders (Million Yen)	% D & B total in 1992	% D & B total in 1991
Takenaka	796,945	1,448,692	55.0	61.0
Shimizu	657,564	1,564,761	42.0	47.4
Kajima	491,778	1,283,451	38.3	42.1
Taisei	486,130	1,267,886	38.3	49.3
Obayashi	465,805	1,005,746	44.1	50.5
Average Usage			43.54	50.1

Table 4.2.2: The ratio of Design and Build to volume of the Big Five Japanese construction companies
Source: Saito (1994 p394/ Nikkie Architecture 1994)

The advantages include:

i. A simple and direct relationship is established.

ii. Maximisation of the pre-contract period.

iii. Overlapping of Design and Construction.

iv. Cost savings potential as no independent design office appointed.

v. Single point of responsibility.

vi. High quality designs may be achieved.

vii. Cost optimisation may be achieved.

3. Joint Venture Contracts

The joint venture system is particularly being used in the public sector due to its ability to allow small and medium sized contractors to work alongside larger more technically sophisticated 'general contractors' in an attempt to gain valuable experience. A major reason for its usage is due to the system improving the financial capability of the contractors and allows substantial risk sharing between them (Yamamoto 1993 p93). Approximately 30% of the total output in the public sector is carried out by such joint venture projects.

Matsushita (1994 p171) identifies this as the "unconsolidated" joint venture where the work is divided into parts and each partner is required to complete their respective portion with the risks also clearly distinguished for each contractor. The 'consolidated' JV approach where all partners contribute equal shares of capital, materials, personnel and equipment, and work collectively, sharing all profits and the risk for completing the works. This system can either be on a design and build basis or on a construction only basis. Approximately 34% of public works projects are executed on a joint venture basis.

The advantages of the JV approach include:-

i. Allows contractors to mitigate possible losses and risks by sharing them on an agreed basis.

ii. Facilitates the pooling of resources between contractors.

iii. Partners to the project can complement one another in terms of their individual construction expertise.

iv. Facilitating technology transfer.

The disadvantages include;

i. Incompatibility amongst the JV partners.

ii. Problems of non uniformity of capabilities with different sized companies.

iii. disintegrity of the sponsor company may result in the major contractor in the joint venture claims profits and passing losses on to other members of the partnership.

iv. uncertainty of the liability position for contracts under this system.

v. if one of the companies in the JV defaults, the others have to make up the capital and complete the work of the defaulted partner.

Management Orientated Procurement Systems

There is a lack of management orientated procurement systems used in Japan. A primary constraint on the use of management orientated procurement systems related is the Building Standards Law. Paulson and Aki (1980 p293) cite the work of Matsushita (1977) who states:

"According to Building Standard law, any construction work on site must not start before all the construction plans, especially working drawings, have been completed and approved by municipal authorities having jurisdiction thereof. So, unless any exceptional procedures are devised by the Ministry of Construction it will involve great difficulty to start site construction before the drawings are completed".

The use of management orientated procurement systems requires a strong and independent group of specialists trade contractors who are all capable of securing, coordinating and managing their own contracts. A constraint is that the Japanese industry does not traditionally recognise the management of construction projects as a separate service. This function has traditionally been conducted by the general contractor. Shan & Fisher (1991 p16-17) propose that there are several reasons for the lack of such management procurement approaches which include:

"a) Japanese society has no custom of paying for intangible know-how.
b) As employees are perceived by both clients and contractors to have a competent management skills, there is considered to be no need to assign this management role to an external organisation.
c) The lump sum contract approach has long been accepted by Japanese clients who feel no necessity to introduce a fee based contract for project management.
d) Japanese subcontractors who are considered not to be competent in management and technology tend to have exclusive relationships with a main contractor".

The traditional approach of lump sum contracting (either conventional design and them construction or D & B) results in the main contractor assuming full responsibility and risk for the completion of the project. In the analysis of the 1991 Nikkie Publications Inc. survey, Matsushita (1994 p180-181) observes that Japanese clients tend not to give priority to cost reductions or shortening construction periods which are two of the associated benefits of using management approaches. Issues which restrict the effective operation of management orientated procurement systems (particularly the use of construction management) in Japan:

i) Specialist trade contractors are generally subordinate to general

contractors.

ii) Japanese contracts do not strictly covered all terms and conditions as social obligations are an important part.

iii) The client is required to obtain a building permit before construction starts on site.

iv) By law the architect is required to explain all construction documentation to the building officer before work starts. commences.

v) Japanese clients tend to use systems which they are familiar with and which provides them with cost, and time certainty before construction commences.

vi) Clients are generally reluctant to use general contractors and subcontractors which they have not previously worked with.

Contract Documents

The key importance of Japanese contracts is for the parties involved to maintain long-term amicable, non-adversarial relationships. Existence of long term relationships are more influential then the formation of a single contract document. The general conditions for public work contracts are produced by the Ministry of Construction and standard contracts are produced by the Central Council for Public Works. The development of the Allied Agreement on Standards of Contract for Works, produced by the Architects Institute of Japan, Architects Association of Japan, Japan Architects Association and the Associated General Contractors of Japan.

The variety of standard forms of building contracts used in both the Public and Private sectors possessing the following features:

i) straightforward, avoiding legal jargon and terminology and

without cross referencing to clauses

ii) consists of a written contract, general conditions, design drawings and specifications and

iii) identify that the owner and contractor shall perform the contract sincerely, through cooperation, good faith and equality.

According to Bennett, Flanagan & Norman (1987, p34):

> "In simple terms, the Japanese contractual system relies upon trust, commitment and mutual understanding ..... The system also relies on the contractor undertaking the coordination and production in collaboration with the specialist trade contractors of working drawings".

The Procurement Systems Models

From the literature review relating to the dominant procurement systems which exist in Japan the Procurement Systems Models (PSM's) have been established. The PSM's have been validated by the questionnaire survey and further verified by respondents of representatives of the construction industry in Japan. The results of the questionnaire and interviews are shown in Appendix A Tables A2 (i), (ii), (iii), (iv) and (v).

Results from the Questionnaire Regarding Dominant Procurement Systems in Japan

As discussed in chapter 2 each of the questionnaires distributed in each country were specific to the various dominant procurement systems. The literature review has identified that there are four dominant procurement systems in Japan. The system

specific questionnaires were designed to be answered with regards to the Lump Sum Design, Tender and Construct system, Design and Build, Joint Venture Lump Sum Design, Tender and Construct system, and Joint Venture Design and Build. A non system specific questionnaire was also distributed to each respondent to identify the existence of any non represented dominant building procurement systems in Japan.

From the eighty sets of questionnaires originally distributed twenty four were returned for analysis, giving a response rate of 30%. Attempts were made to increase the response rate by the use of follow up calls, letters, faxes and finally the re distribution of the questionnaires to the respondents who had not replied. The completed questionnaires came back from a range of respondents including one initiator/prompter, six designers, fourteen constructors and three academics. Attempts were made to collect responses from funders but no completed questionnaires were returned. Due to the qualitative nature of the questionnaire and the degree of consistency from respondents it was considered that the lack of responses from some categories of respondents did not substantially affect the results.

The results of the questionnaire survey have been summarised, analysed and have been used to validate the Procurement Systems Models for the dominant building procurement systems in Japan. The results of the questionnaire are shown in Appendix 2. Each of the table of results (see Appendix A2 (i), (ii), (iii) and (iv) indicates the number of respondents which returned the questionnaire, the category of respondent and their responses to each of the questions. The tables also identify the number of completed questionnaires analysed, and how each question in the survey relates to the various elements of the three functional frameworks in the PSM's.

The responses to each question have been coded in accordance with the coding system in chapter two. Where either the question was not answered or where the question was not applicable an asterisk (*) was inserted into the table.

Each table also provides a summary of predominant responses to each of the questions. These responses were established by identifying the most widely expressed

response to each question. Where there was a number of responses which were equally represented in the table they have all been included in the summary. During the interview survey and the verification of the models, each interviewee was asked to identify which of the predominant responses summarised by the questionnaire survey was the most likely answer.

The results of the questionnaire survey have been used to validate the PSM and made any readjustments to PSMs which were required before the models could be verified during the interviews. The interviews are also shown in Appendix A (table A2 (v)).

The results of the questionnaire survey have been used to validate the PSM and make any readjustments which needed to be made to the models. The models were further validated during the interviews (summarised in Appendix A table A2 (v)). During the verification process of the PSM's, interviewees were asked to comment on which of the predominant responses summarised by the questionnaire survey was the most likely answer. The models were then confirmed of the dominant procurement systems in Japan.

The verified PSM for each of the dominant building procurement systems are identified below along with the organisational chart for each system which indicates the formal relationships between the various participants and the primary advantages and disadvantages of each system.

Figure 4.2.2: Model J1

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist					✓		alt
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships:indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/ Promoter			✓	✓	✓	✓		✓
Funder		✓						
Designer	Schematic	✓						
	Detailed	✓						
	Specialist	✓						
Constructor	Manager							
	Producer	✓						

Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

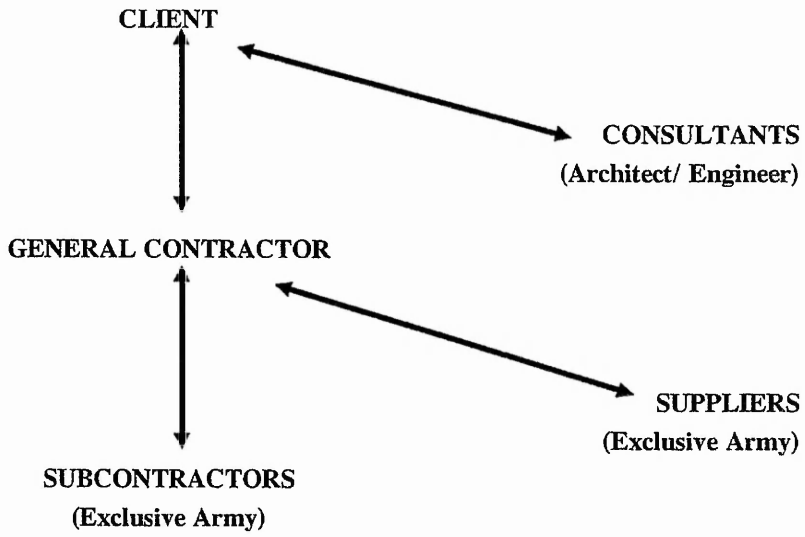
ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		
Project Finance			*					
Effectiveness of Building in operation								*
Quality of work								*

Country: Japan **Model Type**: J1 (Lump Sum Design, Tender, Construct)

alt = alternative arrangement

Figure 4.2.3: ORGANISATIONAL CHART FOR THE JAPAN LUMP SUM DESIGN, TENDER, CONSTRUCT PROCUREMENT SYSTEM

CONTRACTUAL RELATIONSHIP



ADVANTAGES	DISADVANTAGES
competitive fairness	
market forces and certainty	slow to start on site (no parallel working)
satisfactory public accountability	contractor not involved in design or planning
procedures well known	(no buildability)
easy to arrange and value changes	

Figure 4.2.4 Model J2

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic							✓
	Detailed							✓
	Specialist							✓
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships:indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/ Promoter			✓					✓
Funder		✓						
Designer	Schematic							✓
	Detailed							✓
	Specialist							✓
Constructor	Manager							
	Producer	✓		✓	✓	✓		

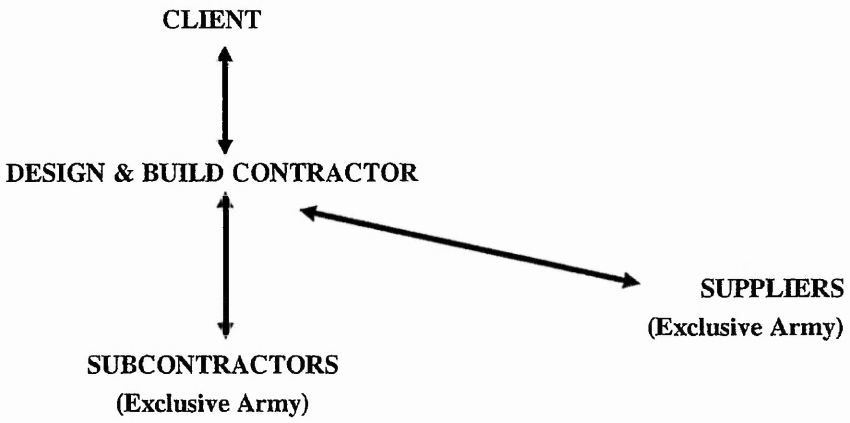
Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic							*
	Detailed							*
	Specialist							*
Project Finance			*					
Effectiveness of Building in operation								*
Quality of work								*

Country: Japan **Model Type**: J2 (Design & Build)

Figure 4.2.5: ORGANISATIONAL CHART FOR THE JAPAN DESIGN & BUILD PROCUREMENT SYSTEM

CONTRACTUAL RELATIONSHIP



ADVANTAGES	DISADVANTAGES
single point contract/ responsibility	inexperienced clients need to appoint independent consultants
improved design /inherent buildability	client need to commit before design complete
early firm price possible	bids difficult to compare
reduced total project time	
maximisation of precontract period	
cost savings as no independent design	

Figure 4.2.6: Model J3

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist					✓		alt
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships:indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/ Promoter			✓	✓	✓	✓		✓
Funder		✓						
Designer	Schematic	✓						
	Detailed	✓						
	Specialist	✓						
Constructor	Manager							
	Producer	✓						✓

Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

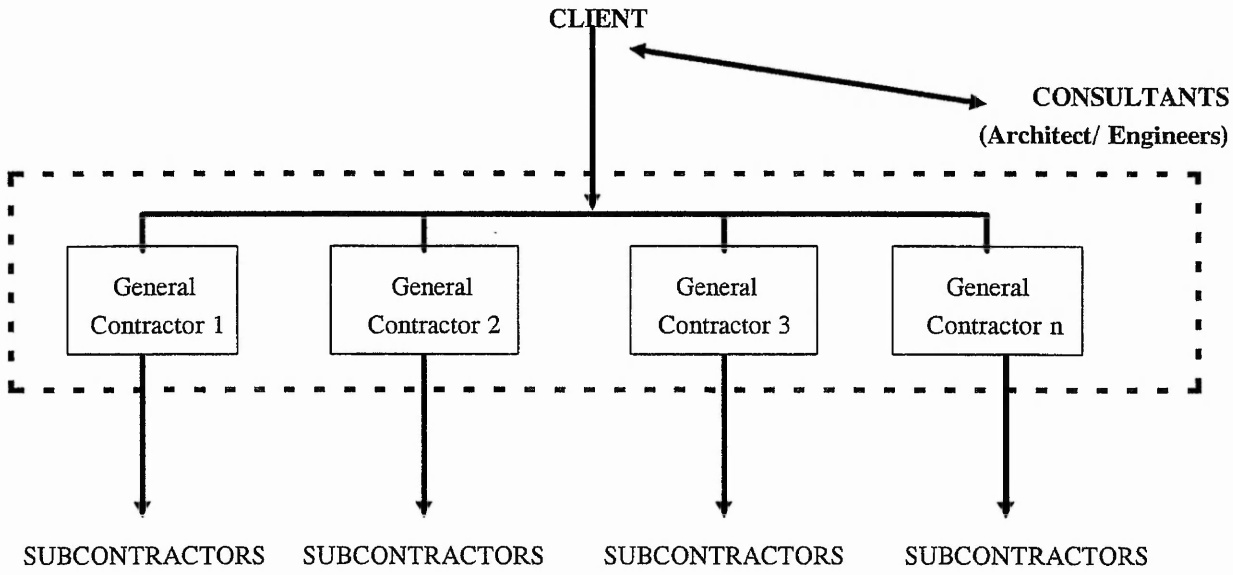
ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		
Project Finance			*					
Effectiveness of Building in operation				*				*
Quality of work								*

Country: Japan **Model Type**: J3 (Joint Venture; Lump Sum Design, Tender, Construct)

alt = alternative arrangement

Figure 4.2.7: ORGANISATIONAL CHART FOR THE JAPAN JOINT VENTURE; DESIGN, TENDER, CONSTRUCT PROCUREMENT SYSTEM

CONTRACTUAL ARRANGEMENT

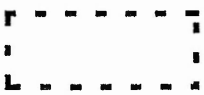


ADVANTAGES

used on large projects
facilitates the pooling of resources
individual company expertise used
allows technology transfer to small companies
advantages as lump sum design, tender and construct system

DISADVANTAGES

incompatibility amongst JV partners
problems of non uniformity of capabilities
disintegrity of sponsor company
uncertainty of liability of companies in the JV
companies are jointly responsible for completion
disadvantages as lump sum, design, tender and construct



indicates joint venture group

Figure 4.2.8: Model J4

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic							✓
	Detailed							✓
	Specialist							✓
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships:indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/ Promoter			✓					✓
Funder		✓						
Designer	Schematic							✓
	Detailed							✓
	Specialist							✓
Constructor	Manager							
	Producer	✓		✓	✓	✓		✓

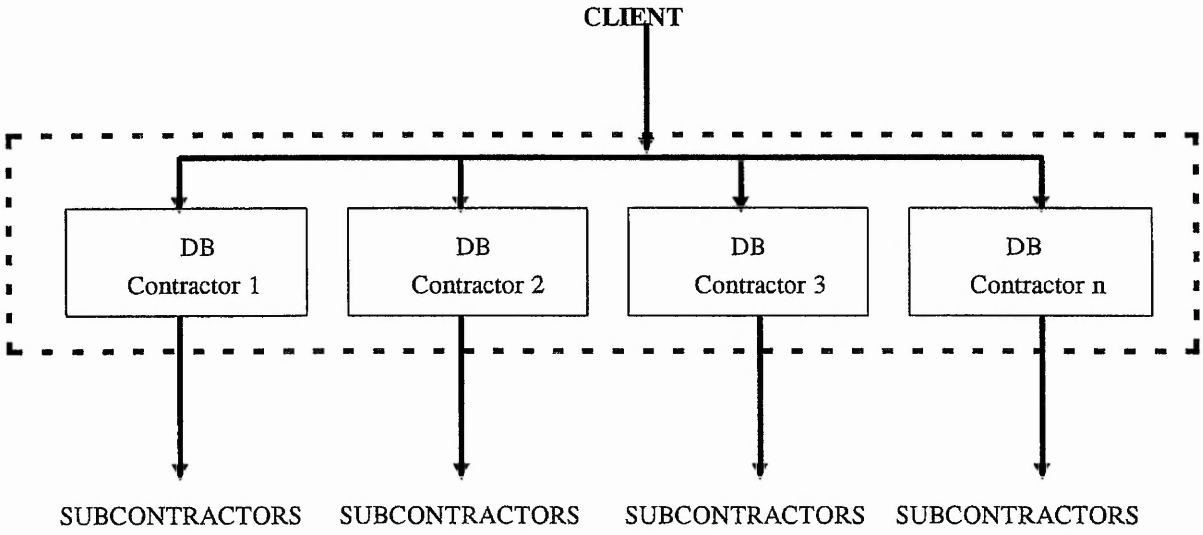
Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic							*
	Detailed							*
	Specialist							*
Project Finance			*					
Effectiveness of Building in operation								*
Quality of work								*

Country: Japan **Model Type**: J4 (Joint Venture: Design & Build)

Figure 4.2.9: ORGANISATIONAL CHART FOR THE JAPAN JOINT VENTURE; DESIGN BUILD PROCUREMENT SYSTEM

CONTRACTUAL ARRANGEMENT



ADVANTAGES

used for large projects which no single contractor can perform
facilitates pooling of resources
individual company expertise's used
small contractor can work alongside large contractors gaining experience and technology
advantages as design and build

DISADVANTAGES

possibility of incompatibility of JV partners
problem of non uniformity of capabilities of companies
disintegrity of sponsor company
uncertainty of liability for companies
companies are jointly liable for the project
disadvantages as design and build.

indicates joint venture group

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SECTION 4.3

FRENCH PROCUREMENT PARADIGMS

Dominant Procurement Systems in France

Introduction

France possesses one of Europe's largest construction industries. In 1989, the BIPE (*Bureau d'Informations et de Previsions Economiques*) indicated that the total output of the French Building and Civil Engineering industry in 1988 was FF 655 bn, in 1989 it was estimated to be FF 675 bn and in 1990, FF 686 bn (all figures are at 1988 Exchange Rate) (BMP 1990 p21). The land area in France is approximately 550,000 square kilometres (213,000 square miles) and the population has been estimated to be 57.35 million (Price Waterhouse 1993 p1-6).

The Organisational Structure of the French Construction Industry

Bennett (1991 p180) observes that in general the European building industry has been shaped by its historical and diverse cultures and each building industry has a distinctive pattern of roles and relationships. Pearson (1994 p4) examines the roles of the various parties in the French building process and concludes that:

> ".... One feature of the French building industry is the fact that functions are not neatly matched with professions as they are traditionally in the UK. Functions may be performed by individuals from a variety of professional/technical backgrounds and 'qualification' may often be based more on experience than formal education and training".

The Meikle & Hillebrandt (1989 p41) RIBA (1991 p105) analyse the relationship which exists between the various organisations and the activities which are conducted in the French building process. Their analysis is presented in Table 4.3.1 below. Table 4.3.1 indicates that various activities may be carried out by the same organisation. For example, the BET, may be appointed by the client as the maitres d'oeuvre, to produce concept working drawings, to carry out cost control, as well

as the activity of the pilotage. However, predominantly the BET is involved in the development of detailed and engineering design, contract documentation and site supervision.

Key: predominantly ● Occasionally *

Organisation Activity	Client	Architect	BET	Engineer	Economiste	pilote	contractor
Maitrise d'ouvrage	●						
Maitrise d'oeuvre		●	*				
Planning permission	*	●					
Concept Design		●	*				
Detailed design		●	●				*
Engineering design			●	●			*
Working drawings			*				●
Contract docs		●	●	*	●		
Site supervision		●	●	*			
Pilotage		*	*		*	●	●
Cost control		●	*		●		

Table 4.3.1: Relationship between organisations and activities
Source; Adaptation of CIRIA (1989) & RIBA (1991))

The data in Table 4.3.1 has been used to develop Table 4.3.2, which indicates which organisation in France carries out which of the generic functions of procurement which has been verified during the interview survey.

Function Organisation	Initiate Promote	Fund	Concept Design	Detailed Design	Specialist Design	Management Construct	Product construct
Client	●						
Funder		●					
Architect			●	*			
Bureau d'etudes			*	●	*		
Pilote						●	
Contractor				*	●	*	●

Table 4.3.2: Organisations and Predominant Functions

Initiation/Promotion

In 1990, 629 billion francs were invested into the construction industry, of which 199 billion Francs (32%) was by the public sector (*Le Moniteur* Magazine, 1990). The *Ministere de l'Equipement et du Logement* (1994) indicate that the total value of Building and Public Works in France in 1993 was 640 billion francs, of which building works account for 492 billion francs, and public works (infrastructure) 148 billion francs. The statistics also highlight that within the 492 billion francs spent on building work, 267 billion francs was allocated to residential work, whilst 225 billion francs were expended on non residential building works in 1993.

The 'client' in France is known as the *Maître d'ouvrage*. Cooke and Walker (1994 p74) suggest that both the public and private sector client (*Maitre de l'ouvrage*) is responsible for the complete building process including purchasing the land, raising capital, establishing a brief and appointing consultants.

The role of the construction client in the Public sector is rigidly codified by various laws and decrees, the most important being the '*Codes des Marches Publics*', which encompasses all the regulations which relate to public sector procurement (RIBA 1991 p39).

According to Pearson (1994 p7):

> ".... public sector clients operate within a complicated framework of codes, laws and decrees which provide detailed descriptions in relation to the procurement of buildings ..... The private sector is by contrast relatively free from regulations".

Clients in the public sector are subject to the '*Codes des Marches Publics*' (Code for public contracts) produced by the '*Commission Centrale des Marches*' (RIBA 1991 p42). The *Codes des Marches Publics* establishes the procedures for the appointment of designers including their levels of remuneration and the appointment of contractors (Borrie 1995 p2). Key areas of legislation include (Pearson 1994 p7):

1. Decree No 73-207 of 28th February 1973.

Focusing on project briefing processes, the roles and responsibilities of the clients consultants and the general process of cost management. In essence, the 1973 decree defined and broadened the role of the public sector client, by recommending that the client appoints an in house consultant (*directeur d'investissement*) to be responsible for financial and administrative decision making processes, and to establish a number of standard services which could be undertaken by design consultants (*Missions normalisées*). This law also introduced a system of fees for the design team.

The twelve '*missions normalisées*'(standard design team services) m1-m12, introduced by this legislation (Decree No 73-207) provide a menu of options for clients varying the amount of involvement the design team has in the design and construction process. Missions m7-m12 limit the role of the design team to that of '*conception*' (design), whilst missions m1-m6 establish the design team as the *maitre d'oeuvre*, carrying out the design and also the supervision of the construction of the project (Wheatley 1989a p72). These twelve missions have been developed from a combination of thirteen standard elements e1-e13 which relate to various services which can be provided by the design team (see Pearson 1994 p7-8).

2. The *mission interministerielle pour la qualite des constructions publiques (MIQCP)* of 1984. This law established that an estimate of the total anticipated project costs must be calculated before the brief (programme) can be developed, in an attempt to increase the cost management procedures in the public sector. The role of the public client is to carry prime responsibility for contracts and to:

> "ensure the feasibility of the project, determine its location, define the programme, decide on a financial plan and provisional budget, secure finance, chose how to organise the construction process and enter into design and construction contract".
>
> (RIBA 1991 p42-43).

The function of the *maitre d'ouvrage* is to prepare the programme. The programme consists of four chapters which include:

a) chapter 1: providing information to the architect relating to site conditions, topographical plans, soil investigations, geographical, climatic and seismic data.

b) chapter 2: establishes the clients needs and includes an objective description of the building that is required with preliminary costings, and information relating to the proposed quality and timing of the building.

c) chapter 3: dealing with external issues including planning issues.

d) chapter 4: which relates to restrictions the client wishes to impose, including time, quality and cost specifications.

This procedure should be followed on all major projects in order to make the brief as clear as possible in an attempt to ensure client satisfaction. According to decree 73-207, of 28 February 1973, it is stipulated that both an architect and an engineer must be appointed for public sector projects over a certain size floor area (see RIBA 1991 p44).

3. Law (loi) No 85-704 of 12 July 1985; *Maîtrise d'ouvrage publique et rapports avec la maîtrise d'oeuvre privee (Loi MOP)*. In this law emphasises the importance of estimates and cost monitoring in construction and states:

> ".... the *mission* of *maîtrise d'oeuvre* which the *maitre d'ouvrage* may entrust to a private person or to a group of people should provide an architectural, technical and economic solution to the brief ....".
>
> (RIBA 1991 p44)

Consequently, it is general practice for the architect to select and appoint the *bureau d'etudes* and increasingly an *economiste*. The law provides that the

client must always remain responsible for the works, and this role may not be subcontracted to another party. The role of the client includes to initiate the process and be responsible for feasibility studies, to define the *programme*, to establish the provisional costs of the work, to carry out financial planning, and to enter into direct contracts with the engineer, architect and contractors.

4. Decrees No 93-1268, 1269 and 1270 of 29 November 1993. These decrees took effect on the 1 June 1994, replacing the decrees of 1973 and have reformed procedures in the public sector. The basis of the 1993 decrees may be summarised as:

   i) *le decret No 93-1268*; defines the duties of a private sector *maîtrise d'oeuvre*, who has contracted with a public sector *maitres d'ouvrage*.

   ii) *le decret No 93-1269*; defines the method of selecting an architects or engineers professional services for a public project.

   iii) *le decret No 93-1270* defines the application of '*conception construction*' in the public sector, which is restricted to technically complex structures (industrial buildings) (Kandiah 1994 p28).

Funding

Traditionally, the French Government have employed strong policies of state investment in housing and public works with communication companies being state owned. The importance of state intervention is illustrated by the 'Five Year National Plans' which were traditionally in operation in France between 1946-1965. Private sector funding is usually supplied by banks, insurance companies and pension funds. A notable feature in France is the close connection which exists between these financing sources, the BET and the construction industry. Many large contractors are partially owned by banks or insurance companies.

Design

The function of design is carried out by a variety of organisations in France. Table 4.3.2 indicated that the process of concept design is principally carried out by the architect, whilst detailed design is primarily conducted by the *Bureau d'Etudes Techniques*, and working drawings are frequently produced by specialist contractors.

The Architect

Cooke and Walker (1994 p74) identify that the role of the *maitre d'oeuvre* may be executed by an architect or engineer and is the leader of the building team, responsible to the client for the concept, design, execution of the works, contracting procedures and financial accounting. The architect became increasingly associated with the fine arts, and their contribution to the building design process became gradually limited to the concept/schematic design stage.

The architect works in close cooperation with the BET, and can assist with the translation of concept designs into detailed design drawings. The role undertaken by the architect invariably depends upon the type of *mission* used for the project, which is usually selected by the client. As such the single essential role of the architect is the conception of the design for a proposed building with their responsibility being limited to its architectural integrity. Detailed designs are often carried out by an independent design office or BET, although the client will often request the architect to coordinate the design detailing process (Chartered Builder 1993 p7).
Within the private sector, the role of the architect is less regulated by legislation, with the *concepteur* (designer) being an architect, or *bureau d'etudes techniques*, an engineer or a contractor. The law does however have some influence in the private sector, by making it necessary for a building permit to be obtained only by an architect for buildings larger that 170 m2 (ACE et al 1990 p13, Borrie 1995 p2).

Wheatley (1989a p71) recognises that both the title of 'architect' and the practice of 'architecture' are protected under law. In order to practice as an architect in France it is necessary to register with the '*Order of Architects*'.

The Engineer

The role of the engineer has traditionally been influential in the French construction industry. Wheatley (1989 p73) indicates that the main function of the engineer is predominantly related to the detailing of design and supervision of the works.

The engineer is often heavily involved in design, frequently being employed by the *bureau d'études (BET)*, engineering consultancies, by the contractors as well as being a major participant in many client's organisations (Meikle & Hillebrandt 1989 p9). Ferry (1991a p98 and 1991b p24) identifies that the BET, who are involved in the detailed design function, are made up largely of engineers and act predominantly for the client although they are often owned by contracting groups and are fairly commercially orientated. The development of the engineer led BET's was inspired by the French government to essentially provide design services for industrial buildings, and to meet the ever changing technological and managerial needs of a modern industry.

The *Bureau d'Etudes Techniques* (BET)

The BET are essentially large engineering consultancy groups, often owned by contractors or integrated within clients organisations in the public sector or they can be owned by industrial companies (FBCIG 1993 p7, Meikle & Hillebrandt 1989 p36). Cooke & Walker (1994 p78) identify that the BET's are commercially orientated organisations which will be involved in establishing alternative design solutions which are submitted by contractors during the tender process. They are multi-professional companies, largely engineer-orientated, but include architects, structural, mechanical and electrical engineers, surveyors and other design specialists. Their role is essentially to provide the architects with the technical assistance which is needed to design a structure in detail.

The *Métreur-Verificateur and the Economistes de la Construction*

The traditional role of the *Métreur*, is to measure drawings and constructional work. The *vérificateur* have carried out the role of checking the work done by the contractor's *métreur*, on behalf of the client. The decree of 28 February 1973, on public sector procurement, placed greater emphasis on the whole area of cost estimating, which was established to be the responsibility of the client. This coupled catalysed the development of the *economiste de al construction*, the specialist who offers the most comprehensive range of cost management services known in France.

The *Bureaux de Pilotage et d'Ordonnancement* or *The Pilote*

The role of the *Pilote* was established in the 1960's as a separate engineering body to co-ordinate the work of the numerous contractors on site *and* is generally used with the *lots séparés* procurement system. The role of the *Pilote* has become increasingly important in order to:

> "Smooth out the relationship between the contractors and their intervention can also be beneficial to the client, from the financial point of view, by reducing the contract period to a minimum".
>
> (FBCIG 1993 p9).

The *Maître-D'oeuvre*

This term means 'Master of the Works' and is used for the body which is the client's main representative and is the leader of the building team traditionally an engineer or architect, but can be any construction consultant (Meikle & Hillebrandt 1989 p29). Although the role of the *maître d'oeuvre* has many variations it essentially includes the responsibility to carry out the concept, design and execution of the works for the client (FBCIG 1993 p10).

Bureaux de Contrôle (BEC)

The *Bureaux de Contrôle* (BEC) which acts on behalf of an insurance company to ensure that the design and technical standard of the work are suitable for insurance cover. The BEC is generally paid by the contractor so that insurance cover will be granted on the works the contractor is carrying out. The functions of these organisations which include to check the concept and detailed designs, specifications and working drawings, choice of materials and products, as well as the construction on site, advising the contractor on design solutions and attending site meetings in order to minimise the risk of failure of the building under construction.

Constructors

The French building industry comprises of a large number of small firms and self employed tradesmen and large firms (Eurequip 1992 p3). It is indicated that 94% of construction firms in the French industry have 10 or less employees; with such firms employing overall 31% of the construction workforce (BMP 1990).

Employment figures in 1990 have identified that the construction industry is a major employment sector and employed approximately 1,589,000 people (Europa 1993 p1073). The survey conducted by *Le Moniteur* Magazine (1993) demonstrated that in the last quarter of 1992, the French Construction Industry employed 1.25 million people with a further 329,000 being unemployed but looking for work in the industry. This represents approximately 6% of the total French working population.

The number of construction companies which operated in France during 1993 is indicated in table 4.3.3. The table illustrates that there are a large number (285, 800) of 'small' companies (less that 50 employees). This suggests that 99.44% of the construction companies which operated in the building industry have less than 50 employees. These 'small' companies carried out approximately 72 % (354 billion Francs) of the total value of building work executed in 1993. There were approximately 205 companies with 200 and above employees (classified as 'large' companies) which represents 0.07 % of the total number of building companies. These 'large' companies carried out an estimated 16.5 % (81 billion francs) of the

total value of building work in 1993 *(Ministere de l'Equipement et du Logement,* 1994).

Classification of company/ Number of employees	Number of companies	Size of Companies as a percentage	value of Building work Executed (Billion francs)	**Value of Building work as a percentage**	Average Value of work per company as a percentage
Trade/Craft contractors with 1 to 10 employees	270 000	93.944%	221	44.919	0.0002
Contractors with 11 to 50 employees	15 800	5.498%	133	27.003	0.0017
Contractors employing 51 to 200 employees	1 400	0.487%	57	11.585	0.0083
Contractors employing 200 and over employees	200	0.069%	33	6.707	0.0335
Largest Contractors	5	0.002%	48	9.756	1.9512
Total	287405	100	492	100	

Table 4.3.3: **Number of Construction Companies by Value of Construction Work**
Source; *Ministere de l'Equipement et du Logement* (1994)

The RIBA (1991 p114) emphasise that the size of contractors in the French market can be correlated to the dominant building procurement system used. As construction contracts are traditionally let directly to trade based contractors the development of general contracting organisations has been limited. The trade based contractors themselves may be classified as *Gros Oeuvre* (structural trades) and *second oeuvre* (or finishing trades).

Companies which undertake *gros oeuvre* projects are usually generally contractors with 100 or more employees, building medium-sized projects for both the public and private sector and predominantly carrying out the structural work on large projects. These contractors may also perform the role of the "main contractors" taking the responsibility for the works contractors (FBCIG 1993 p8). The contractors who carry out *second oeuvre* work are generally specialist contractors, usually regionally based firms. The *enterprise générales* who are large firms capable of carrying out a wide range of work.

The large geographical size of France, coupled with its regionalised demand of

construction involving various trades, has helped to maintain this tradition of prominence of relatively small, locally based trade contracting organisations.
Trade based contractors are often required to be associated with the national contractors qualification system, operated by the 'Professional Organisation for the Qualification and Certification of Building' (*OPQCB*) (Gleeds 1994 p10).

Meikle and Hillebrandt (1989 p33) have discussed the degree of contractor involvement in the design process indicated that although the engineers or BET will often produce detailed, designs, working and shop drawings are often produced by contractors. Pearson (1994 p13) identifies that this is done to:

> ".... exploit the design expertise of the *enterprises* who traditionally assume responsibility for working drawings and detailed specifications which form the basis for construction, ie, design continues to evolve and is finalised during the process of construction (tendering)".

The fragmentation of design and construction associated with each contractor producing their own working drawings imposes the need for the presence of a technical coordinator to ensure that all the packages designed fit together.

The Dominant Procurement Systems in France

Einbinder (1994 p179) identifies the 'highly centralised nature of the French industry' as a factor which contributes to the prevalence of lump sum contracts.
In the French construction industry the design responsibility for a project is usually shared between the architect, *BET* and contractor. Consequently, the contractor often takes on some responsibility for the detailed design produced from the architect's basic performance specifications and layout drawings. Detailed drawings vary between contractors and form a major element in making tender comparisons (RICS 1975 p117).

1. *Lots Séparés*

The *lots séparés* system is considered to be the traditional French method of procurement and is the most widely used (Meikle & Hillebrandt 1989 p50 Knowles, 1989 p10, Gilmore 1994, p40 Borrie 1995 p4). This system operates by a project being divided into separate work or trade packages (*lots)* which are let to individual trade contractors and are each supervised by the client's representatives, the *Maître d'oeuvre* (BMP 1989 p35). On site supervision and co-ordination of the works will be conducted by the *pilote* who is often one of the contracting firms working on site (Meikle & Hillebrandt 1989 p50). Under the *Lots Séparés*, although the client is not given a final lump sum price at the onset of the project, each trade package is let competitively on a lump sum basis.

The origins of this system are acknowledged to be based in the dispersed demographic structure of rural France, and the local demand for which has not been filled by single contracting firms. The *lots séparés* system facilitates the benefits of each of the trade contractors having a direct contract with the employer. Bennett (1991 p183) and Borrie (1995 p5) suggest that each contractor has no legal ties with any other contractor on site.

The client will appoint an architect for the preparation of the schematic concept design for a project. Once such preliminary design are finalised detailed design work is often completed by the BET who then divide the project into separate trade packages. Each package designs and tender documents are sent out to trade contractors for competitive tendering, usually on a lump sum basis prior to the work being commenced on site. The trade contractor is often involved in an element of designing their packages by producing working drawings.

Bennett (1991 p183) illustrates that in French Law, the public sector are not permitted to just accept the lowest financial bid but they must "accept the tender which is most advantageous". Each selected trade contractor enters

into a formal arrangement (contract) with the client and consequently each contractor becomes responsible for their work with respect to cost and quality.

The number of *lots* used on a project will depend upon the size and type of construction project being undertaken. The client will usually appoint a *maitre d'oeuvre* (an architect) to co-ordinate the works of the trade contractors on small projects. As projects become larger and more complex, the number of trade contractors required invariably increases, and the whole process of project co-ordination becomes more intensive and critical. Often in such instances a specialist *pilote* firm will be engaged for this purpose, on a fixed fee basis (Wilmot & Shaw 1979 p98). Pearson (1994 p19) identifies that the *pilote* may be either: the *enterprise* who undertakes the *gros oeuvre*, a specialist *pilote,* or the project architect, BET, and more recently, the *economiste*.

The lots approach requires a great amount of detailed design work to be completed by the designers before trade packages can be tendered. The major benefit of this approach is that it has the potential for parallel working and therefore it is a fast track procurement system although such a provision may not be used. Additionally as each package is let separately during the tender process at least 3 contractors are asked to tender for each trade. This allows the client to benefit from contracts pricing, receiving the most economical cost for each package of work. This procurement system is design led and is used for project in which design and the quality of workmanship are the overriding criteria followed by time and cost (Columbard Prout 1994 p1-2).

The advantages include:

i. Limiting those tendering for a particular package ensures that it goes to a known and experienced contractor.

ii. The system allows the employer potential cost savings by dealing directly with the trade contractors.

iii. *Lots Séparés* also allows the potential for time saving due to the ability to stagger the preparation and letting of the works packages.

iv. Each contractor has a direct contract with the employer.

The disadvantage include:

i. As there are no contractual links between the separate trade contractors on the site, if one contractor defaults on the project therefore causing a delay, this has a knock-on effect on the other contractors with the client assuming responsibility.

ii. As the employer has separate contracts with each trade contractor, the employer (*maître d'oeuvre*) must produce contract documentation, drawings and specifications for each trade.

iii. The client does not have total price certainty for the whole of the project, until the last trade package has been competitively let.

vi. If one of the trade contractors causes a delay in a project, it is standard procedure that he should bear the full costs of liquidated damages for late completion (Drewer 1990).

2. *Enterprise Générale*

This system is characterised by the appointment of a single general contractor who is responsible to the client for the completion of the whole project (Meikle & Hillebrandt 1989 p50). Although the general contractor is responsible for completing the works the majority of the construction work is subcontracted. The architect and the BET will be required to complete all design work, drawings and tender documentation, before the project may be let out to tender. A general contractor (*Enterprise Générale*) is finally

selected on the basis of a competitive tender to carry out the works for the client (Pehuet & Allermand 1991 p63 and Kandiah 1994 p12).

Although there are a variety of contractor design options which may be incorporated into this approach, (from the contractor being appointed on full drawings and specifications to being appointed on a brief and outline design), the system still results in a long sequential process of design, tender, construct especially on complex projects. As such the contractor assumes the risk of the project being completed within a certain time frame to an agreed cost, and also assumes the risk of quality of workmanship.

The *enterprise*, (main contractor) agrees to undertake the project for a fixed price and is responsible for the overall site management and the co-ordination of various trades thus acting as the *pilote* on the project (Meikle & Hillebrandt 1989 p50). The major benefit of the latter arrangement is that the client only has to sign one contract and deals with a single organisation for the execution of the project. This system is particularly used for small to medium sized projects.

The advantages of this approach include:

i. A single point of responsibility and point of contract for price, time and quality is achieved.

ii. There is only a single contract to administer.

iii. The main contractor takes on the responsibility for the sub-contractors.

iv. This system provides a reduction in risk for the client.

The disadvantages of this system include:

i. The system requires greater pre-contractual preparation time.

ii. There is a comparatively long tender period before work starts on site.

iii. Little parallel working is possible.

iv. The contractor is considered to have an "unadvantageous" control of power.

v. French clients consider this system as being an "expensive" way of acquiring a building as they will pay a premium for the transfer of risk and administrative burdens to the general contractor (LaLaurie 1991 p37).

3. *Groupements*

This system is characterised by a set of contractors who come together as a group to execute a single project. Bennett (1991 p184) suggests that there are various types of *groupements* which may be used in France whereby:

> ".... Contractors may be jointly responsible for the whole project or simply join together to enter into a single contract within which they each retain their separate responsibilities for their own trades".

Within both of these systems, one of the contractors (*enterprises*), normally a *gros oeuvre*, will be appointed as a *mandataire commun*. The function of the contractor as the *mandataire common* will be that of the *OPC* (the site management service), and may also include assistance with the selection of the other *enterprises* which will collectively form the *groupement* (Wilmot and Shaw 1979 p98, Pearson 1994 p20 and Kandiah 1993 p8).

Within the public sector, the system of grouping the contractors together is codified by legislation.

i. *Groupement des Enterprises Solidaires*

Each of the contractors take an equal responsibility for the whole work and jointly bear the risk should one of the members default (Meikle & Hillebrandt 1989 p52 and Knowles 1989 p10). This system is only feasible if all of the contractors are of comparable size and experience to undertake the project (FBCIG 1993 p28). The essential features of this system which include:

a) all *enterprises* involved in the project have collective responsibility to the client for the execution and completion of the project. If one contractor fails to complete his section of the works, the other contractors are required to complete it.

b) if a penalty or defect occurs in the project, the whole group has to compensate the client for that penalty or rectify the defect.

c) it is particularly suited where groups of trade contractors come together to tender for individual trade packages on large projects under the *Lots separes* approach.

ii. *Groupement des Enterprises Conjointes*

Each of the *enterprises* involved in the *groupement* will enter into a *convention du groupement*, amongst themselves, clearly defining the responsibilities of each of the *enterprises* in the group. This agreement sets each contractors responsibility and liability for their respective trades in the whole project (Knowles 1989 p105, Borrie 1995 p5).

The *mandataire common* will take responsibility if one of the contractors in the group defaults. In doing so the *mandataire common* takes charge of finding a replacement *enterprise* to finish the uncompleted work package, and will bare any

additional costs incurred to complete that area of work (Kandiah 1994 p8).

Of the two *groupement* projects, it has been suggested that the latter option is the most popular system (FBCIG 1993 p28).

The advantages of the *groupement* include:

i. Reduced tender documentation as only one set of documents is sent to the *groupement*.

ii. There is a shorter overall tender period.

iii. The system can allow the saving of cost and time in post-contract administration.

iv. Combining the groups technical resources, allowing complex projects to be undertaken, and yet still permitting the individual expertise of each contractor to be capitalised on.

The disadvantages of the system include:

i. Under the *Solidaires* approach a *groupement* can find itself shouldering burdens which would otherwise be the responsibility of a single contractor.

ii. For competing contractors, the *groupement* structure can allow the risk of letting fellow contractors see their competitors working and pricing policies.

Contract Documents

In the public sector, documentation is generally produced by the *Commission Centrale des Marches* (CCM). The general rights and obligations of the parties is set out in the *Cahier des clauses administratives générales* (CCAG) with separate publications for the public and private sector. In the public sector the *Cahier des clauses administratives générales applicables aux marchés publics de travaux* is used, published by the CCM.

In the private sector the most widely used contract is published by the *Association Francaise de Normalisation* (AFNOR) and is known as the *Cahier des clauses administratives générales applicable au travaux de bâtiment faisant l'objet de marchés privés* (Pearson 1994 p28). Private sector clients are able to modify these conditions as long as they do not contradict the common law system and after reaching consent between the parties involved (RICS 1975 p120).

Liability and Insurance

Federation National des Travaux Publiques (FNTP who organises civil engineering and public works) and the *Federation Nationale de Bâtiment* (FNB which deal with the general building industry) collectively endorse a 10 year insurance liability on construction works (Haenlein, Brookes & Penz 1989 p21). This unique liability structure of the French industry has its roots in Article 1792 of the French Civil Code states:

> ".... Every constructor of a structure is legally responsible to the owner or purchaser for any damage (including damage from sub-soil conditions) which jeopardises the integrity of the structure or which by affecting one of its component elements of equipment renders the structure unfit for its intended purpose. Such responsibility does not apply if the constructor proves that the damage was caused by an outside cause".
>
> (FBCIG 1993 p29)

The 'constructor' in the above article includes every architect, contractor, technician, vendors, or other person bound to the client by a contract of work, every person who

sells after completion works that he/she has constructed or had constructed and every person who, while acting in the capacity of agent or the employer, accomplished a mission similar to that of an employer, but does not include sub-contractors (FBCIG 1993 p29).

French Civil Code deals with defects arising after the completion of construction work providing a 10 year warranty period from the date of handover of the project for all those involved in the construction process that the work will be fit for the purpose (RIBA 1991 p64 and Gilmore 1994 p40). Julliot (1993) analyses the objectives of this law and concludes that they have been introduced in order:

i) to increase protection of building, clients and subsequent building owners form defective work,

ii) to reduce delays from settlement of claims for damages by giving priority to the funding of repair work rather than the establishment of liability, and

iii) to improve the quality of construction.

The law requires the client to insure with a policy called *dammages-ouvrages* which allows any latent defect to be put right during the 10 year period, while the courts decide who is responsible. The advantages of this law for the client include;

a) as the clients are required to indemnify themselves against defective work, it has resulted in a new and beneficial relationship between the design team, the construction team and the client,
b) there is no need to allocate blame or responsibility when problems occur,
c) substantial reduction of litigation where legal requirements have been fulfilled by the parties, and
d) settlements are negotiated with the contractors.

Meikle & Hillebrandt (1989), the ACE et al (1990) and the RIBA (1991 p65) have concluded that the implications of this liability and insurance system in France has resulted in increasing construction costs by between 3 and 8%.

The Procurement Systems Models

From the literature review relating to the dominant procurement systems which exist in France the Procurement Systems Models (PSM's) have been established. The PSM's have been validated by the questionnaire survey and further verified by interviews with respondents from the construction industry in France. The results of the questionnaire and interviews are shown in Appendix A Tables A3 (i), (ii), (iii), (iv) and (v).

Results from the Questionnaire Regarding Dominant Building Procurement Systems in France

As discussed in Chapter 2 each of the questionnaires sent to respondents were system specific. From the literature review it has been established that there are 4 dominant building procurement systems in France. Each of the questionnaires was designed to be answered in relation to the following identified procurement systems - *Lots Séparés, Enterprise Général, Groupement des Enterprises solidaires and Groupement des Enterprise Conjoints.* In addition to one of each of the system specific questionnaire a non-specific questionnaire was also sent to each respondent, to identify the existence of a non represented dominant procurement system in operation in France.

Of the eighty sets of questionnaires originally distributed by mail, twenty three were sent back of which seventeen sets were completed. It should be noted that attempts were made to increase the response rates by follow up letters, faxes, telephone calls and finally a redistribution of the questionnaires. The response rate was 28.75%. The completed questionnaires came from a range of respondents including 2 initiator/ processes, 8 designers, 5 constructors and 2 academics. Although attempts were made to collect responses from funders, no questionnaires were sent back for analysis

in this study. Due to the qualitative nature of the questionnaire and the degree of consistency from respondent it was considered that the lack of response from some respondents does not substantially affect the results. The results have been analysed and used to validate the accuracy of the procurement systems models produced from the literature review of each dominant procurement systems in France.

The results from each questionnaire are shown in Appendix A table A3 (i), (ii), (iii) and (iv). Each table indicates the total numbering respondents, the number of respondents which returned a completed copy of the questionnaire for each identified dominant procurement system. The tables also indicate how each question answered by respondents corresponds with the various elements of the procurement systems model.

The tables summarise the number of respondents, their category and the answer provided by the respondent to each of the questions. The coding system has been used to code the responses to each question in all of the questionnaires used in this investigation. The summary tables each show the coded response provided by respondents to each question. Where either the question was not answered by the respondent or where the question was not applicable an asterisk (*) was inserted into the table.

A summary of the predominant response to each question given by the respondents is also indicated in the questionnaire summary tables. The predominant response to each question has been established by identifying the most widely expressed response. Where there are several responses which are equally represented in the summary for a particular question then they have been discussed during the interviews and the verification process of the models. Each respondent interviewed was asked to identify which of the responses summarised by the questionnaire survey is the predominant answer.

The results of the questionnaire survey have been used to validate the PSM produced from literature and to make any readjustments to the models. Each model was subsequently verified through a series of interviews. The results of the interviews are shown in Appendix A (Table A3(v)).

The results of the questionnaire survey have been used to validate the PSM and make any readjustments which needed to be made to the models. The models were further validated during the interviews (summarised in Appendix A). During the verification process of the PSM's, interviewees were asked to comment on which of the predominant responses summarised by the questionnaire survey was the most likely answer. The models were then confirmed of the dominant procurement systems in France.

The verified PSM for each of the dominant building procurement systems are identified below along with the organisational chart for each system which indicates the formal relationships between the various participants and the primary advantages and disadvantages of each system.

Figure 4.3.1: Model F1

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist					✓		alt
Construct;	Management						✓	
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓	✓	✓		✓	✓
Funder		✓						
Designer	Schematic	✓			alt			
	Detailed	✓		alt		✓		
	Specialist				✓			
Constructor	Manager	✓						
	Producer	✓						

Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

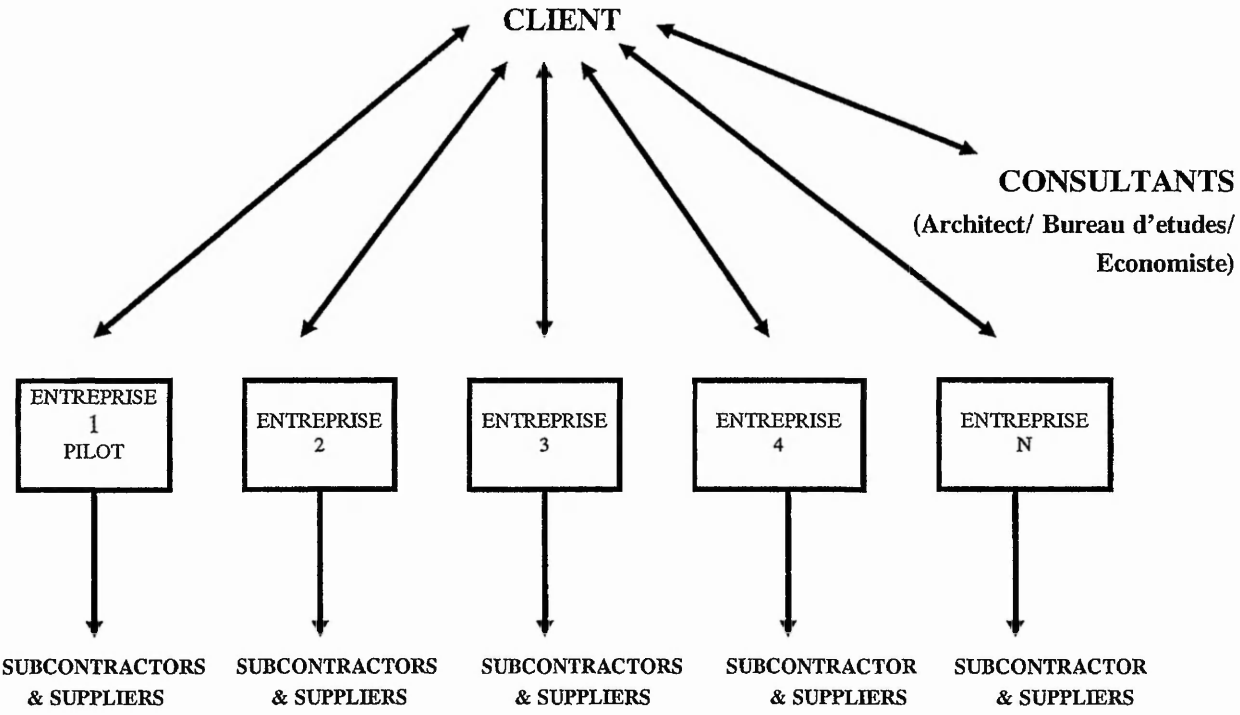
ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time		*						*
Price Determination		*						
Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		
Project Finance			*					
Effectiveness of Project in operation				*	*			
Quality of work								*

Country: France **Model Type**: F1 (Lots Separes)

alt = alternative arrangement

Figure 4.3.2: ORGANISATIONAL CHART FOR THE FRENCH LOTS SÉPARÉS PROCUREMENT SYSTEM

CONTRACTUAL ARRANGEMENT



ADVANTAGES

most experienced contractor appointed for each package
client benefits from trade contractors pricing parallel working inherent
clarity of roles, risks and relationships for all participants

DISADVANTAGES

client assumes risk if a trade contractor defaults
on large projects there are many contracts to administer
total price certainty only reached when all packages are let

Figure 4.3.3: Model F2

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist					✓		alt
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓	✓	✓			✓
Funder		✓						
Designer	Schematic	✓			alt			
	Detailed	✓		alt		✓		
	Specialist				✓			
Constructor	Manager							
	Producer	✓						

Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

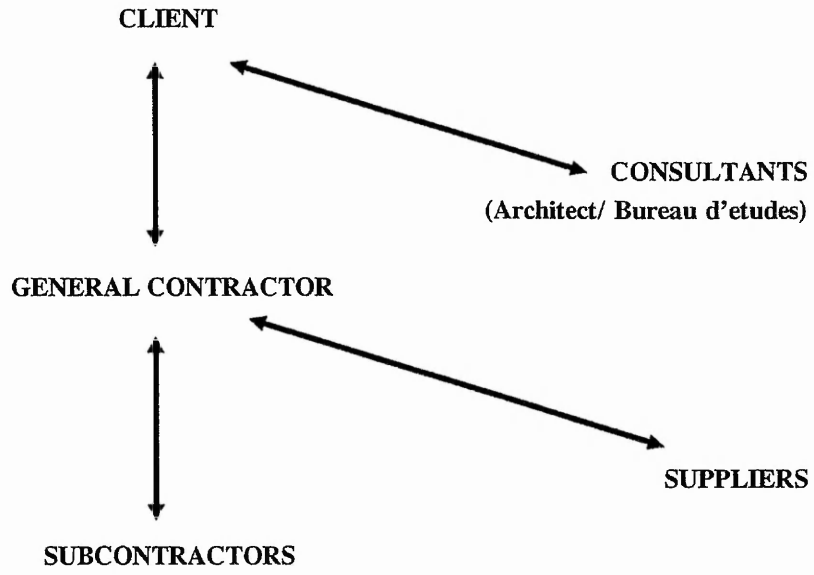
ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		
Project Finance			*					
Effectiveness of Project in operation				*	*			
Quality of work								*

Country: France **Model Type:** F2 (Entreprise Generale)

alt = alternative arrangement

Figure 4.3.4: ORGANISATIONAL CHART FOR THE FRENCH ENTREPRISE GÉNÉRAL PROCUREMENT SYSTEM

CONTRACTUAL RELATIONSHIP



ADVANTAGES	DISADVANTAGES
single point of responsibility for construction	design often required to be completed before start
reduced tender documentation	of construction on site
cost /time certainty before construction	slow to start on site
general contractor responsible for	little parallel working on site
administration / coordination of subcontractors	contractor considered to have unadvantageous control of
contractor design options available	power
majority of risk is placed with the contractor	considered to be an expensive way building
	client has no choice of subcontractors used

Figure 4.3.5: Model F3

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist					✓		alt
Construct;	Management						✓	
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓	✓	✓		✓	✓
Funder		✓						
Designer	Schematic	✓			alt			
	Detailed	✓		alt		✓		
	Specialist				✓			
Constructor	Manager	✓						
	Producer	✓						✓

Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

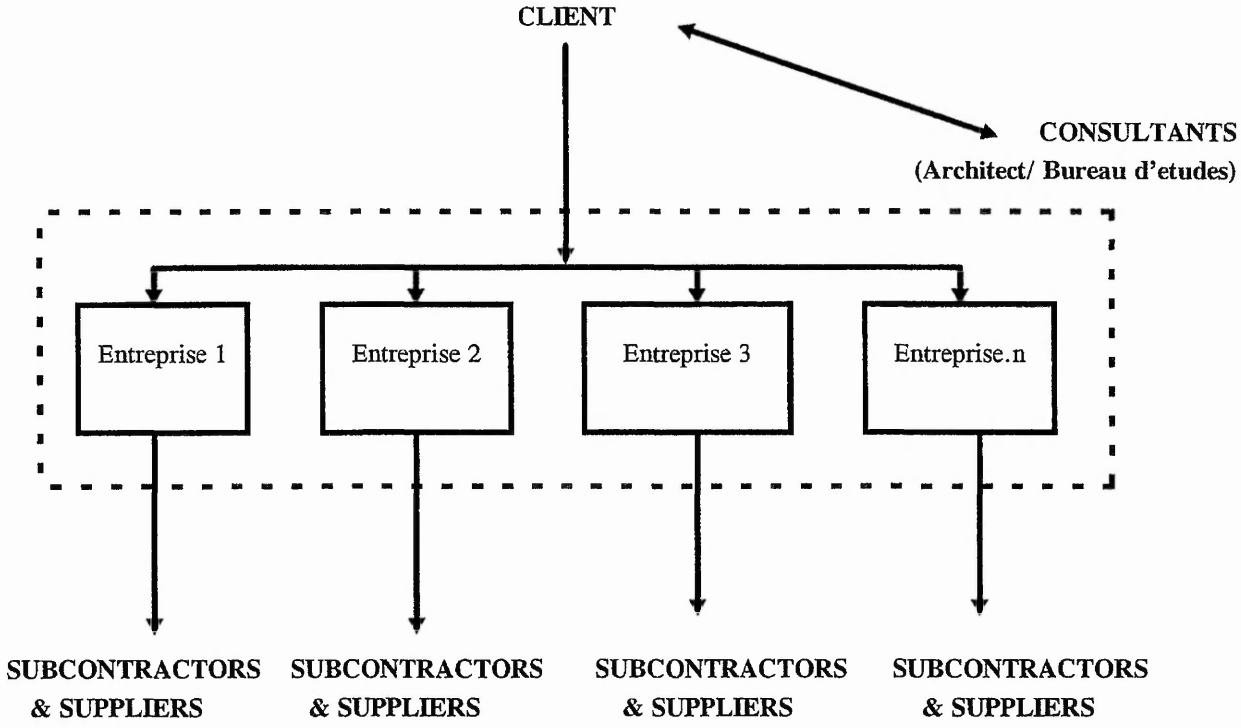
ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		
Project Finance			*					
Effectiveness of Project in operation				*				*
Quality of work								*

Country: France **Model Type**: F3 (Groupement des entreprises Solidaire)

alt = alternative arrangement

Figure 4.3.8: ORGANISATIONAL CHART FOR THE FRENCH GROUPEMENT ENTREPRISE CONJOINTES PROCUREMENT SYSTEM

CONTRACTUAL ARRANGEMENT



ADVANTAGES

used for the construction of large project that no single contractor can undertake
shorter overall tender period
most suitable contractors selected
cost / time savings in contract administration
single point or responsibility for the client
allows the pooling of resources between companies
facilitates the process of technology transfer

DISADVANTAGES

no contractor accepts liability for the completion of the project
client assumes high risk
similar to under lots separés

indicates joint venture group

Figure 4.3.7: Model F4

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist					✓		alt
Construct;	Management						✓	
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓	✓	✓		✓	✓
Funder		✓						
Designer	Schematic	✓			alt			
	Detailed	✓		alt		✓		
	Specialist				✓			
Constructor	Manager	✓						
	Producer	✓						

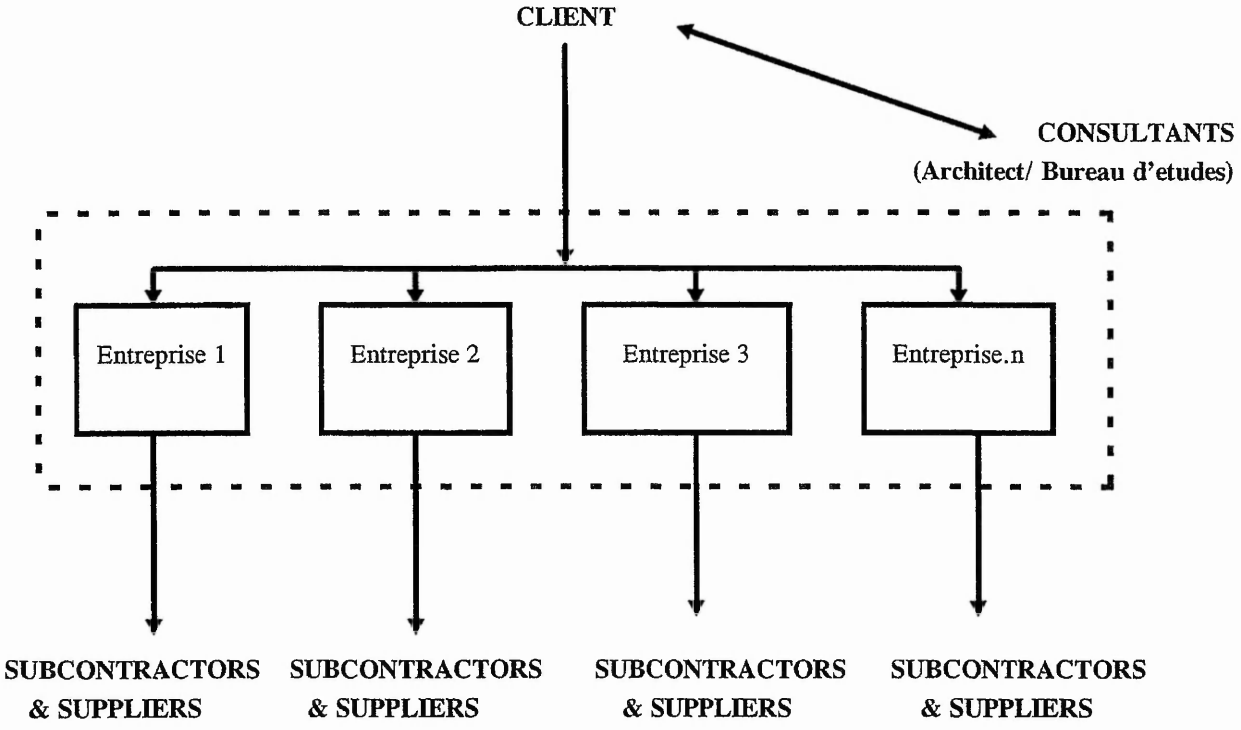
Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time		*						*
Price Determination		*						
Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		
Project Finance			*					
Effectiveness of Project in operation				*	*			
Quality of work								*

Country: France **Model Type:** F4 (Groupement des entreprises Conjoint)
alt = alternative arrangement

Figure 4.3.8: ORGANISATIONAL CHART FOR THE FRENCH GROUPEMENT ENTREPRISE CONJOINTES PROCUREMENT SYSTEM

CONTRACTUAL ARRANGEMENT

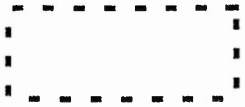


ADVANTAGES

used for the construction of large project that no single contractor can undertake
shorter overall tender period
most suitable contractors selected
cost / time savings in contract administration
single point or responsibility for the client
allows the pooling of resources between companies
facilitates the process of technology transfer

DISADVANTAGES

no contractor accepts liability for the completion of the project
client assumes high risk
similar to under lots separés



indicates joint venture group

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SECTION 4.4
UK PROCUREMENT PARADIGMS

Dominant Procurement Systems in the UK

Introduction

The UK has an approximate area of 242,429 km sq and has a population of 56,466,700 million residents.

The Organisation Structure of the UK Construction Industry

The fragmented nature of the UK construction industry has been discussed by the Simons Report (1944) commenting upon the separation of design and construction, the uniqueness of the construction project and the transient nature of the project organisation which collectively contribute to the fragmented characteristics of the UK construction industry (Sidwell 1982 quoted in Masterman 1992 p1). The Emmerson report (1962 p27) which remarked:

> ".... in no other important industry is the responsibility for design so far removed from the responsibility for construction".

Rowlinson (1988 p43) provides an explanation for this fragmentation as being due to a complex interaction of historical precedents, professional distinctions, the prototypical nature of construction projects and constructions other diverse features. Huru (1992 p22) discusses the two unique features of the traditional UK construction process as:

> "1. Design work and accountability for it are totally separated from construction and the related responsibility.
> 2. The responsibility of the architect-led design teams is further divided between the specialist professional whose qualifications and tasks are controlled and protected by professional institutions."

Initiation/Promotion

The role of the initiator has been identified by Turner (1990) and Moxley (1993 p40) as establishing the need for a building, selecting a method to obtain the building, negotiating the finance, choosing the design team, deciding on a brief and encouraging the enterprise of construction. Latham (1994p3) also confirms that clients are at the core of the process and their needs must be met by the industry. Latham (1994 p4-5) suggests that the public sector should commit itself as being a "best practice" initiator for the industry, and assist with private sector development by establishing the Construction Clients Forum (for private sector clients).

Funding

The public sector is the biggest single initiator in the UK building industry. The Government Statistics Service (1993), indicate that total public sector expenditure on construction between 1992-1993 was £18,070. million. This figure includes Central Government expenditure of £7,880. million, local authority expenditure of £7,287. million and public corporation expenditure of £2,903. million.

The RICS identify the various sources of finance available as predominantly banks and the stock market for short term finance which carries high interest rates and associated risks, and building societies, insurance companies, pension funds, property unit trusts and charities for long term finance. Darlow (1988) confirms the main sources of finance in the private sector is from banks, building societies, insurance companies, pension funds, property unit trusts, private finance, trusts and charities and other institutions.

Design

The Architect

Architects have established themselves at this time as separate consultants specialising in the design function. Turner (1990 p28) suggests that the traditional structure of the UK construction industry is where:

> "... The architect is responsible for helping prepare a brief, then continuing for design and management of the project through the design stages by co-ordinating the work of other design consultancies, through the construction period until project completion and the handover of the completed building to the client".

Stone (1983 p175) identifies the architect as the usual leader of the design team who receives the commission to design and supervise the erection of a building. The architect remains the principle designer in the construction process. Gray, Hughes and Bennett (1994 p10) discuss the changing nature of design as a result of the increased complexity of project, the high level of specialist design which is now available, and the increased importance of management in the construction process, and conclude that this has resulted in the design process becoming less detached from construction.

The RIBA's "Plan of Work for Design Team Operations" (1970) and RIBA (1980) details the traditional activities of the architect in the construction process primarily being concerned with design and breaks down the principal operations during the design process, indicating the role to be performed by the various members of the design team at each of the respective stages in the design process. The four key procedures being briefing, sketch plans, working drawings and site operations.

The Quantity Surveyor

A unique characteristic of the UK construction industry is the presence of the quantity surveyor, who Stone (1983 p179) refers to as the "building accountant" whose function involves the measurement of quantities of material and labour from plans and specifications produced by the designers, providing estimates for the likely costs of the building, and to measure any difference between the priced bill and the final costs of the project. The QS are involved with the financial management of projects, cost consultancy services and the many services which relate to price and cost forecasting, analysis, planning and accounting, manpower planning, resource control, project management and control,feasibility studies, cost planning, tender documentation and a range of post contract services as well as production services.

The Engineer

The structural engineers assist the architect with the structural design of the building and are far less involved with the overall co-ordination of the building project. Stone (1983 p178) discusses the variety of engineers involved in the building industry, highlighting that specialist design work (such as electrical and heating and ventilation) is often carried out by specialist engineers.

Constructor

Stone (1983 p146) and Ball (1988 p54) identify that there are broadly three types of constructors within the UK; general contractors, trade contractors and specialist contractors. General contractors are characterised by being involved in the major trades within the construction production process, (such as brickwork, concrete, excavation) and as such they often act as the main contractor being involved with the overall management and coordination of other constructors on site. Trade contractors are suggested to be concerned with the work of one or several specific trades and are often used as subcontractors by main contractors, or directly appointed by the client to execute a particular area of work. Specialist contractors are those which concentrate on a particular type of work rather than on one trade of craft. These firms will often be manufacturers of specialist components as well as the constructor which install such items (for example heating contractors). Specialist contractors may also perform the role of subcontractors or alternatively, directly appointed by the client.

Surveys conducted by Building (1994 p21-26, 1995 p22-24) identify the largest 300 contractors in Europe and the largest 50 contractors in the UK respectively, by turnover, profits and employees. The latest survey identified that the UK's largest contractor Trafalgar House employed 33,153 staff in 1994/95 (Building 1995 p24). Upto 90% of construction work was implemented by specialist and trade contractors (Huru 1992 p40).

The UK construction industry can be broadly classified as comprising of a large number of small firms and a small number of large companies. In an analysis of the

economic nature of the UK Construction Industry Latham (1994 p7) describes it as comprising of 200,000 contracting firms in 1992 of which 95,000 were private individuals or one person firms. He also identifies that only 12,000 firms employed more than seven people. In 1993 the value of industry output was £46.3 million, which represented approximately 8% of Gross Domestic Product, with firms employing 80 people or more carrying out 40% of the workload by value in 1992.

The Dominant Procurement Systems

The range of available procurement systems has expanded in recent years in an endeavour to develop the most suitable or "best practice" procurement system. This development has been accelerated by the increased complexity of building designs, increased demands of building owners, the magnitude of projects and escalating costs. The "contracts in use survey" identified in Table 4.4.1 shows the various procurement systems which are used within the UK by value. From the information in Table 4.4.1 the dominant procurement systems (by number) in the UK have been identified to include the traditional lump sum system, Design and Build, Management Contracting and Construction Management. The dominant procurement systems that exist in the UK are now discussed.

Table 4.4.1 - Contract in Use Survey

Procurement Method	Percentages of Contracts by Value					
	1984 %	1985 %	1987 %	1989 %	1991 %	*1993 %
Lump Sum - Firm BQ (1)	58.73	59.26	52.07	52.29	48.26	41.63
Lump Sum - Appropriate BQ(2)	6.62	5.44	3.43	3.58	1.26	2.43
Lump Sum - Spec & Drawings	13.13	10.20	17.76	10.26	8.35	9.98
Prime Cost plus Fixed Fee	4.45	2.65	5.17	1.12	0.12	0.15
Design & Build	5.06	8.05	12.16	10.87	14.78	35.70
Management Contract	12.01	14.40	9.41	14.99	7.87	6.17
Construction Management	-	-	-	6.89	19.36	3.94
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: "Contracts in Use", a survey by Davis Langdon & Everest on behalf of the Quantity Surveyors Division of the Royal Institution of Chartered Surveyors, published in November 1992.
* RICS (1994) Contracts in Use: A Survey of Building Contracts in Use During 1993, p6.

1. Traditional Lump Sum System

The traditional Lump Sum procurement system has been in operation in the UK for over 150 years (Masterman 1989 p30). These contracts are let predominantly on the basis of tender documents which include a Bill of Quantities (B of Q) prepared by the QS, from largely completed designs produced by the design team. The unpriced B of Q which describes and measures all materials and item of work required in the construction of the project is sent out to constructors to be priced during the tender process. Once the B of Q's have been priced each is analysed and recommendations are made to the client as to the most suitable contractor for the project. The successful contractor enters into a contract with the client to complete the project in accordance with the architect's designs, and to an agreed price and construction period.

The architect is involved in coordinating all of the design input from the various design specialists, and producing a single set of documents which comprehensively describe the building. The QS's role is a function of what the designers produce and is involved in pricing of design, the cost planning and monitoring services. The role of the contractor is in production of the building and is consequently responsible for the fabrication of the building and not the design (which remains the liability of the designers). The isolation of the designers from the constructors during this sequential method of procurement is a consequence of the initiators desire to ensure that the responsibility of design is vested in one group (the designers) whilst the responsibility for construction is vested in another (the constructors) (Masterman 1989 p42).

The general contractor combined the main trades into a single organisation assuming responsibility for undertaking the majority of the works, whilst subletting specialist areas. The general contractors still assumes responsibility for the project and provides the management to organise the construction work.

The advantage of the lump sum traditional system include:

i. Provides a climate for fair competition between contractors.

ii. The tender figure represents the market price for the work.

iii. The system is considered to be satisfactory in terms of public accountability.

iv. The procedure has been in operation for the last 150 years and has evolved, thus becoming a well-known and used system.

v. The client is usually able to assess his financial commitment before commencement on site.

vi. One contractor is solely responsible for the completion of the works.

The architect and design team are responsible for the design, whilst the contractor is responsible for constructing the project in accordance with the architect's designs.

The disadvantages of the system included:

i. A long initial period is required before work starts on site and no parallel working is possible.

ii. Separation of the design and construction periods means that the benefits of "Buildability" are not attained.

iii. Little involvement by the contractor at the design stage.

iv. Theoretically designs should be completed before tender documentation is produced, but in reality this is often not the case and leads to excess design variations and claims for extra costs and extensions of

time.

The DOE (1982) and Flanagan (1981 p28) concluded that the lump sum approach offers clients a high degree of cost certainty placing the financial risk largely with the contractor. Turner (1990 p67) confirms that the risk of time certainty is shared between the client and the contractor, whilst the risk of quality of workmanship is retained by the contractor. Senior (1990 p3) identifies that the risk associated with failure of the design of the project is maintained by the designer who is responsible for that part of the works (often the architect, engineer or specialist). The design consultants bear the risk of designing the structure in accordance with the clients requirements (re Sales of Goods and Services Act 1979).

Standard forms of building contract are available to be used in conjunction with this procurement system with the most widely known contract being JCT 80, produced by the Joint Contracts Tribunal for the Standard Form of Building Contract, which has evolved from the RIBA contract prior to 1963 (Turner 1990 p99).

2. Design and Build

In the Design and Build system of procurement the initiator enters into an agreement with one single administrative entity, the constructor, who is responsible for the project (Nahapiet & Nahapiet 1985). The constructor therefore becomes the coordinator and manager of the project team. The responsibility for both design and construction lies within one organisation (the constructor). The system also allows the extensive overlapping of design and construction phases, shortening the overall development period and allows the benefits of buildability to be achieved.

The main advantages of the design and build system include:-

i. There is a single point of contact between the client and contractor.

ii. An early and relatively accurate final costs can be achieved if the client's requirements are specifically specified.

iii. Buildability is inherent in the system.

iv. This system enables both the design and construction stages to overlap.

The major disadvantages include:

i. High levels of functionality or quality are not attained by this system, resulting in the system being suitable for simple projects.

ii. There is a requirement for early commitment by the client when designs may be incomplete.

iii. The design and build firm is an entity and cannot compensate for the shortcomings in other parts of the organisation.

iv. Design and build bids are difficult to compare and analyse.

v. Marshall and Morledge (1988) have also illustrated that the standard contract used for this system limits the responsibility for design liability to care and skill and not fitness for purpose which would be the case in other contractors for the purchase of a product.

Akintoye (1994 p155) identifies the options available under the design and build route as being:

a) Traditional Design and Build; where contractor accepts responsibility for both design and construction.

b) Package Deal; including turnkey contracts where the contractor provides a standard building to suite the clients functional

requirements.

c) Design and Manage; where the contractor receives a fee for managing the planning, design and construction process which is executed by subcontractors.

d) Design Manage and Construct; as above but the contractor also carries out the construction work.

e) Novated Design and Build; where independent designers are appointed to commence the design work and are novated to the contractor to complete the design work.

f) Develop and Construct; relatively advanced independent designs are completed by the constructor who is appointed to build the project.

Akintoye's (1994 p162) study concluded that Novated design and build is the most requested system by initiators and the most disliked arrangement by constructors.

The major risk which is maintained by the initiator is the risk of quality performance of the product. Akintoye (1994 p156) proposes that with independent advice and the establishment of a comprehensive brief "quality" buildings may be produced using this procurement system. Bennett and Grice (1990 p252) commented upon the certainty of price and time given to the initiator, have a close affinity to the relative degree of flexibility a procurement system offers to the initiator. With the case of Design and Build, the initiator is given security of costs and time at an early stage, and that changes are likely to be expensive. This procurement option fundamentally exposes the initiator to relatively few risks, with the contractor assuming the majority of associated risks.

The Joint Contract Tribunal have developed unique documentation to be used with design and build contracts including:

1. Joint Contracts Tribunal, Standard Form of Building Contract with Contractor's Design 1981 Edition, used for general Design and Build work.

2. Joint Contracts Tribunal Standard Form of Building Contract with Quantities 1980 Edition, Contractor's Design Portion supplement 1981; used if selected elements of the project require to be designed by the contractor.

3. Management Contracting

Management contracting is thought to have been introduced into the UK from the USA in 1968 with the 'Horizon' factory for John Player and Sons in Nottingham (Morledge 1987). Naoum & Langford (1987 p) define this system as the:

> ".... process whereby a contractor is employed to undertake the coordination of specialist sub-contractors to complete a project. The management contractor relies upon a percentage fee, or lump sum to be remunerated for the service offered. The management contractor becomes associated with the client's team of professional advisors and in common with other professionals has liability for the provision of a professional service".

CIRIA (1983b, 1984) and Masterman (1992 p78) illustrate the main characteristics of this procurement approach as:-

a) A management contractor is appointed on a professional basis as an equal member of the design team to provide construction expertise.

b) Payment or reimbursement to the management contractor for the management service and the prime construction costs is on the basis of a lump sum or a percentage fee.

c) No construction work is carried out by the management contractor, it is done by works or package contractors who are contracted to, coordinated and administered by the management contractor.

Once an appropriate designs have been developed, a management contractor will be appointed to manage and coordinate the procurement process. The contractor is appointed at an early stage of the project to encourage close working with the design team, giving advice and involved in setting up the site. The management contractor will enter into a contract with the client and the various works contractors and is paid a fee for his/her duties.

Under this arrangement the initiator must exercise ultimate authority over the project team and finance, with the initiator assuming a key role in decision making. Although the management contractor (MC) has communication links with the design team the contractual links exist between the MC and the works contractors who execute the construction work. As such the MC bears the responsibility of the work without carrying it out (CUP No 36 1992 p10).

As the work is divided into work packages, they are let to suitable contractors. Each of the successful subcontractors enter into a direct contract with the Management Contractor. White (1992 p175) identifies the function of the MC as the coordinator of the various contractors and providing an interface in the resolution of problems which may occur between them.

The advantages of the system include:-

i. Early completion is possible due to the parallel working and overlapping of activities.

ii. Changes can easily be accommodated.

iii. The management contractor assumes risk for the performance of the trade contractors.

iv. Direct control by the design team may be maintained.

v. The system works well on complicated building designs.

The disadvantages include:-

i. Price certainly may not be achieved until all of the work packages have been let.

ii. Compared with the traditional system of procurement, the project costs incurred are higher using this system.

iii. The client has no contractual link with the trade contractors making it difficult to recover any performance cost from them.

iv. As the management contractor is responsible for organising and paying the separate trade contractors and can allow poor management contractors to influence the trade contractors resulting in the detriment of the project.

The initiator assumes the majority of the risks, which is a major disadvantage of this approach. The risk of timing is predominantly held by the constructor along with the risk of quality, whilst the risk of cost certainty is predominantly placed with the initiator. The system provides a high degree of quality and enabling a completion date to be established with certainty. Hughes (1991 p5) finds that the risk associated with management contracting (with regards to JCT 87) substantially corresponding to the risks experienced under construction management. The design team retain the responsibility for the design of the project however the situation is made complex with the increased involvement of specialist contractors in the design process. In terms of the quality of workmanship, the management contractors and works contractors share the risks.

The standard contracts which may be used with this procurement system

include:-

1. Joint Contracts Tribunal, Standard Form of Management Contract 1987 Edition

2. Joint Contracts Tribunal, Standard Works Contract 1987 between a Management Contractor and his various Works Contractors.

4. Construction Management

BEDC (1985) define construction management as where a management service is provided by a professional construction manager for a fee (in the same way as design consultants are) and all the construction contracts are between the client and trade contractors directly. Masterman (1992 p96) identifies the main characteristics of this system as:

> "1. The Construction Manager (CM) is appointed as a consultant during the initial stages of the project and has equal status to the members of the design team.
> 2. Reimbursement is made by means of a lump sum or percentage fee for the management service.
> 3. The physical construction of the project is carried out by works or package contracts who are employed by the client and coordinated, supervised and administered by the CM."

Bennett (1991 p201) identifies that under this system the client must be able to sustain "overall leadership for the project". The construction manager supervises the construction process, trade contractors and co-ordinates the design team providing advice when required. The function of the CM is as a consultant for management advice and expertise, in the same way an architect is a consultant for design. The CMF (1991 p3) maintain that under this approach:

> ".... the designer designs, the construction manager

> manages, the works contractors produce the elements, and the client directs the project for which he alone is ultimately responsible".

In order for the system to operate reliably and timely it demands the early appointment of the CM, designers and specialist contractors. The CM will be involved in coordinating and managing the cost planning and control procedures (CMF 1991 p21). The designer (which includes the architect, engineers and QS's) will be primarily involved in the production of pre-contractual design information, the associated statutory requirements and the translation of design information into working packages (CMF 1991 p14). The specialist constructors duties will often involve design input and the construction of elements of their work packages (CMF 1991 p31). Once the contractors have been selected the CM assumes responsibility for the control and coordination of contractors who carry out the work packages.

A major feature of this system is that it facilitates the overlapping of the design and construction phases and as such is known as a "fast-tracking strategy". The construction management system does not allow price certainty to be reached until the design and construction have advanced to a stage when all the separate work packages have been let (BEDC 1985 & Bennett 1986).

The advantages include:-

i. The client enters into a direct contract with the individual trade contractors it allows a greater level of security and cost savings to be achieved.

ii. The system allows the potential for early completion due to the overlapping of design and construction periods.

iii. The system is suitable for 'complex' projects.

3 iv. The CM's objectives are in line with those of the client.

v. Better working relationships within the project team are reached due to the increased involvement of the clients.

vi. Variations can be made without increasing costs substantially at a late stage, provided that the particular trade package has not been let.

vii. The system offers the advantages of "buildability".

The major disadvantages of this system include:-

i. The client is required to be extensively involved in the project at all levels and thus must have the experience and capability to accommodate the additional administrative duties and responsibilities inherent to this system.

ii. The client is given little price certainty until all the works packages have been let.

iii. The construction manager does not carry any risks in terms of cost or time over-runs but carries the risk of professional negligence.

iv. The client must be able to administer contracts for the separate trade contractors and the design team.

v. At present there is no standard form of contract which may be used with this procurement system, available in the UK.

The risk of time and quality predominantly rests with the constructors whilst the risk of price certainty resides with the client. Hughes (1991 p5) confirms that although risk of delays theoretically lies with the defaulting trade contractor, the client ultimately carries this risk. The CMF (1991 p50-53)

further corroborates that the risk of delays in completion of the project and quality lie with the client. The quality of the project depends upon the architects descriptions and specifications and the workmanship of the trade contractor who are carrying out the construction work. The CMF (1991 p51) confirm that the liability for the design of the project primarily resides with the designer, which increasingly includes specialist contractors.

Contract Documents

The most widely known contracts are produced by the Joint Contracts Tribunal (JCT) which is an affiliation of interest groups within the UK industry, acting as a forum for discussing and determining the content of clauses incorporated into standard forms. The membership of the JCT includes the RIBA, RICS, Building Employers Confederation, Association of County Councils, Association of Metropolitan Authorities, Association of District Councils, British Property Federation, Confederation of Associations of Specialist Engineering Contractors, Federation of Associations of Specialists and Subcontractors, Association of Consulting Engineers and the Scottish Building Contract Committee. Other bodies which produce a variety of contracts within the industry include the Institution of Civil Engineers, the International Federation of Consulting Engineers (FIDIC), the Association of Consulting Architects and Central Government (Murdock & Hughes 1992 p20-28).

Latham (1994) called for the spirit of co-operation and mutual trust to be encouraged to develop within the UK industry and advocated the wider use of the New Engineering Contract (NEC) which is now known as the Engineering and Construction Contract (ECC), in both the public and private sector (Perry 1995 p243). The ECC has been designed to be flexible allowing its use in both areas of construction activity (Building and Civil Engineering) in conjunction with a variety of procurement systems.

The Procurement Systems Models

From the literature review relating to the dominant procurement systems which exist in the UK the Procurement Systems Models (PSM's) have been established. The PSM's in the UK have been validated through the review process associated with the development of The Procurement Guide (Morledge & Sharif 1995). The verified PSM for each of the dominant building procurement systems are identified below along with the organisational chart for each system which indicates the formal relationships between the various participants and the primary advantages and disadvantages of each system.

Figure 4.4.1: Model A1

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed			✓				
	Specialist					✓		
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓	✓		✓		✓
Funder		✓						
Designer	Schematic	✓						
	Detailed							
	Specialist	✓						
Constructor	Manager							
	Producer	✓						

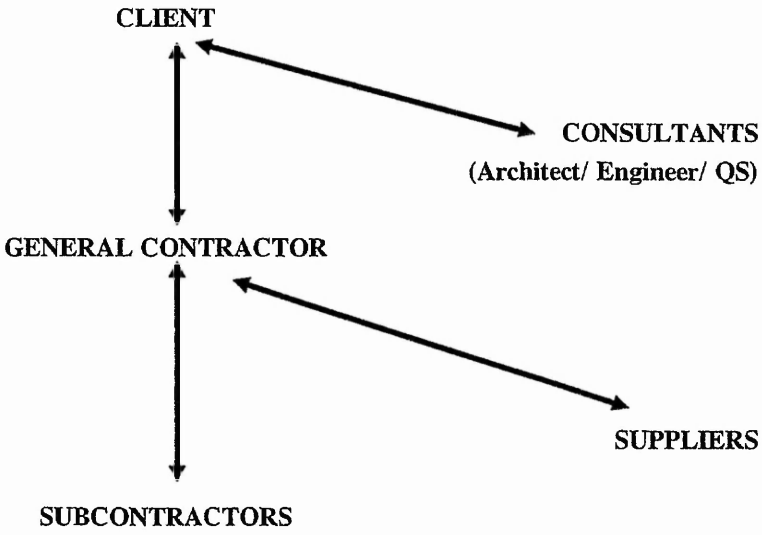
Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic			*				
	Detailed			*				
	Specialist					*		
Project Finance			*					
Effectiveness of Building in operation				*				
Quality of work								*

Country: UK **Model Type:** A1 (Traditional Lump-Sum)

Figure 4.4.2: ORGANISATIONAL CHART FOR THE UK TRADITIONAL LUMP SUM PROCUREMENT SYSTEM

CONTRACTUAL RELATIONSHIP



ADVANTAGES	DISADVANTAGES
competitive fairness	open to abuse (resulting in less certainty)
market forces and certainty	slow to start on site (no parallel working)
satisfactory public accountability	contractor not involved in design or planning
procedures well known	(no buildability)
easy to arrange and value changes	adversarial

Figure 4.4.3: Model A2

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed							✓
	Specialist							✓
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓	✓				✓
Funder		✓						
Designer	Schematic	✓						
	Detailed							✓
	Specialist							✓
Constructor	Manager							
	Producer	✓			✓	✓		

Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic			*				
	Detailed							*
	Specialist							*
Project Finance			*					
Effectiveness of Building in operation		*						
Quality of work								*

Country: UK **Model Type:** A2 (Design and Build)

Figure 4.4.4: Model A3

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/Promote		✓						
Fund			✓					
Design;	Schematic							✓
	Detailed							✓
	Specialist							✓
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓					✓
Funder		✓						
Designer	Schematic							✓
	Detailed							✓
	Specialist							✓
Constructor	Manager							
	Producer	✓		✓	✓	✓		

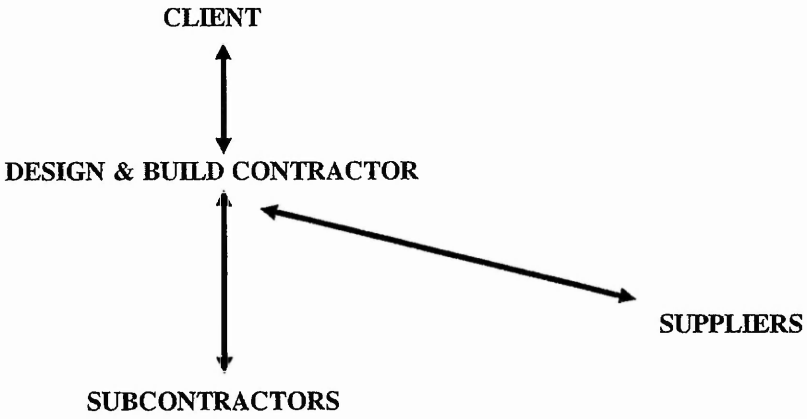
Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic							*
	Detailed							*
	Specialist							*
Project Finance			*					
Effectiveness of Building in operation		*						
Quality of work								*

Country: UK **Model Type:** A3 (Design & Build, Package Deal/Turnkey)

Figure 4.4.5: ORGANISATIONAL CHART FOR THE UK DESIGN & BUILD PROCUREMENT SYSTEM

CONTRACTUAL RELATIONSHIP



ADVANTAGES	DISADVANTAGES
single point contract and responsibility	relatively few firms (less real competition)
inherent buildability	client need to commit himself before design complete
early firm price possible	design and build firm is an entity
reduced total project time	(compensation for weak parts not possible)
	no design overview unless consultants appointed
	difficult for clients to prepare adequate brief
	bids difficult to compare
	design liability limited by standard contract

Figure 4.4.6: Model A4

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed			✓				
	Specialist					✓		
Construct;	Management						✓	
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓	✓		✓	✓	
Funder		✓						
Designer	Schematic	✓						
	Detailed							
	Specialist	✓						
Constructor	Manager	✓						✓
	Producer						✓	

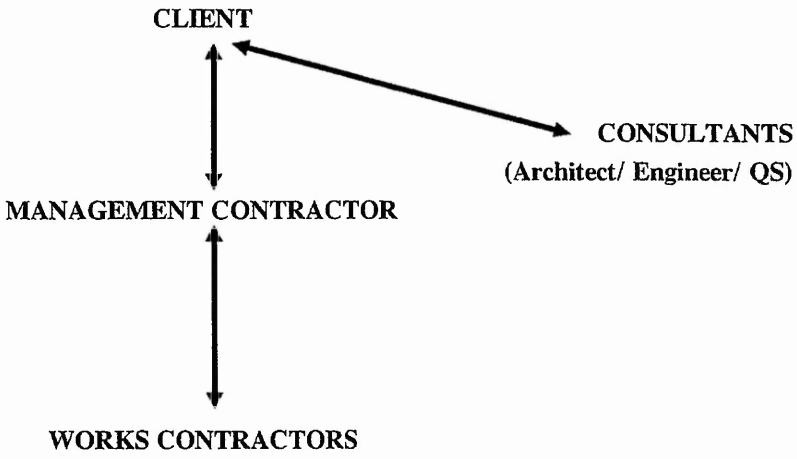
Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time		*					*	
Price Determination		*						
Design Liability	Schematic			*				
	Detailed			*				
	Specialist					*		
Project Finance			*					
Effectiveness of Building in operation				*				
Quality of work							*	*

Country: UK **Model Type:** A4 (Management Contracting)

Figure 4.4.7: ORGANISATIONAL CHART FOR THE UK MANAGEMENT CONTRACTING PROCUREMENT SYSTEM

CONTRACTUAL ARRANGEMENT



ADVANTAGES	DISADVANTAGES
time saving potential for overall project time	need for a good quality brief
buildability potential	poor certainty of price
breaks down traditional adversarial barriers	relies on a good quality team
parallel working inherent	may become no more than a 'post-box' system in certain circumstances
	removes resistance to work contractors claims

Figure 4.4.8: Model A5

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed			✓				
	Specialist					✓		
Construct;	Management	✓					✓	
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/Promoter			✓	✓		✓	✓	✓
Funder		✓						
Designer	Schematic	✓						
	Detailed							
	Specialist	✓						
Constructor	Manager	✓						
	Producer	✓						

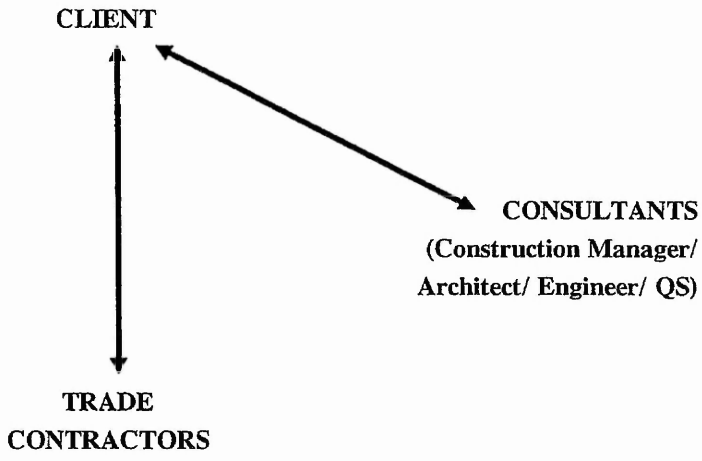
Framework 3; Functional Role against Risk: indicating who carries the higher risk for each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time		*						
Price Determination		*						
Design Liability	Schematic			*				
	Detailed			*				
	Specialist					*		
Project Finance			*					
Effectiveness of Building in operation				*				
Quality of work								*

Country: UK **Model Type** A5 (Construction Management)

Figure 4.4.9: ORGANISATIONAL CHART FOR THE UK CONSTRUCTION MANAGEMENT PROCUREMENT SYSTEM

CONTRACTUAL ARRANGEMENT



ADVANTAGES

time saving potential for overall project time
buildability potential
breaks down traditional adversarial barriers
parallel working inherent
clarity of roles, risks and relationships for all participants

DISADVANTAGES

needs informed client, able to take an active part
needs a good quality brief
relies on a good quality team
needs time and information control

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SECTION 4.5

INDIAN PROCUREMENT PARADIGMS

Dominant Building Procurement Systems in India

Introduction

As identified in the methodology section (Chapter 2) due to the limited access to secondary data regarding dominant building procurement systems in India, the author was given the opportunity to visit the country. Attempts were made to collect additional secondary data directly from India through the National Institute of Construction Management and Research, the Builders Association of India, the Council of Architecture, the Central Building Research Institute and the various Public Works Departments.

Background to the Indian Construction Industry

The Country and her people

India has a mainland area of approximately 3,290,000 square kilometres (1270,000 square miles) and is the seventh largest country in the world, being the second most populous (Price Waterhouse 1993 p1). According to the last official census in 1991, the total population was approximately 844.4 million (Europa 1993 p1362). India is still predominantly a rural country with nearly 75% of its population living in 550,000 villages, however, there is a growing trend towards city life (Foreign and Commonwealth Office 1993 p3). The agriculture sector is estimated to contribute 33% to India's GDP and provides employments for 64% of the work force (Price Waterhouse 1993 p6).

Historical View of the Construction Industry

The importance of construction in the national economy is obvious from the pattern of investment during India's 5 year development plans. It has been estimated that investment in construction has steadily risen from Rs 988 crores in the first five year

plan (1951 - 1956) to Rs 69, 160 crores in the seventh plan (1985 - 1990). The approximate construction component of these plans varies from 50.40% in the first plan to 38.42% in the seventh plan, with the average being estimated at 49%.

A major limitation of the construction sector in many countries is because it is not considered as an industry. Chandra (1990 p223) and Lansley (1990 p197) identify that the construction industry in India is not organised as an industry. The authors recognise that there is no single agency or institution in charge of co-ordination and control of construction of industry nationally. Nagabhushana Rau (1990 p393) proposes that although India spends over half of her investment in national development on construction, the methods and procedures used often involve outmoded technology, management and administration systems. This is due to lack of direction and encouragement in the industry and suggests that the rate of industrial development will only improve when such techniques and procedures are upgraded to suite the changing requirements of the industry. Nagabhushana Rau (1982 p2) states that:

> "... There is no central authority at centre or even at state levels and the construction activity is fragmented and is subject to controls at all levels from village panchayats to central government departments and The Planning Commission, with each having its own approach ...".

Nagabhushana Rau (1982 p2) proposes that this form of institutional support is vital for the indigenous development of the construction industry and has called for the establishment of such a ministry within the government. The establishment of such an organisation would mean that the policies and procedures which the industry must adhere to would be clearly laid down and enforced, with an overall aim of long term development.

The first development plan was implemented in 1951-1956 and since then, they have run consecutively on a five year basis. Sundaram (1990 p427) has indicated the approximate construction content of the total five year development plan's (Table 4.5.1). He also illustrates that the successive plans have placed increasing emphasis on the development of infrastructure, irrigation, energy, transportation and communication, health, housing, social welfare, rural development and other activities

with the objective of improving the nations development status.

Table 4.5.1: Percentage Outlay on Construction in India

Five Year Plan Period	Construction content as a percentage of the Total development Plan Outlay
First Plan (1951-56)	50.4
Second Plan (1956-61)	42.6
Third Plan (1961-66)	42.3
Fourth Plan (1969-74)	43.2
Fifth Plan (1974-79)	43.4
Sixth Plan (1980-85)	36.2
Seventh Plan (1985-90)	47.4*
Eighth Plan (1990-95)	48.0**

Source: Sundaram (1990 pg 425)

* Adapted from paper presented by Nagabhushana Raw (1991) 'Status of Construction Sector in India' (Table 4.5.2).

** Adapted from Inaugural Address by Shri Ramakrishna Hegete-Deputy Chairman, Planning Commission May 7 and 8 1990. National Conference on Construction, NICMAR Bombay.

Nagabhushana Rau (1991 p2) provides an estimation of the construction components in each of the various sectors of the economy (Table 4.5.2).

Table 4.5.2: Estimated Component of Construction in the Various Economic Sectors

Sector	Construction Component as a % of Outlay
Agriculture and Allied Sectors	34
Immigration and Food Control	80
Power	75
Small industries	25
Organised Industry	30
Transport & Communication (Excluding Railways)	40
Education	20
Scientific Research	10
Health	37
Housing	100
Welfare of Backward Classes	12
Social Welfare	21
Labour welfare and craftsman training	45

Source: Nagabhushana Rau (1991 p2)

The World Bank (1994) have identified that construction GDP at 1980/1981 prices was Rs 61.4 billion in 1980/1981 and by 1992/1993 it had reached Rs 98.38 billion (Table 4.5.3). This represents an increase of Rs 37.24 billion, or a growth of GDP of 60.22% during this 12 year period which gives an annual average increase in construction GDP of 4%.

Year	Construction GDP billion Rs at (1980/81) prices	% GDP growth from previous year
1980/81	61.4	-
1984/85	68.28	-
1985/86	71.83	5.20
1986/87	75.35	4.90
1987/88	77.77	3.22
1988/89	83.79	7.74
1989/90	88.90	6.10
1990/91	93.28	4.93
1991/92	96.24	3.17
1992/93	98.38	2.22

Table 4.5.3: Construction GDP Growth at 1980/81 prices

Source: Adapted from World Bank (1994 table A1.1(b))

Even though construction plays a role in many other sectors of the economy there are generally no reliable statistics available on the construction industry. The Department of Environment (1993 p2-20) on a recent visit to India have stated that the Indian economy is undergoing profound changes in terms of its construction industry and economic development.

Raj (1993 p1) discusses the general shortage and backlog in infrastructure provisions in India, and illustrates that the popular approach towards infrastructure development is that it is the responsibility of the state to provide all essential facilities. This attitude is beginning to change since the recent government initiatives of 1991 which generally include; more decentralisation, rationalisation of Acts affecting land availability and the general liberalisation of the financial sector facilitating credit and private finance (DOE 1993 p22). The DOE (1993 p2) recognise that the lack of basic infrastructure provisions coupled with the generic characteristics of neglect and problems of the Indian construction industry (regarding cost and time overruns, poor quality work, late payments, claims, labour problems and poor attention to safety issues) could severely affect the speed and pattern of national development.

A study conducted in the Government of India (1985) identified the grave time and cost problems which litter the construction sector. The study revealed that from a

range of 184 public sector projects, with individual project costs of over Rs 200 million, 119 projects (65%) suffered with time overruns. The extent of such overruns varied between projects and in some cases were as much as 200% greater than the original anticipated completion period. The survey suggested that the average delay in commissioning of such projects was approximately three years. In terms of cost increases on projects, the study illustrated that 125 (68%) of the 184 projects undertaken also suffered from such problems. It was estimated that in extreme cases the cost overruns were up to 750% higher than the original anticipated project costs.

Chandra (1990 p215) carried out a further survey of 290 construction projects. The project costs ranging from Rs 0.20 to Rs 0.70 billion and concluded that almost 65% of such projects experienced cost overruns. The causes of such overruns were identified as being due to: i) inadequate project formulation ii) insufficient implementation planning of projects and iii) the deficient management of implementation of projects. The Government of India (1989 p1) and Chandra (1990 p215) identified the influential factors as i) inaccurate project cost estimating, ii) delays in obtaining statutory approvals/clearance, iii) inadequate evaluation of technology, iv) late project changes, v) lack of expertise in project appraisal, vi) finance problems, vii) poor management, viii) no human resource planning, ix) ambiguities in the relationships between the various parties involved, and x) inadequate supporting infrastructure.

The Organisations Structure of the Indian Construction Industry

Initiation/Promotion

Singh & Sofat (1977 p313) suggest that the major 'client' of the industry is the public sector due to the volume of work included in each of the Five Year Development Plans (See Table 4.5.1). In the Eighth Five Year Plan (1992-1997), observers have witnessed a significant shift from the traditional detailed planning approach to indicative planning with the private sector investment assuming a much greater role in the economy (Price Waterhouse 1993 p17-18). Each of the 25 states of India, are responsible for their respective construction activities and are responsible for drawing up their own programmes of development activity and put forward applications to

central Government for funding. Large projects however, are often controlled by the Central Government. Hayward (1995a p16-18) recognises the growing role of both private and international clients within the construction market since the 1991 liberalisation policies. He proposes that traditionally with the main clients of the industry being central or state government, problems in the projects regarding lack of finance created stop-go policies laced with interminable bureaucracy.

Funding

Nagabhushana Rau 1991 identified that for the public sector finance is allocated through the five year plans at Central and State level, much of the finance is raised through fiscal policies and taxation. March (1995 p23) identifies that a major constraint in the development process in India is the acquisition of finance and that the role of foreign companies in providing finance in India is increasing. March discusses that the majority of Indian banks and insurance companies are still state owned, and suggests that US insurance companies are attempting to enter the market in order to provide finance for the emerging Indian Construction Market.

APO (1983 p82) concluded that because construction is not considered to be an 'industry', like other sectors of the economy, finance is often very difficult to obtain and state that:

> "... finance being a main resource, any lack of it at any time will create problems and will have a chain reaction on the other resources ..... Government use construction as an economic policy regulator, and many times the works on hand get the axe in the allocation of funds".

Finance agencies in India still regard construction as a trading activity and are reluctant to provide finance for construction activity although suggestions have been made for the improvement of construction finance acquisition in India (see APO 1983 p86).

Special finance institutions have been established by the Indian government for construction and other Financial Institutions, these include the National Bank of Housing (Gulabchand 1990 p12). Ramakrishna Hegde (1990 p19) discussed the

formation of such banking institutions as the Housing Urban Development Corporation (HUDCO) and the assistance they provide the construction industry in terms of Finance for the construction of private housing. Newcombe (1994 p38) in discussing financial institutions which provide mortgages for housing and identifies that such institutions will not lend to borrowers who do not have clear land titles, unless financial guarantees are provided in lieu of land deeds which often constrains the development process. Vaid (1990 p50) recognises that the high interest rates charged by private financiers and the problems associated with advances and payments from clients are major problems in the Industry.

A number of financial institutions which do provide finance for building work include:

i) The Housing and Urban Development Corporation Ltd (HUDCO)
ii) The Life Insurance Corporation (LIC)
iii) General Insurance Corporation (GIC)
iv) The Housing Development Finance Corporation (HDFC) and
v) Commercial Banks

Hayward (1995a p16) analyses the impact of the 1991 liberalisation policies suggesting that the result of these policies is expected to double the construction industry turnover within five years. He identifies that finance was traditionally provided by the stagnant cash starved public sector and suggests that there is an urgent need for finance to be injected into the Indian construction Industry. This is currently being provided by both private sector investors and international sources. The government liberalisation policies have resulted in finance for construction work has now become available from new sources including private sector investors, foreign banks and insurance companies (usually forming a construction BOT projects) as well as from various international lending agencies including the World Bank, the Asian Development Bank, the Dutch Overseas Economic Corporation Fund and the Saudi Fund for Development.

Design

Gulabchand (1990 p11) confirms that the majority of conceptual and detailed design work for public sector projects is carried out in government run design departments, mainly staffed by qualified engineers and to a lesser extent by architects in Public Works Departments. In such organisations specifications, designs and contract conditions and other related aspects of the project are regulated. Private sector projects design consultants including architects, engineers and QS's are in charge of producing detailed designs and specifications for the proposed project.

The Architect

Doshi (1987a p4 & 1987b p1) recognises that as a result of the rapid development of urban areas, the majority of architectural practices have been concentrated in the large cities. In rural areas there is virtually no participation by architects in the design function, with both householders, neighbours and craftsmen being involved in designing the building (Doshi 1987b).

Bhalla (1970 p344) identifies that the architects role is often restricted to designing and preparing drawings. Once such designs are complete, the architects role is considered to be diminished, with all building work, including cost estimates, calculations for standard details, layout of services and supervision of the works, being executed by the engineer. Pandya (1995 p11) corroborates these findings, suggesting that the architect is principally appointed by the employer to prepare design drawings, and if required to supervise the construction and monitor progress of construction work on site, the latter being traditionally carried out by the engineer. Between 90-95% of buildings in India being designed and supervised by non-qualified architects, draughtsmen or engineers.

The Engineer

The role of the engineer is considered to be most influential in the design function in India. Bhalla (1970 p344), Correa (1970 p329), Doshi (1987a p3) identify that the role of the engineer in India is to participate in the design function as well as

producing estimates of construction costs, structural details and services layouts as well as supervision of the construction work on site. Ramakrishnan (1995 p8) suggests that the engineer consultant performs a range of duties in the construction process including being the agent/representative of the client, being involved in the design function, producing specifications, estimates, details, tender evaluation, development contractual documentation, supervision of works, ordering variations, carrying out site measurements, billing and carrying out the function of a quasi-arbitrator incase if disputes. The engineer is regarded as an expert in the field of construction and has a powerful role in the construction process, being required to issue drawings, technical details, certification, instructions and variations, monitoring progress, interpreting the contract and issuing final decisions in the case of disputes.

Constructors

The APO study (1983 p41-42) indicates that there are many small contractors spread throughout India and there is a grave and immediate need for training of such contracts as they are rarely supported by technically qualified staff. The need for training all sizes of contracting organisation in managerial expertise is apparent. It is also recommended that some form of registration system for contractors is implemented into India. There is no central authority for the registration of contractors at a national level whilst at state level public agencies tend to adopt their own registration systems each with varying criteria (APO 1983 p56-57 and Nagabhushana Rau 1982 p2).

There are approximately 90,000 contracting companies operating throughout India. The Builders Association of India (BAI) has a membership of 8,000 contractors (suggested to be less than 10% of the total number of contractors operating) and are recognised as the major contracting organisations operating throughout the industry.

Moavenzadeh (1988 p72) recognises that there are excellent contractors operating in India in terms of their skilled labour and cheap costs, however their managerial capabilities are considered to be weak compared to international standards. Nicholson (1987b p35) identifies that a major reason for the poor quality of workmanship is due to the lack of skilled workers within the industry. Increasingly, speculator's are

involved in the construction process, who have no formal qualifications or posses any crafts skills nor building construction background. He attributes the poor skills levels to the inadequate development of training programmes and associated institutions. Hayward (1995a p17) highlights that although there are large sophisticated contractors operating within the market, the country comprises of thousands of contractors, ninety percent of whom consist of two individuals and a lorry, employing cheap unskilled labour and using labour intensive construction methods. The use of construction equipment such as tower cranes, large excavators and batching plants is rare. The lack of both the use and availability of plant coupled with the supply of poor quality overpriced construction equipment and materials, has resulted in the poor execution of projects and the lack of construction industry development.

The traditional restrictions (including shortages of steel and cement) coupled with the bureaucratic control of imported materials and equipment and the high levels of import duty which have been applied to such items has influenced the construction process. This results in the industry relying on indigenously manufactured materials and equipment, which are often substandard as compared to the imports.

The industry is characterised by up to 80% of all construction activity being labour intensive. The industry employs 50,000 men and women, recruited as labour only family based contracts with limited formal training. Hayward (1995a p19) identifies that the existence of limited plant and labour intensive construction methods is due to the cheap and abundant supply of labour, and the traditional restrictions imposed on imported plant. The employment of thousands of labourers for several years is recognised by the client (most often the state or central government) as an affordable extra when compared with the use of advanced plant such as tower cranes or excavators which use the minimum of labour. For these public clients early completion is not first priority as maintaining employment is more important.

Dominant Procurement Systems

Although attempts were made to collect secondary data regarding the various procurement systems used in India, due to its unavailability only a limited amount of data was examined. The study conducted by Singh & Sofat (1977) highlighted that the analysis of the performance of the various contracting systems in use is vital in the selection of appropriate methods of contracting to obtain maximum economy in construction costs. Mohan and Sofat (1987 pg 83) recognise that in order to achieve the successful completion of a project, both in the public and private sector, the correct contracting philosophy must be adopted long with the right contact documentation and the suitable tendering procedure.

1. Lump Sum Contracts

Sing & Sofat (1977 p313), Mohan & Sofat (1987 p86), Guha Thakurta (1990 p219) and Dala (1992 p188) advocate that the lump sum system of procurement is predominantly used by the public sector in the Military Engineering Services department. In the lump sum procurement system the contractor is required to agree a fixed price based on full contract documentation, drawings, plans, specifications and other construction details in advance of actually carrying out the work. Competing contractors will all be given the same tender documentation in order to price the works in advance. Tender documentation includes full drawings and specifications and may include a Bill of Quantities. Mohan & Sofat (1987 p86) propose that where a B of Q's forms part of the contract documentation the client is bound by the accuracy of the quantities within the document and allows the contractor to prepare an accurate tender for the project.

The advantages of this system include:-

i. All parties are aware of their commitments in advance of commencement of the construction works.

ii. The system facilitates quick interim and final payments as all items of work are present in the bill and may be easily priced and measured.

iii. This arrangement allows better and easier cost controls as all the work items are clearly priced and quantified before construction commences.

iv. There is considered to be a reduction in administrative duties during the construction period which provides greater time for supervision of the works.

v. Its contended that this arrangement allows higher efficiency and speed in construction leading to increased profits for the contractor.

vi. Due to the preparations of plans, details and specifications in advance of selecting a contractor for the works there is considered to be less likelihood of changes once construction commences on site.

The disadvantages of the system include:-

i. This system can only be efficiently used on work which is of a standard repetitive nature and is consequently suitable for a small selection of projects.

ii. Contractors are suspected to quote higher rates for each item of work to accommodate for unforeseen risks as once they submit a priced bill they are required to complete the project for the agreed sum stated in the tender documents.

iii. Mohan and Sofat (1987 p86) note that under this arrangement if a B of Q's forms part of the contract documents the client is

bound by the accuracies of the quantities within a prescribed limit of variations. As a consequence this procurement system is not frequently used in India.

iv. Designs are required to be completed before construction commences on site which results in a relatively long and sequential time sequence in the delivery of the building.

Under this procurement approach the contractor is required to bear most of the risk involved. Guha & Thakurta (1990 p221) states that the lump sum system remains unpopular in India due to the clients and their consultants not freezing designs after tender stage. It is common that drawings are continually changed and work is redesigned throughout the construction process and so the use of such arrangement is limited to a few standard, specialist types of projects.

2. Measurement Contracts

There are two types of measurement systems used in India, the item rate contract and the percentage rate contract. In both of these systems, a B of Q is prepared for all anticipated construction items to be incorporated in the works. Under the item rate contract the contractor is required to insert a rate for each item measured in the B of Q at tender stage. The client and his consultant will then select the contractor for the job on the basis of the rates inserted into the B of Q's. The contractor once started on site will be paid in accordance with amounts of each item of work executed and the price of each item as inserted in the B of Q's (Singh & Sofat 1977 p313, Mohan & Sofat 1987 p85).

In the percentage rate system the contractor as part of the tender documentation is given a standard schedule rates prepared by the client (usually a public works department) and is required to quote a positive or negative percentage on each rate included in the schedule (Mohan & Sofat

1987 p85). Singh of Sofat (1977 p313) indicate that this procurement system is suitable for work which requires late changes using relatively few construction methods and where the volume or extent of the works can not be exactly determined in advance of the contractor being appointed. This form of measurement contract with percentage rates is particularly used by the public works departments, whilst the item rate contract is extensively used in the private sector.

The advantages of this system include:

i. less pre tender time is required as completed drawings and specifications are not required prior to the selection of a contractor.

ii. This systems is flexible as it allows late changes to be incorporated easily.

iii. Payments are made after the work is carried out on a measurement basis there is virtually no risk of over payment.

The disadvantages of this system include:

i. The system allows variations to be easily incorporated into the project once construction has commenced providing the client with little certainty in terms of time and cost at the onset of the project.

ii. There is no incentive for the contractor to be economical.

iii. Adequate proper planning is not possible in advance as the exact requirements of the client are not fully established until construction is completed.

iv. This system frequently results in time and cost overruns due to

the delayed release of drawings and specifications because of design late changes by the client.

3. Design and Build (Turnkey) Contracts

Panchadhari (1992 p119) acknowledges that design and build (turnkey) contracts are increasingly being used in the Indian construction industry illustrating that under this system a single contractor is responsible for completing the full design and construction of the proposed building in accordance with the clients specifications for a lump sum price.

Although the large sophisticated contracts in India will have their own in house design departments it is frequently the case that under this arrangement the D & B contractor will appoint independent designers to design the project. The client is still however given a single point of responsibility for the design and construction process. The client enters into a formal relationship with the contractor to design an construct the building for a fixed price.

The interviews conducted identified that this procurement system is increasingly being used in the construction of hotels, shopping complexes, offices and residential developments. The advantage of the design and build approach included:-

i. the client is offered as single point of contract and responsibility for both the design and construction function through the design and build contractor making the process simple.

ii. the design and build approach allows parallel working as the design phase can develop the construction phase allowing a faster project delivery period.

iii. reduced precontractual period and costs.

iv. the system offers potential cost savings as the client does not have to appoint independent consultants to design.

The disadvantage included:-

i. The client is required to commit himself/herself with regards to design and costs from the start of the project to realise the benefits of this approach.

ii. late design changes or variations are expensive under this arrangement.

iii. As no independent design consultant is appointed by the client in this approach the system is criticised for offering poor quality designed buildings.

iv. As the design and construction function are carried out by the same organisation the design of the project is often compromised by the contractors desire for maximising profits.

v. At present only a few large experienced contractors are able to offer this procurement system to clients, therefore the level of competition under this system is less than the other procurement systems used in India.

4. Piece Work Contract

The APO (1983 p42) have identified the piece work method of procurement is frequently used in India. Under this system of procurement piece workers or labour only subcontractors carry out various packages of work under the co-ordination of the client or the clients representative. Many sperate labour only subcontractors will be involved on a single project each employed to complete their respective package of work. It has been suggested that this system is one of the most traditional ways of obtaining buildings in India and is still used for housing projects, and other building works particularly in rural

areas (Doshi 1987a p3).

The client (which is frequently the householder) will be responsible for co-ordinating the individual trade contracts. For small project independent designers will not be used as the design and the construction of each package of work will be carried out by the respective trade contractors or frequently by the householders themselves. With large houses or other building work it is common for an architect or engineer to be appointed by the client to prepare drawings and specifications of the work. As such each trade contractor will enter into a formal relationship with the client to execute a particular package of work. Such formal relationships are often verbal agreements rather than written contracts between the parties. For simple projects the role of management of the construction process will be assumed by the client.

The advantage of this procurement system include:-

i. The client benefits directly from trade contractors pricing as there is no general contractor.

ii. The system facilitates parallel working allowing the design phase to overlap the construction phase.

iii. The client can appoint the most suitable trade contractor for each package of work.

iv. The system is inherently flexible allowing late design changes to be accommodated easily.

v. The client is aware of his/her financial commitment with the project as the work proceeds. Often the client will supply the materials and appoint specialist labour only contractors to carry out each trade.

vi. It is the traditional system of building in India and is widely

understood and is particularly used in rural areas of the country.

The disadvantages of the system include:

i. As the client is responsible for the co-ordination of the various contractors on site he/she is required to play an active role in the co-ordination, management and supervision of the project.

ii. The quality of workmanship is often not controlled by any party within the process. The client is responsible to check the quality of workmanship.

iii. This system frequently operates without the use of formal written contractors as verbal contracts are generally used. If the client has any problems with the individual contractors regarding price or quality there is no formal way of dealing with disputes. If the quality of workmanship or construction is poor, the client simply refuses to pay the respective contractor.

iv. This system provides the client with little cost certainty until the project is completed, as packaged will be let at various stages and late design changes by the client are a frequent occurrence.

Contract Documents

The APO (1983 p16) also recommend that there is an urgent need for the revision and updating of contract documents and have laid down guidelines for the introduction of fair and equitable contract conditions (see APO p27 1993 1a to 1e). Chandra (1990 p222) discusses importance of context and ethno-centricity in planning and running the Indian construction industry. He concludes that:

> "Modernisation is contextual and ethno-centrity in planning and technological upgrading are a must. What is needed is adaption of technology and not the adoption of technology evolved in the developed countries .... it should be adapted to suite our cultural, social and economic conditions".

Mohan and Sofat (1987 p84) and Ofori (1990 p372) recognise that contract documents used in the Indian construction industry are often prepared from existing international documents (FIDIC, JCT and RIBA) contracts which are subsequently modified to suite individual clients needs. Mohan and Sofat state that each public sector department produces own form of contract with various specific conditions. The number of Public Work Departments which produce their own bespoke conditions of contract results in the non-uniformity of contracts imposing great strain and risk on contractors operating within the industry. The ways in which contracts are "loaded" in favour of the client and the distinct lack of clarity and contradictions in contract terminology all results in the client having unrealistic powers to make changes and modifications in such documents. This consequently result in time and cost overruns on most construction projects in India.

Every state or department and large private sector clients will have their own form of contract with specific terms, conditions and specifications with the majority of them being prepared during the period of colonial rule (Verma 1994 p129). Nagabhushana Rau (1990 p399) identifies the efforts which are being made by the National Institute of Construction Management and Research (NICMAR) and the Builders Association of India (BAI) who have drafted a proposed model form of contract which is recognised as being fair and equitable and appropriate for the Indian construction industry context. This document is currently being reviewed by various government departments and may be implemented nationally as a standard form of contract.

Ramakrishnan (1995 p8) identifies that the general complaint is that such documents are one sided usually favouring the client at the expense of the contractor which results in late over budget projects being delivered. The situation may only be remedied by the introduction of appropriately worded contractual documents which are fair to both parties and suited to the contextual conditions of the Indian construction industry.

The Procurement Systems Models

From the literature review relating to the dominant procurement systems which exist in India the Procurement Systems Models (PSM's) have been established. The PSM's have been validated by the questionnaire survey and further verified by interviews with respondents from the construction industry in India. The results of the questionnaire and interviews are shown in Appendix A Tables 4(i), (ii), (iii), iv) (v).

Results from the Questionnaires Regarding Dominant Building Procurement Systems in India

As discussed in Chapter two each of the questionnaires sent to respondents in India were system specific. From the literature review it has been established that there are four dominant procurement systems in India. The questionnaires were designed to be answered in relation to the following systems: Lump Sum contracts, Measurement contracts, Design and Build, Piece Work contracts . In addition to one of each of the system specific questionnaires, a non-specific questionnaire was also sent to each respondent to identify the existence of any non represented dominant procurement systems in operation in India.

From the eighty sets of questionnaires originally distributed, twenty seven were returned which gave a response of 33.75%. Attempts were made to increase the response rate by follow up letters, faxes, telephone call and finally by re-distributing the questionnaires to respondents who did not respond. The complete questionnaires come from a range of respondents including: six initiator/promoters, four funder's, four designers, ten contractors and three academics. Due to the quantitative nature of the questionnaire and the degree of consistency between respondents it is considered that the limited response from some categories of respondents does not subsequently affect the results.

The results of the questionnaires have been summarised and analysed and have been used to validate the PSM. Each of the results tables are shown in Appendix A tables 4 (i), (ii), (iii) and (iv). The tables indicate the number of respondents which returned questionnaires and their response to each question. The tables also identify

the number of completed questionnaires analysed, the respondent category and also how each question used in the survey relates to the various elements in Procurement Systems Model. The responses to each question have been coded in accordance with the coding system identified in Chapter 2. All of the questionnaire responses used in this investigation have used the same coding system. Where either the question was not answered or where the question was not applicable to a procurement system an asterisk (*) was inserted into the table.

The tables also provide a summary of predominant response to each question which has been used to validate the PSM's produced. The predominant response to each question has been calculated by identifying the most widely expressed response to that question. Where there is more than one response which has equally represented then they have all been added to the summary of predominant response in the tables. The results of the questionnaire survey have been used to validate the PSM and make any readjustments which needed to be made to the models. The models were further validated during the interviews (summarised in Appendix A table 4(v). During the verification process of the PSM's, interviewees were asked to comment on which of the predominant responses summarised by the questionnaire survey was the most likely answer. The models were then confirmed of the dominant procurement systems in India.

The verified PSM for each of the dominant building procurement systems are identified below along with the organisational chart for each system which indicates the formal relationships between the various participants and the primary advantages and disadvantages of each system.

Figure 4.5.1: Model I1

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist					✓		alt
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/ Promoter			✓	✓	✓	✓		✓
Funder		✓						
Designer	Schematic	✓						
	Detailed	✓						
	Specialist	✓						
Constructor	Manager							
	Producer	✓						

Framework 3; Functional Role against Risk: indicating who carries the higher risk for each risk identified.

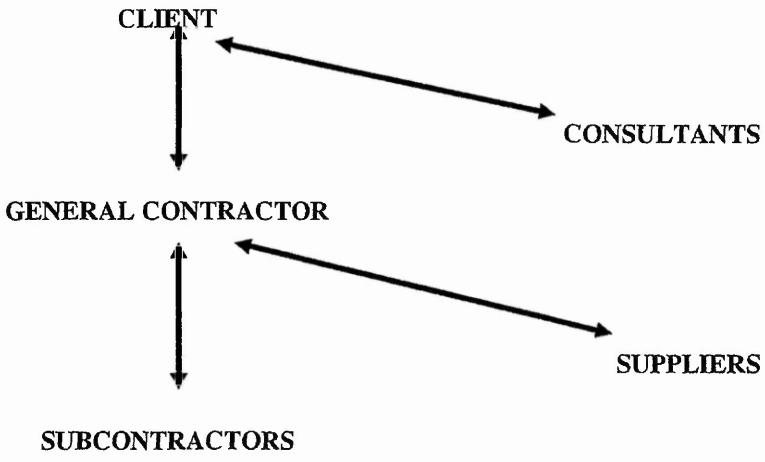
ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time		*						*
Price Determination		*						*
Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		alt
Project Finance			*					
Effectiveness of Building in operation				*	*			
Quality of work								*

Country: India **Model Type:** I1 (Item Rate)

alt = alternative arrangement

Figure 4.5.2: ORGANISATIONAL CHART FOR THE INDIAN ITEM RATE PROCUREMENT SYSTEM

CONTRACTUAL ARRANGEMENT



ADVANTAGES	DISADVANTAGES
preconstruction time saving potential	low or no cost certainty
design flexibility where uncertainties exist	no cost control (only cost checking possible)
late design changes possible	potential for ill-advised speed at cost of design
parallel working possible	requires a level of mutual trust
	no control of uneconomical use of resources or wastage

Figure 4.5.3: Model I2

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist					✓		alt
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/ Promoter			✓	✓	✓	✓		✓
Funder		✓						
Designer	Schematic	✓						
	Detailed	✓						
	Specialist	✓						
Constructor	Manager							
	Producer	✓						

Framework 3; Functional Role against Risk: indicating who carries the higher risk for each risk identified.

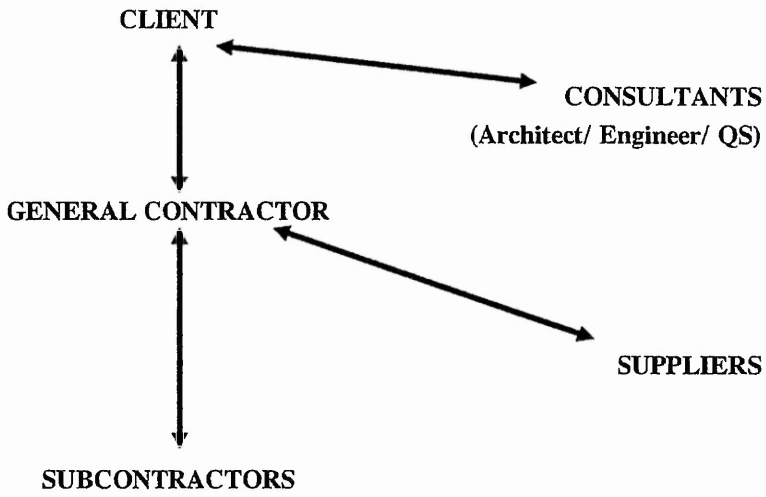
ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time		*						*
Price Determination		*						*
Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		alt
Project Finance			*					
Effectiveness of Building in operation				*	*			
Quality of work								*

Country: India **Model Type:** I2 (Cost Plus Percentage)

alt = alternative arrangement

Figure 4.5.4: ORGANISATIONAL CHART FOR THE INDIAN COST PLUS PROCUREMENT SYSTEM

CONTRACTUAL ARRANGEMENT



ADVANTAGES	DISADVANTAGES
pre-construction timesaving potential	low certainty of price potential
designed do not completed before construction commences on site	system can allow excessive variations to be claimed by the contractor
system is flexible as it is easy to arrange late changes	no incentive for the contractor to be economical
little risk of overpayment of the contractor as the project is remeasured	adequate planning is not possible prior to construction
	system provides little time certainty

Figure 4.5.5: Model I3

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic							✓
	Detailed							✓
	Specialist							✓
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/ Promoter			✓					✓
Funder		✓						
Designer	Schematic							✓
	Detailed							✓
	Specialist							✓
Constructor	Manager							
	Producer	✓		✓	✓	✓		

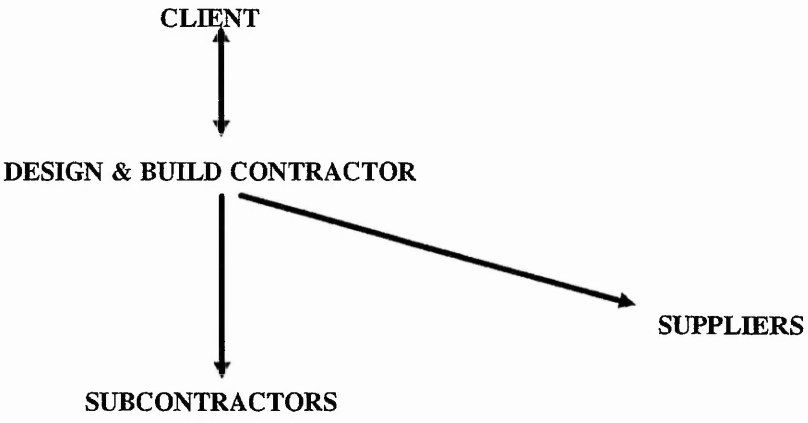
Framework 3; Functional Role against Risk: indicating who carries the higher risk for each risk identified.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic							*
	Detailed							*
	Specialist							*
Project Finance			*					
Effectiveness of Building in operation		*						*
Quality of work								*

Country: India **Model Type**: I3 (Design & Build Turnkey)

Figure 4.5.6: ORGANISATIONAL CHART FOR THE INDIAN DESIGN & BUILD (TURNKEY) PROCUREMENT SYSTEM

CONTRACTUAL RELATIONSHIP



ADVANTAGES	DISADVANTAGES
single point contract and responsibility	relatively few firms (less real competition)
inherent buildability	client need to commit himself before design complete
early firm price possible	design and build firm is an entity
reduced total project time	(compensation for weak parts not possible)

Figure 4.5.7: Model I4

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist							✓
Construct;	Management	✓						
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/ Promoter			✓	✓	✓			✓
Funder		✓						
Designer	Schematic	✓						
	Detailed	✓						
	Specialist							
Constructor	Manager							
	Producer	✓						

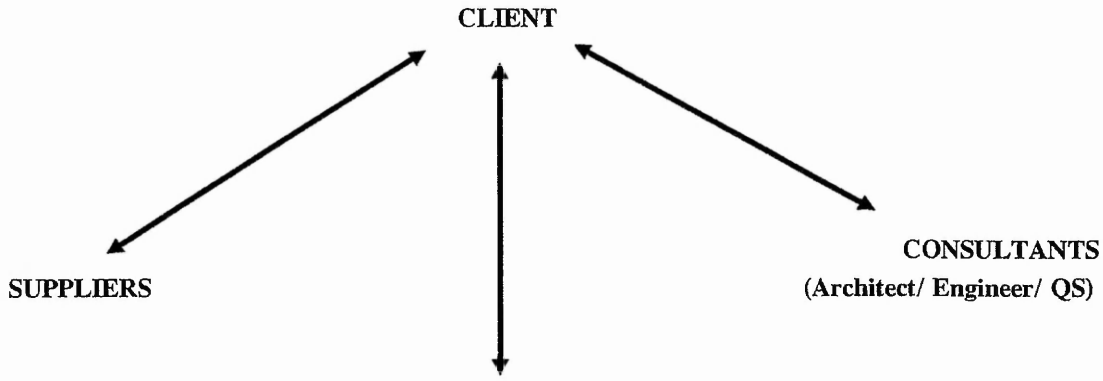
Framework 3; Functional Role against Risk: indicating who carries the higher risk for each risk identified.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time		*						
Price Determination		*						
Design Liability	Schematic			*				
	Detailed				*			
	Specialist	*						
Project Finance			*					
Effectiveness of Building in operation		*		*				
Quality of work		*						*

Country: India **Model Type:** I4 (Piece Work)

Figure 4.5.8: ORGANISATIONAL CHART FOR THE INDIAN PIECE WORK PROCUREMENT SYSTEM

CONTRACTUAL ARRANGEMENT



ADVANTAGES	DISADVANTAGES
cost savings potential	client responsible for coordination and management
parallel working possible	quality of workmanship not controlled
most suitable trade contractor appointed for each trade	no written formal arrangements used
inherent flexibility to accommodate for late design changes	client is given cost certainty until project is completed
traditional system of procurement in rural areas	

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SECTION 4.6
MALAYSIAN PROCUREMENT PARADIGMS

Dominant Procurement Systems in Malaysia
Introduction

Due to the limited access to secondary data regarding dominant building procurement systems in Malaysia a visit was undertaken to interview respondents and collect locally published information the results of which have been incorporated into this study. Attempts were made to collect data through the Construction Industry Development Board, the Master Builders Association of Malaysia, the Institute of Surveyors Malaysia and the Universiti Teknologi Malaysia.

Country and Its People

The federation of Malaysia, consists of 13 states, eleven of which are on Peninsular Malaysia, and two states in East Malaysia bordering Indonesia (Europa 1993 p1976). The total land area is considered to comprise of more than 329, 758 km (127, 320 square Miles) however 80% of the land is covered by tropical rain forest (DLS 1994 p45, Ernst & Young 1992 p81). The population is estimated to be 17.8 million in 1990, with an overall population density of 54 persons per square km (Europe 1993 p 1800). Figures produced by the Ministry of Finance (1995) estimated the population in 1994 to be 19.5 million.

An important characteristic of Malaysia is its multiracial population, with the largest ethnic grouping being the Bumiputra, then the Chinese and Indians. The emphasis on 'racial' economic restructuring has been a policy which has been expounded by the Malaysian Government policies since their initial development plans (BOTB 1974 p5). The objectives of such polices have been to relocate 30% of ownership of the countries assets to indigenous Malays by 1990. The successor to the Malaysian 20 year New Economic Policy in June 1991 (known as the New Development Policy) still maintained this proposal for restructuring the ownership of the country's corporate assets (to 30% Bumiputra) but has not given a specific achievement (Europa 1993 p1799).

Background to the Malaysian Construction Industry

Peng (1994 p1) illustrates that the construction industry in Malaysia was traditionally a small neglected sector regarded as a by-product of other areas of activity in the economy. Yong (1986) identifies that many of the practices and procedures are similar to those that exist in the UK, including various regulations, by-laws and contract documents.

It is estimated that the construction sectors share of the Gross Domestic Product increased from 3.9% in 1970 to 4.4% in 1973, and that construction accounted for 2.9% of total employment (BOTB 1974 p7). During the early part of the 1980's, there was rapid expansion of construction activity in Malaysia due to the property boom and expanded public sector investment which accelerated from 9.3% of GNP in 1979 to 20.5% in 1983, with construction being the highest overall sector. Lam Tsun Ip (1990 p37) investigates the Malaysian industry and argues that the special characteristics of this industry are three fold:

a) the Government Policy to foster greater Bumiputra involvement in business and commerce,

b) Due to raging construction and development across Malaysia, there is non-uniform skilled labour and plant distribution nationally. The majority of skilled labour and plant outlets exist around major development areas.

c) The varying administration and building by-laws which exist amongst the thirteen states of Malaysia.

The Organisational Structure of The Construction Industry

Initiator/Promoter

Since Independence, the government has taken a keen role in national and economic development, instigated through the 5 year plans. Their policy for activity maintaining indigenous Malay involvement in the economy can be illustrated by the activities of the 'Urban Development Authority' (UDA) which was established to assist the Malay population to obtain their own property, take an active interest in residential and commercial projects and buy and rent/property to the Malays at equitable rents (BOTB, 1974 p9).

Construction investments in Malaysia is estimated to be one third by the public sector and two thirds by the private sector (DLS 1994 p147). The Annual Survey of the construction industries in 1992 prepared by the Statistics Department of Malaysia (1992 p25) indicates that the Gross Value of output of this sector in 1992 was RM 19,634,765,000 for both the private and public sector. The Ministry of Finance (1994 p61) in their analysis of sectoral performance of the Malaysian construction industry, concludes that the construction Industry is expected to maintain its double digit growth for the sixth consecutive year. The report highlights that the reason for this sustained growth is largely due to increased spending on infrastructure, residential and industrial construction activities.

Mohammed Din (1994 p3) confirms that the role of the client is to generate the finance, information and authority necessary to embark on the process of obtaining a building.

Funding

The MBAM (1984b p24) and Keat (1989b p3) identify that the major forms of financial institutions which provide finance for public construction projects include the government or public sector, whilst for private sector they principally comprise of commercial banks, finance companies and merchant banks.

Lin (1985 p11) also acknowledged this resistance to providing equitable finance for the construction industry suggesting that if contractors fail to secure funds for their projects, it is likely to result in the delays in the implementation of construction projects throughout the industry. Wang (1987 p77) and Moggie (1989 p12) confirm that although Malaysia is witnessing rapid expansion in terms of her construction industry, due to the difficulty in obtaining finance, the majority of contractors have been unable to develop sophisticated skills in financial management. Lam Tsun Ip (1990, p40) further comments on the reluctance to support the construction industry by financial institution in Malaysia and goes on to state that Malaysian Banks are "ultra-conservative" in their lending policies.

Peng (1995 p11) and Wang (1995 p11) identify that there is an urgent need for the introduction of supportive financial policies by lenders and particularly the Central Bank (Bank Negara) to all construction companies admittance to equitable finance and credit facilities. This is considered to be a pre-requisite to the advancement of the construction industry in Malaysia.

Design

The function of Design is organised in a similar way to the UK construction Industry which is a consequence of the continual links between the two countries, especially in education and professional affiliation. One of the major characteristics of the industry however is that the growth rate of the industry is greater than the supply and capacity of indigenous consultants and specialists. This results in the continual demand for foreign consultants and experts (BOTB 1974 p MS36 and Kumarasaivam 1985 p35). Tan (1990 p53) identifies that the major limitation of the industry as:

> "given the robust economic growth, there may not be sufficient numbers to cope with the volume of work .... To cope, we may have to rely on imported labour and additional professional personnel for the next few years to augment local resources".

Due to rapid expansion and implementation of development policies in Malaysia, there is an acute demand for skilled, experienced consultants and contractors. The

Ministry of Finance (1995 p166-170) have identified that the major importation of contractor and professional services comes from Japan, the UK, France and the USA, with each country exporting (millions) 519.3RM, 181.5RM, 181.7RM and 101.7RM to Malaysia in 1994. As such the percentage share of the market of imported contractors and consultants in 1994 was 43.29% by Japan, 15.1% by the UK, 15.1% by France and 8.5% by the USA. It is recognised that if the expertise (competence) and advanced technology required is not available locally, Malaysia will have to continue to import such competencies in the area of contract and professional services. In order to reduce expenditure on such important and develop such skills indigenously.

The Architect

Yong (1986 p6) confirms that the role of the architect is considered to be one of the project leader, who should work in co-operation with other consultants and bodies to effectively implement the project. In this role the architect is the team leader and is assigned responsibility but does not own all of the authority for the project. The traditional responsibility of the architect is to arrange and co-ordinate the project, during the design and construction phase. The role of the architect often includes the development of the clients brief, submitting the application for development, obtaining the development order, production of designs, the submission of building plans for approval by the various approving authorities and the administration of the contract between the client and the contractor. The architect will be involved in the both concept and detailed design (with the assistance of other design consultants), and will usually take on the role of supervising the execution of the works.

Statistics indicate that in the USA, there are approximately 5.3 architects per 10,000 urban population. In contrasted Malaysia, has 2.9 architects per 10,000 urban population.

The Engineer

Assistance is provided to the architect by structural and mechanical engineers in the detailed design stage. The broad category of engineers includes structural, mechanical, electrical and civil engineers. They are required to be registered by their respective boards, under the 1967 Registration of Engineers Act. The engineer is principally involved in the preparation of detailed designs, and the submission of plans for approval by the appropriate authorities. Particularly in the public sector, the engineer is frequently involved in the supervision of the construction works on site and the installation of specialist equipment in the project.

The Quantity Surveyor

Wang (1987 p8) outlines the traditional role of the QS, which include the preparation of a Bill of Quantities (B of Q's), preparation of tender and contract documentation, tender analysis, interim and period payments, and the preparation of the final account of the project. Hashim (1995 p10) analyses the role of the QS in Malaysia, suggesting that the range of services which they currently offer have been developed from the Royal Institute of Chartered Surveyors publication, 'The Services of the Chartered Quantity Surveyor'.

Constructors

The majority of constructors in the market are "small contractors" in terms of the value of work they can undertake and their number of employees (Lin 1985 p11). There is a three tier structure of contracting organisations which operate in the market, including:

a) General Contractors
b) Specialist Contractors
c) Labour Subcontractors

(Wang 1991 p90)

Sulaiman (1995 p4-5) confirms that the industry is fragmented and is made up of many small firms, a number of large contracting organisations, and suggests that

there are a great number of subcontractors operating in the industry.

Figures released by the Statistics Department Malaysia (1993) on the construction industry in 1992, show that the total number of contractors which officially operate within the industry is 6,991; of which 5123 companies are small (employing less than 49 employees), 1,481 are medium sized (employing 50 to 199 employees) and 387 are large (employing 200 and over employees) (see table 4.6.1). These statistics have been established from contractors who have reported that their value of work is MR 100,000 annually or above. All those contractors with a value of work below MR 100,000, were not included in the survey figures. Consequently, there are many contractors which are not registered or included in such studies, and which continue to operate in the market.

Year	Number of Contractors	Total Value of Output	Total Employed
1983	5,101	9,108,806	306,412
1984	5,377	9,702,165	297,811
1985	5,187	9,648,075	294,065
1986	5,011	8,026,323	250,172
1987	4,595	5,914,975	195,632
1988	4,882	6,187,098	201,576
1989	5,499	8,288,596	250,481
1990	6,012	11,938,881	305,547
1991	6,610	15,573,500	362,748
1992	6,991	19,634,765	425,285

Table 4.6.1: Number of registered Companies with an annual turnover of RM 100,000 and above between 1983-1992

Source: Statistics Department Malaysia. (1993 p25)

The firms whose reported work per annum is MR 100,000 and over, undertake 97% of the construction sectors output, but only account for 10% of the total number of construction companies who operate in the industry, irrespective of reported value of work (DLS 1994 p47). The explanatory notes to the survey indicate that in 1991, 6,610 companies were reported to have a turnover of MR 100,000 and over, which

constituted 98% of the total value of construction work in the industry, representing 25% of the total number of contracting establishments operating in the industry (Department of Statistics 1993 p20). The actual number of contractors which operate in the market is difficult to calculate, as there are numerous registration bodies in both the public and private sector. Registration bodies in the private sector include, PAM, Bumiputra Contractors Association, and the MBAM (Wang 1987 p75).

The size of the various contractors who have an annual output of MR 100,000 or more in 1992 is shown in table 4.6.2. The figures indicate that the majority of companies are small in terms of employees. Over 73% of companies which were included in this survey employ between 1 and 49 employees (recognised standard classification of small companies). Such small companies carry out nearly 20% of the gross value of work executed in the industry.

In contrast, the large companies (classified as those comprising of 200 and more employees) make up 5.54% of the total number of companies with work value of RM 100,000 or above in 1992. As expected, such companies carry out 48.81% of the total value of work in the industry.

Classification of Company/ Number of Employees	**Number of Companies**	**Total Value of Output (RM'000)**	**Total Employed**
Less than 5	215	48,591	776
5-9	1,221	348,684	8,570
10-19	1,806	974,527	25,076
20-29	897	922,159	21,608
30-49	982	1,597,583	37,049
50-99	960	2,765,303	66,213
100-199	521	3,394,153	71,817
200-499	292	3,991,686	88,932
500-999	65	1,962,614	43,777
1000 and above	30	3,629,465	61,467
Total	6,991	19,634,765	425,285

Table 4.6.2: Principle Statistics of Construction Industries, by size of Contractor 1992
Source: Statistics Department Malaysia (1993 p29)

Statistics provided by the Construction Industry Development Board (Malaysia) (CIDB), compiled by the Contractors Service Division, Ministry of Public Enterprises are illustrated in Table 4.6.4. The Ministry of Public Enterprises Maintain their own system of registration of contractors (Lam Tsun Ip, 1990 p69).

Sector of Industry	Number of registered Companies	Total Value of Output	Number of Employees
residential building	1,492	4,270,106	114,966
non-residential building	1,247	3,775,055	88,584
civil engineering	2,194	8,117,019	148,847
special trades	2,058	3,472,585	72,888
total	6,991	19,634,765	425,285

Table 4.6.4: Number of Registered Companies in Malaysia
Source: Construction Services Department

The duties of a single registration body for all contractors (public and private) is one of the proposed duties of the Construction Industry Development Board (CIDB). The development of such a board, whose overall objective was to cater for the needs of the construction sector, was first discussed in the late 1980's, but it was not until 1991 that recommendations were made to the government to establish a body which could carry out these functions. Consequently, the CIDB was officially established on 1 December 1994 (Mohammed 1995 p1).

The industry is beset with problems such as shortages of skilled labour, poor quality of workmanship, inadequate safety record and insufficient research activities, the CIDB was established to attempt to redress some of these issues. Mohammed (1995 p3) maintains that the registration and accreditation of all contractors by the CIDB will provide a form of national pre qualification system, and is expected to promote a more responsible and quality conscious attitude within the industry.

Peng (1993 p21) confirms that the Public Works Department Malaysian is the largest employer in the construction industry, contributing substantially to the demand for construction.

Dominant Procurement Systems in Malaysia

Ming (1990) reviews the historical development procurement systems in Singapore and Malaysia observes that:

> "Malaysia shares a common arrangement with Commonwealth Countries' procurement systems primarily through its administrative machinery inherited with independence from British colonialism".

1. Lump Sum General Contracting

This approach is regarded as the traditional conventional approach of procurement in Malaysia, and is characterised by the client engaging a design team, including an Architect, Engineer, Quantity Surveyor and other contract administration consultants to fully design the project and prepare tender documentation. The project will then be sent out to tender (either open or selective tendering) and finally a single contractor enters into a direct contract with the client to build the project in accordance with the design details (Kumarasivam 1985 p36, Yong 1986 p6, Mokhtar 1993 p2).

Kumarasivam (1985 p36) highlights that this approach requires the distinction of responsibility between the design and construction teams. Yong (1986, p6) further recognises that although under this system a single contractor becomes responsible to the client for completing the project in accordance with the contract, most of the actual construction work is performed by various sub-contractors. The contractual relationship is therefore between the client (initiator/promoter) and the general contractor, and between the general contractor and the individual subcontractor. The lump sum contract may be let on the basis of drawings and specifications, but more usually on the basis of a B of Q's (Wang 1987).

The advantages of the system include:

i. The client is aware of his/her financial commitment (once a tender has been accepted on completed designs), before construction commences on site.

ii. The architect has freedom to select the most suitable design to meet the clients requirements.

iii. Drawings and a B of Q's provide a basis for the evaluation of tenders.

iv. If a B of Q is used, prices which are included for the items of work can be used as a basis to adjust the contract sum in the event of any variations.

The disadvantages include:-

i. The system relies upon a sequential process of execution of activities.

ii. It may results in the contractor being in an opposing position to the designer and client.

iii. Unless tenders are called for and placed on fully completed designs, the client has reduced certainty of the final cost of the project before construction commences (Hassan (1994 p9).

iv. The competitive nature of lump sum general contracting has resulted in fierce competition amongst contractors, resulting in unrealistically low bids being given (Yong 1986, New Straits Times 1993, The Star 1994).

Mokhtar (1993 p2) confirms the use of this system of procurement in both public sector and in the private sector in Malaysia.

2. Design and Build (Turnkey)

Turnkey or Design and Build may be defined in its pure form as:

> "a single source of contract with a fixed price for the design, procurement, construction and commissioning of a facility in line with the owner's intentions".
>
> (Bahari 1986 p54)

It has been used in Malaysia since the early 1980's and its use has gradually increased and it is now one of the dominant procurement systems used in the public sector. The government promotion of this system has influenced its use substantially throughout the public and private sector, encouraged by the Public Works Department (JKR) setting up their own Turnkey Unit to manage turnkey projects (Lam Tsun Ip 1990 p142). Lam Tsun Ip clarifies that this arrangement is often referred to as "Turnkey" contracting.

The Design and Build arrangement is characterised by the client engaging a single contractor to undertake both the design and the construction of the proposed project (Mokhtar 1993 p3). The main contractor enters into a contract with the client to ensure both the function of design and the function of construction for a lump sum price. Consultants may be appointed by the client as well as the main contractor. Kumarasivam (1985 p36) indicates that consultants appointed by the client will be predominantly involved in the preparation of tender documentation, and concept design, evaluation of tenders, contract administration, and quality control during the project. As the majority of contractors do not have their own in house design departments, so design consultants are appointed to carry out detailed designs and specifications for the contractor.

The advantages include:-

i. The client has only to deal with one organisation for both the design and construction functions.

ii. There are contractually only two parties involved which results in little disputed responsibility in the event of defects.

iii. The popularity of this approach in many emerging nations is argued to be due to the systems ability to complete projects with greater speed than the traditional approach at a fixed price (UNCTC 1989 p33-34).

iv. Bahari (1986 p55) suggests that under the design and build system the planning, design and construction stages of the project are more streamline and co-ordinated, due to the improved management approach of this system, and because the contractor assumes most of the responsibility.

The disadvantages of the approach include:

i. Potentially higher costs with this approach when compared to general contracting or with separate trade contracting.

ii. The contractor is responsible for the detailed design, and often the concept design. Due to the contractors motivating force being price minimisation, a major critique of this approach is that the client is left with a basic designed building.

iii. This system is suggested not to be suitable for all projects, especially where specific technology or expertise is required during the design and construction of the project (UNCTC 1983 p11).

iv. Hassan (1994 p11) suggests that the system has the potential problem of being inflexible as once the client has produced his/her requirements changes to the original brief are considered to be substantially more expensive than under the traditional approach.

v. The client is often considered to have little knowledge/ information on the build-up of costs under this system.

3. Management Contracting

Mokhtar (1993 p3) identifies that the organisational structure of this system and describes this as being similar to the conventional approach to contracting, but with an independent manager involved. The duties of this manager are to manage and co-ordinate the project for the client, including the role of appointing and the administration of the design and other consultants for a fee, whilst the contractors are engaged directly by the client. Kumarasivam (1985 p38) defines this system as:

> "where after the client has appointed a design team, the client and the design team together appoint a management contractor, who then appoints all the works contractors to carry out the works on site".

In this system the total responsibility for design still rests with the designers. Consequently, the management contractor has responsibility for ensuring that each works contractor carries out the works in accordance with the design and specifications. For the client, the sole responsibility for supervision of the works rests with the management contractor.

Thevendran (1988 p9) indicates that the management contractor acts as a construction consultants. In order to facilitate parallel working the role of the management contractor commences at pre-tender stage, often during the design stage, until completion and handover of the works. The contractual links are between the client and the management contractor, and between the management contractor and the works contractors. The management contractor will be paid a fee for this service.

The advantages include:

i. It enables construction work to start on site more rapidly, as early work packages can be placed before the overall design is completed.

ii. Management contracting is considered to be flexible as it facilitates

design changes to be made at late stages during the project.

iii. The advantage of buildability are offered.

iv. The Management contractor takes full contractual responsibility for the works contractors and delays for non-performance of the works contractors on the project.

v. The client can benefit from potential cost savings, as all the works packages will be let separately on a competitive basis.

The disadvantages of this approach include:

i. The client is not given certainty of total building costs until all of the work packages have been successfully placed.

ii. This arrangement usually works best when the client's organisation has a sophisticated management structure, allowing decisions to be made easier.

Contract Documents

Lam Tsun Ip (1990 p106) analyses the construction contracts in Malaysia, beginning his commentary by stating that:

> "Many consultants and contractors alike had been used to taking the judicial decisions and text book principles of the predecessor UK forms as their guidelines".

The standard form of contract which is used by most public bodies and particularly by the 'Public Works Department' is known as the JKR (Jabatan Kerja Raya) (DLS 1994 p148). This contract comes in two varieties; JKR 203 A which is used for projects with a Bill of Quantities and JKR 203 for projects without a B of Q (Lam Tsun Ip 1990 p113). Robinson and Leavers (1988) suggest that the JKR form of

contract is based upon the RIBA 1931 standard form of contract.

Wang (1987 p74) discusses the use of standard conditions of contract in Malaysia, confirming that they often contain the name of the architect or engineer who will act as the Superintending Officer, entrusted with the duty of administering the contract. Wang highlights that such standard document are increasingly coming under scrutiny within the industry, due to the power that such documents grant to the superintending officer and to the client.

The Malaysian Institute of Architects (Pertubuhan Akitek Malaysia; PAM) and the Institute of Surveyors Malaysia (ISM) have produced their own 'Agreement and schedule of Conditions of Building Contract', which are used for the private sector, (referred to as the PAM69) (Lam Tsun Ip 1990 p111). The PAM69 has two versions; one for the use on projects with a Bill of Quantities, the other for projects without a B of Q. Lam Tsun Ip (p111) states:

> "except for amendments to suit local circumstances on matters like statutory notices and arbitration, the form is virtually a reproduction of Joint Contracts Tribunal 1963".

Foong & Sheng (1990 p175) confirms that the PAM standard conditions of contract adopted in Malaysia are closely related to the JCT forms recommended by the RIBA in the United Kingdom. They recognises the need for improvement of existing contracts and suggests that new contracts are require to be clear, incorporating standardised condition, reflecting a "fair and equitable" apportionment of responsibility between the parties involved.

In late 1988, the MBAM and The Bumiputra Contractors Association Malaysia (BCAM) in conjunction with the PAM began to make moves towards the revision of PAM69, producing a more equitable form of contract. Master Builders Association Malaysia (1989 p41) have called for the promotion and introduction of new fair and equitable forms of contract in the industry. The MBAM and the Bumiputra Contractors Association (BCA) have collectively made recommendations for the existing PAM contract to be reviewed and have made them fair and equitable towards

contractors and more appropriate for the Malaysian construction industry. Discussions are still taking place on this issue.

Criticism has been increasingly levied at the PAM69 contract (which is modelled on JCT63) due to its lack of clarity in terms of contractual rights, liabilities and obligations between the parties. This continual and prolonged use of this document has resulted in the construction industry requesting the development of a new standard form of contract which adequately deals with the areas suggested (Kok Mow On, 1994 p47).

The Procurement Systems Models

From the literature review relating to the dominant procurement systems which exist in Malaysia the Procurement Systems Models (PSM's) have been established. The PSM's have been validated by the questionnaire survey and further verified through interviews with respondents from the construction industry in Malaysia. The results of the questionnaire and interviews are shown in Appendix A5 (i), (ii), (iii) and (iv).

Results from the Questionnaires Regarding Dominant Building Procurement Systems in Malaysia

The questionnaires sent to respondents in Malaysia were system specific as discussed in Chapter 2. The literature review identified that there are three dominant building procurement systems in Malaysia. Each of the questionnaires were designed to be answered with regards to: The traditional lump sum system, design and build and management contracting. In addition to one of each of the system specific questionnaires, a non-specific questionnaire was also sent to each respondent to identify the existence of a non-represented dominant procurement system in operation in Malaysia.

Eighty sets of questionnaires were originally distributed by mail, and twenty eight were returned, giving a response rate of (35%) thirty five per cent.

Attempts were made to increase the response rate by follow up letters, telephone calls, faxcimile transmissions and finally by redistributing the questionnaires to respondents who had not previously replied. The completed questionnaires come from a range of respondents including four initiator/promoters, ten designers, eleven constructors and three academics. Although attempts were made to collect responses from funders, no questionnaires were returned from this category of respondents. Due to the qualitative nature of the questionnaires and the degree of consistency between respondents, it was considered that the lack of response from some categories of respondents does not substantially affect the results obtained.

The results of the questionnaire survey have been summarised and were used to validate the accuracy of the procurement system models which had predominantly been established from literature.

The results form each questionnaire are illustrated in Appendix A tables A5 (i), (ii) and (ii). Each table indicates the number of respondents which returned the questionnaire and identifies the response given to each question. The table further identifies the number of completed questionnaires analysed, the respondent category, and also how each question used in the questionnaire relates to the various elements which are included in the procurement systems model.

The responses to each question have been coded in accordance with the coding system identified in chapter two. All of the questionnaire responses used in this investigation have used this coding system.

Where either the question was not answered by the respondent, or where the question did not apply, an asterisk (*) was inserted into the table. The tables also provides a summary of the predominant response to each question, which is used to validate and readjust the PSM's. The predominant response to each question has been calculated by identifying the most widely expressed response. Where there are several responses which are equally represented they have all been added to the summary of predominant response. During the interviews to verify the PSM's, respondents were asked to clarify which of the responses summarised by the questionnaire were predominant.

The results of the questionnaire survey have been used to validate the PSM and make any readjustments which needed to be made to the models. The models were further validated during the interviews (summarised in Appendix A table A5 (iv). During the verification process of the PSM's, interviewees were asked to comment on which of the predominant responses summarised by the questionnaire survey was the most likely answer. The models were then confirmed of the dominant procurement systems in Malaysia.

The verified PSM for each of the dominant building procurement systems are identified below along with the organisational chart for each system which indicates the formal relationships between the various participants and the primary advantages and disadvantages of each system.

Figure 4.6.1: Model M1

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist					✓		
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/ Promoter			✓	✓	✓	✓		✓
Funder		✓						
Designer	Schematic	✓						
	Detailed	✓						
	Specialist	✓						
Constructor	Manager							
	Producer	✓						

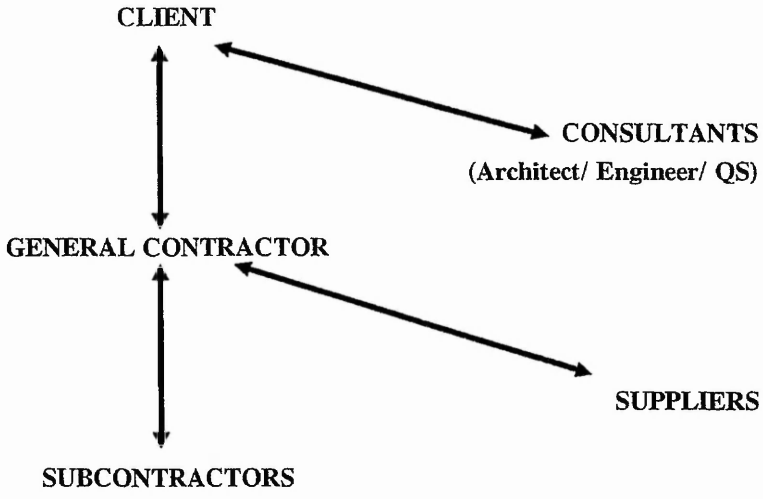
Framework 3; Functional Role against Risk: indicating who carries the higher risk of each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		
Project Finance			*					
Effectiveness of Building in operation				*	*			
Quality of work								*

Country: Malaysia **Model Type:** M1 (Traditional Lump Sum)

Figure 4.6.2: ORGANISATIONAL CHART FOR THE MALAYSIAN TRADITIONAL LUMP SUM PROCUREMENT SYSTEM

CONTRACTUAL RELATIONSHIP



ADVANTAGES	DISADVANTAGES
costs known before construction starts	due to competition unrealistically low bids
market forces and certainty	slow to start on site (no parallel working)
satisfactory public accountability	contractor not involved in design or planning
procedures well known	(no buildability)
designs are suited to clients requirements	tenders often called on incomplete designs
easy to evaluate tenders due to use of B of Q	resulting in reduced cost certainty
easy to value changes	

Figure 4.6.3: Model M2

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed							✓
	Specialist							✓
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/ Promoter			✓	✓				✓
Funder		✓						
Designer	Schematic	✓						
	Detailed							✓
	Specialist							✓
Constructor	Manager							
	Producer	✓			✓	✓		

Framework 3; Functional Role against Risk: indicating who carries the higher risk of each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic			*				
	Detailed							*
	Specialist							*
Project Finance			*					
Effectiveness of Building in operation		*						*
Quality of work								*

Country: Malaysia **Model Type:** M2 (Design & Build)

Figure 4.6.4: Model M3

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic							✓
	Detailed							✓
	Specialist							✓
Construct;	Management							✓
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/ Promoter			✓					✓
Funder		✓						
Designer	Schematic							✓
	Detailed							✓
	Specialist							✓
Constructor	Management							
	Product	✓		✓	✓	✓		

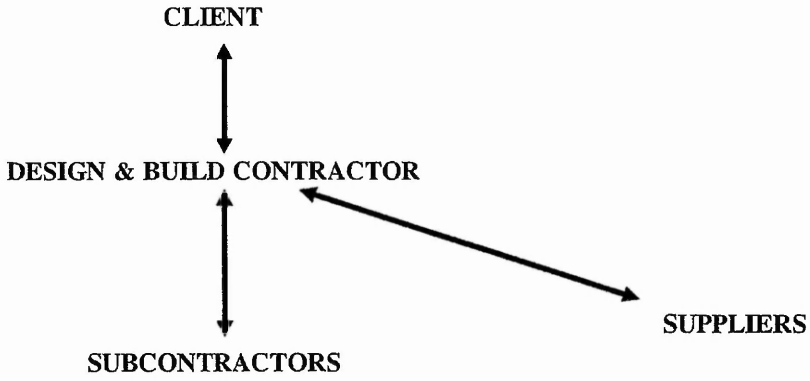
Framework 3; Functional Role against Risk: indicating who carries the higher risk of each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time								*
Price Determination								*
Design Liability	Schematic							*
	Detailed							*
	Specialist							*
Project Finance			*					
Effectiveness of Building in operation		*						*
Quality of work								*

Country: Malaysia **Model Type:** M3 (Design & Build:Turnkey)

Figure 4.6.5: ORGANISATIONAL CHART FOR THE MALAYSIAN DESIGN & BUILD PROCUREMENT SYSTEM

CONTRACTUAL RELATIONSHIP



ADVANTAGES	DISADVANTAGES
single point contract and responsibility	higher costs than lump sum contracting
inherent buildability	client need to commit himself before design complete
early firm price possible	designs often compromised due to cost
reduced total project time	no design overview unless consultants appointed
parallel working possible	changes are expensive once contractor is appointed

Figure 4.6.6: Model M4

Framework 1; Functional Role against Functional Process: indicating who carries out each function.

ROLE / PROCESS		Initiator/ Promoter	Funder	Designer sch.	Designer det.	Designer spe.	Constructor Manager	Constructor Producer
Initiate/ Promote		✓						
Fund			✓					
Design;	Schematic			✓				
	Detailed				✓			
	Specialist					✓		
Construct;	Management						✓	
	Product							✓

Framework 2; Functional Roles against Formal Relationships: indicating who has a formal relationship with whom.

ROLE / FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Initiator/ Promoter			✓	✓	✓	✓	✓	
Funder		✓						
Designer	Schematic	✓						
	Detailed	✓						
	Specialist	✓						
Constructor	Manager	✓						✓
	Producer						✓	

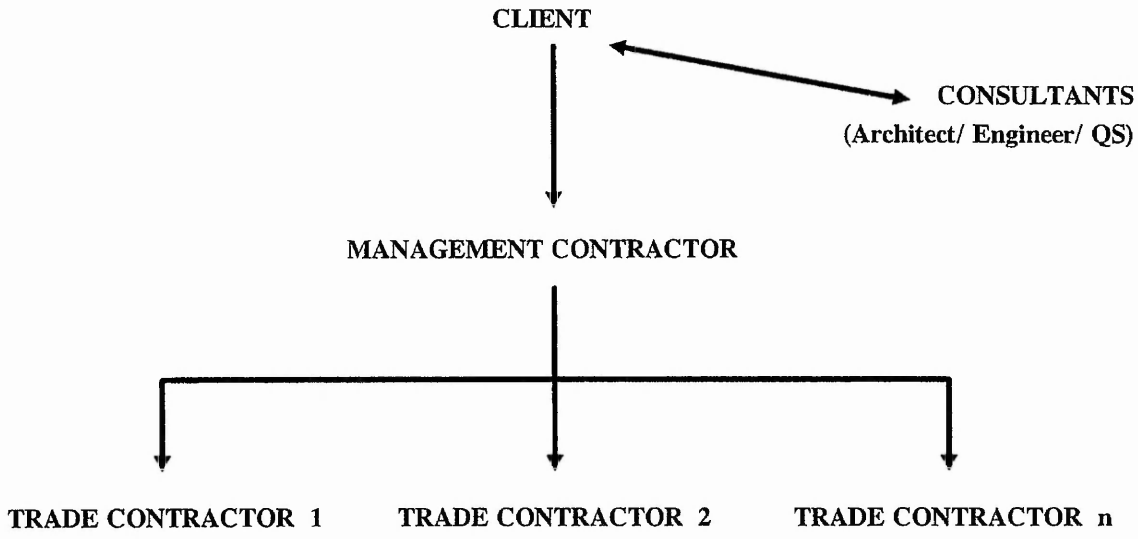
Framework 3; Functional Role against Risk: indicating who carries the higher risk of each identified risk.

ROLE / RISK		Initiator/ Promoter	Funder	Designer Sch.	Designer Det.	Designer Spe.	Constructor Manager	Constructor Producer
Time							*	
Price Determination							*	
Design Liability	Schematic			*				
	Detailed				*			
	Specialist					*		
Project Finance			*					
Effectiveness of Building in operation				*				
Quality of work							*	*

Country: Malaysia **Model Type:** M4 (Management Contracting)

Figure 4.6.7: ORGANISATIONAL CHART FOR THE MALAYSIAN MANAGEMENT CONTRACTING PROCUREMENT SYSTEM

CONTRACTUAL ARRANGEMENT



ADVANTAGES	DISADVANTAGES
early start on site (parallel working)	client has low certainty of total price
flexible as it facilitates late design changes	requires a sophisticated client to work well
inherent buildability	
management contractor takes responsibility for works contractors	
potential cost savings as work packages are let separately on a competitive basis	

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Summary

In this chapter the organisational structure by function and the various dominant building procurement systems which exist in a range of countries have been analysed. Procurement Systems Models (PSM's) organisational charts and procurement diagrams have subsequently been produced for each of the dominant systems which exist in the USA, Japan, France, the UK, India and Malaysia. As the models were initially established through literature, they were subsequently validated through a questionnaire survey. The questionnaire survey allowed the models to be validated and facilitated any readjustments required to the models. The models have been verified through a series of interviews with respondents from each country.

The validation and verification of the PSM's has provided evidence to suggest that the procurement systems model allows the identification and modelling of procurement systems in a range of countries. It is acknowledged that the PSM's have been used to model dominant procurement systems in each country, and may be further tested by being used to model all procurement systems which exist. The investigation has identified that various forms of each of the procurement systems identified can occur in each country. The PSM's developed illustrate the configuration of the most widely used procurement system. The results of the surveys conducted with respondents from each country have corroborated that each PSM illustrates the most widely used variant of each indigenous procurement system.

The PSM's have allowed the identification of dominant procurement systems which exist in more than one country and further allow the comparison of procurement systems between countries. Having modelled dominant procurement systems by the functional approach in each country and subsequently validated and verified each of the models produced, it is possible to compare the existence of common procurement systems between countries. Although it is recognised that the intricate operating procedures of each systems will be country specific, the PSM's have facilitated the comparison of models to identify the existence of dominant procurement systems in a range of countries based upon functions.

By applying the procurement categorisation system proposed by Masterman (1992 p3) it is possible to identify whether separated and co-operative procurement systems, integrated procurement systems and/or management orientated procurement systems exist in the countries under investigation.

Each of the verified PSM's are further analysed to establish whether:-

a) The responsibility of the design function and construction function are assumed by separate participants in the procurement systems.

b) The responsibility of the design function and the construction function are assumed by one participant in the procurement system.

c) Emphasis is placed upon the overall management of the construction process function either the designer or manager of construction is involved in the management process, whilst the construction function is executed by package or work based constructors.

This information is obtained from the three frameworks which make up the PSM's and table 4.7 identifies the categorisation of common PSM's between countries.

The process of modelling dominant procurement systems by functional analysis has provided evidence to support hypothesis 1: Building procurement systems can be objectively modelled by the user of a theoretical functional framework. Having modelled the various dominant procurement systems in each country, the PSM's produced may be compared between the countries under study to further allow the analysis of the range of key competencies and resources which are required to be available in order for each dominant system to operate effectively.

Table 4.7: Categorisation of common PSM's between countries

Country	Dominant Procurement Systems Validated & Verified PSM	Masterman's Categorisation
UK	Traditional Lump Sum	Separated
	Design and Build	Integrated
	Management Contracting	Management
	Construction Management	Management
	Lots Separes	Management
France	Entreprise General	Separated
	Groupement D'entreprise Solidares	Management
	Groupement D'entreprise Conjointes	Management
	Lump Sum; Design, Tender, Construct	Separated
Japan	Design & Build	Integrated
	Joint Venture Lump Sum Design, Tender, Construct	Separated
	Joint Venture Design and Build	Integrated
	Traditional Lump Sum	Separated
USA	Design & Build	Integrated
	Pure Construction Management	Management
	Construction Management/ Independent Contractor	Management
	Lump Sum Contracts	Separated
	Measurement Contracts	Separated
India	Cost Plus Contracts	Separated
	Design & Build	Integrated
	Piece Work Contracts	Management
	Lump Sum Contracts	Separated
	Design & Build	Integrated
Malaysia	Management Contracting	Management

CHAPTER FIVE

FUNCTIONAL COMPETENCIES

Introduction

The analysis of building procurement systems in the six countries under investigation has shown that although the organisational structure and the participants involved in the building procurement process varies in each country, similar procurement systems exist. The dominant procurement systems in each country have been identified and modelled using the functional approach to procurement. The analysis of procurement systems using the PSM has facilitated the objective comparison of dominant procurement systems. The examinations of the PSM's has shown that some procurement systems are common to more than one of the countries under investigation.

The PSM from each country have been categorised in accordance with system proposed by Masterman (1992 p3) as either separated and cooperative procurement systems integrated procurement systems or management orientated procurement systems.

The PSM's which have been established are used to facilitate the analysis and identification of the key competencies and resources which are required to be available in order to operate a particular dominant procurement system in an effective way (see figure 1.1). Previously published research into competency theory is analysed and the methodology which have been developed by this approach is applied to the analysis of the key competencies and resources required to operate a dominant procurement system.

The examination of the key functional competencies which are required to operate a particular procurement category is consistent with the five generic functions of procurement identified. For each of the three categories of procurement systems each function has been isolated and examined to identify the competencies required to be available in order to execute each function. The functions will depend upon the availability of the supply of resources such as finance, materials and manpower. These resources must be available in adequate amount and of satisfactory quality at the time they are required. The key competencies needed to operate any procurement system effectively using these resources must be in place. It is proposed that if

resources are not available within a country then the procurement system will operate ineffectively.

The functions of procurement include to initiate/promote, fund, design, construct, and allocation of risk. In identifying the key competencies it is proposed that there are a range of generic, common and specific key competencies needed to operate a particular procurement system. It is contended that in order to operate a particular procurement system effectively an array of key competencies must be available. If such competencies are not available indigenously, they may be imported in order to effectively operate the chosen procurement system. If such competencies are not available indigenously and are not imported, it is contended that the procurement system chosen will only operate at an ineffective level.

This section concerns the development of the second hypothesis in the investigation. The origins of the "Competency" approach will be outlined, illustrating its purpose, application and relative limitations when applied to procurement systems. This is followed by the identification of the generic key competencies needed and a review of the array specific key competencies which are required to operate common procurement systems which exist in more than one country. The particular procurement system which have been considered include the Lump sum design, tender and construct system, design and build and construction management.

The Competency Approach

During the 1960's in the USA a new concept of education and training emerged based on 'competency'. The approach began by analysing the professional roles and responsibilities in order to determine the specifications of competency based programmes (Stewart & Sambrook 1995 p95). The work of Boyatzis (1982 p11) concentrated upon the development of competency models related to the traits of managerial jobs. Boyatzis began his analysis by discussing the requirements for effective performance of 'a job' which may be assessed by the attainment of output objectives (results) or the appropriate execution of procedure and processes. The definition he provides for effective job performance is:

> "The attainment of specific results (outcomes) required by the job through specific actions while maintaining or being consistent with policies, procedures and conditions of the organisational environment."
>
> (Boyatzis 1982 p11)

Boyatzis (1982 p12) suggests that the characteristics or abilities of an individual enable him/her to demonstrate appropriate specific actions and these characteristics are known as competencies which all occur in the context of a specific organisation, group, job or role. He identifies Klemp's (1980) definition of job competency as: "an underlying characteristic of a person which results in effective and/or superior performance in a job" and goes further to suggest that a job competency is:

> "an underlying characteristic of a person in that it may be a motive, trait, skill, aspect of ones self-image or social role, or a body of knowledge which he or she uses".
>
> (Boyatzis 1982 p21)

The manifestation of competencies are developed in the context of the requirements and demands of a specific organisation or job. Boyatzis (1982 p20) also highlights how the social-economical, political and the religious status of the culture in which an organisation exists will affect the competencies associated with a specific job or role within the organisation. Stewart & Sambrook (1995 p97) propose that this concept of competence has two characteristics, firstly that competence consists of particular and specific behaviours by individuals and that these behaviours are associated with personal qualities which can be learned and developed.

The competencies model developed by Boyatzis (1982 p13) entitled 'A model of effective job performance' (fig. 5.1) consists of three key components:-

i) the individuals competencies

ii) the particular job's demands and

iii) the 'organisational environment' in which the job is carried out.

The 'individual competencies' illustrates what a person is capable of doing, and why

they may act in a certain way in a specific job. The 'job demands' reveals what a person in a particular job is expected to do, whilst the 'organisational environment' defines how an individual is expected to respond to the demands of a particular job. The model may be summarised by suggesting that effective action (or performance) can only occur when all three of the components 'fit' and of any of these components are inconsistent then it is expected that ineffective action will result. If any two of the models components are consistent, then there is increased likelihood that effective action (performance) will occur (Boyatzis 1982 p14).

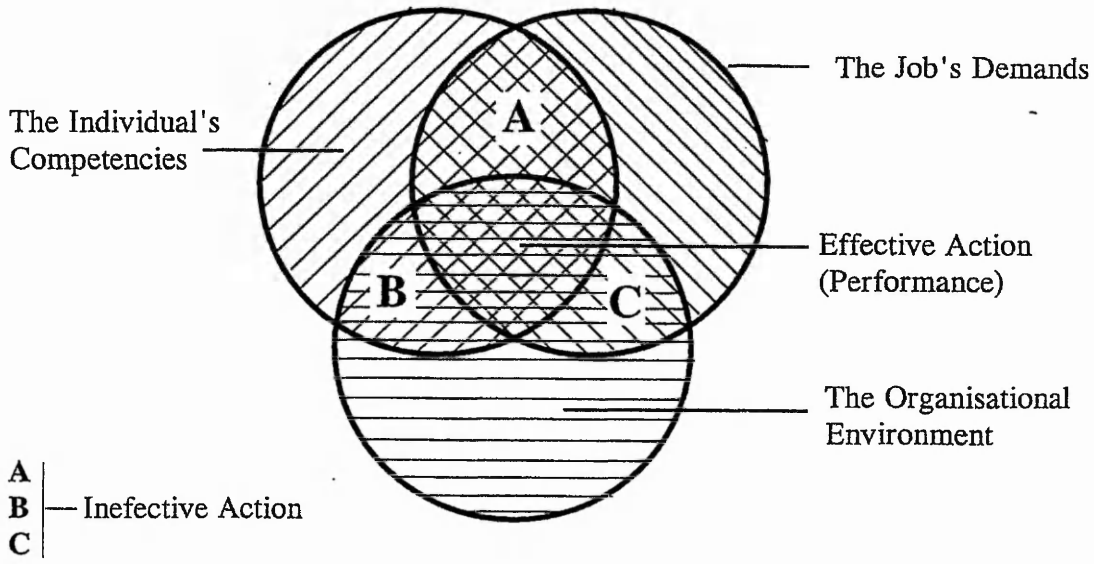

Fig 5.1: A model of effective job performance
Source: Boyatzis (1982) p13

The identification of competencies is a difficult process and is often misinterpreted as competencies may be a motive, trait, aspect of the persons self-image or social role, skill or a body or knowledge which he or she uses. Boyatzis (1982 p23) suggests that:

> ".... a persons set of competencies reflects his/her capabilities, describing what he or she can do, but not necessarily what he/she does, nor does all the time regardless of the situation or setting ....".

Consequently Boyatzis (1982 p23) distinguishes between "threshold competency" and "competencies". He defines "threshold competency" as:

> ".... a persons generic knowledge, motive, traits, self image, social role or skill which is essential to performing a job, but is not causally related to superior job performance ....".

Conversely, Boyatzis defines "competencies" as:

> ".... characteristics that are casually related to effective and/or superior performance in a job ...."

Because individuals possess different traits, skills and specialist knowledge, different levels of competencies are described/identified (Boyatzis 1982 p25). He concludes that such competencies are required to be identified and empirically determined in order for the model to operate. He suggests that as competencies are related to the effective performance of a particular job, within a specific organisational environment, the models must be developed and tested for each job. Consequently, the validated competencies in each model will be related to the functional and task demands of jobs, as well as to aspects of the organisational environment (Boyatzis 1982 p249).

The competency approach was used in the UK in the early 1980's in vocational training. In the "White Paper: A New Training Initiative" (DOE 1981) the Manpower Services Commission made a commitment towards the development of vocational education and training based upon the concept of competence (Elkin 1990 p1). Homes (1994) suggests that the style of the 1981 White Paper clearly had its roots based in the competency approach with its emphasis on standards and employment corresponding clearly with emerging themes concerning competitive success and economic criteria. Each occupation was being examined to identify the tasks, skill, knowledge and experience required to carry out that job. Stewart & Sambrook (1995 p95) identify that this approach concentrated around task analysis, which resulted in the occupational standards produced being narrow interpretations of competencies as they neglected to adequately describe the broader concept of competence, such as associated planning, management and environmental interaction.

Jessup (1991 p27) contrasts the traditional approach taken to vocational training which had concentrated on task analysis with the new approach which adopts a functional analysis of competencies. He suggests that the functional analysis and competency approach provides a broader conception of competence than the task analysis approach. He recognised that the task analysis approach often neglected the wider aspects of performance required to fulfil a work role suggesting that there is more to being successful in a job than carrying out the basic tasks competently. Jessup advocates that the move towards using functional analysis in the identification of competence shifts the focus from concentrating upon tasks and procedures to the purpose and outcome of work activity which takes account of changes in technology and working procedure. As such a more realistic and demanded level of skills will be produced. Functional analysis itself is based upon the Job Competency Model produced by Mansfield and Mathews (1985) (fig.5.2).

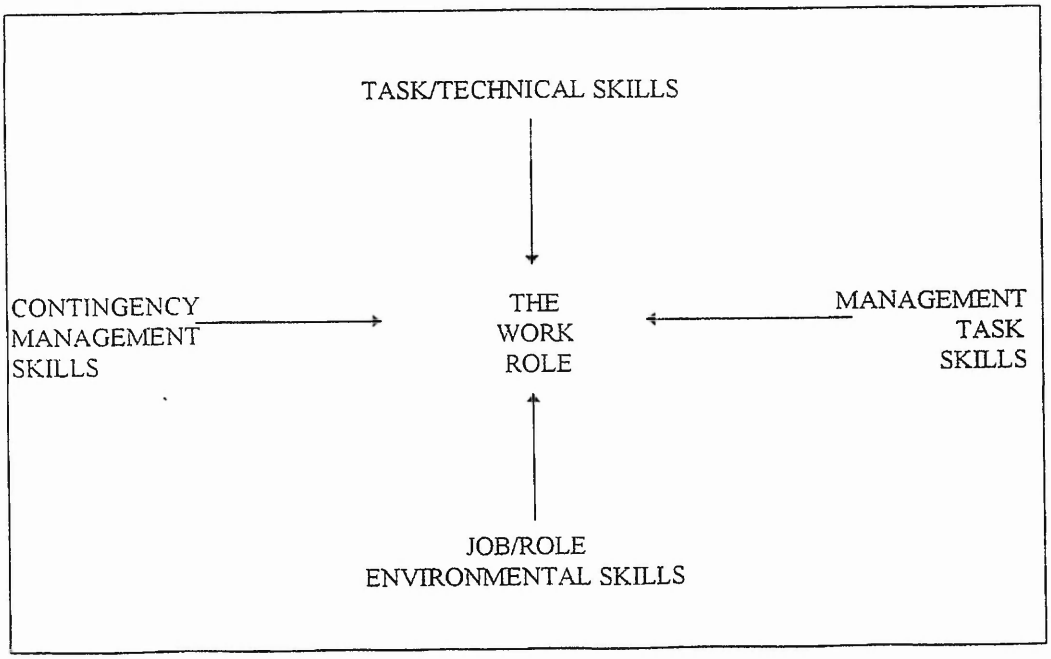

Fig. 5.2: The Job Competence Model (based on Mansfield & Mathews 1985)
Source: Stewart & Sambrook (1995 p96)

The model suggests that there are four components which are required for competent performance which including:

i) Technical Skill:- the ability to carry out the technical aspects of the role, which through application of specific activities produced tangible products or outputs.

ii) Contingency Management Skill:- the ability to cope with expected and unexpected conditions. This competency is associated with process management decision making and problem solving.

iii) Task Management Skill:- allow the job holder to manage and coordinate different components of the work role to meet targets and objectives.

iv) Job/Role Environment Skill:- the ability to perform the role in particular environments which have specific characteristics.

Functional analysis is therefore designed to identify the specific content of each component of the Job Competency Model in relation to any particular occupation. The first stage of functional analysis (referred to as occupational mapping) establishes the limits of the focus of the analysis, achieved by specifying the occupational area and then identifying the occupation to be analysed. This is followed by determining the key purpose of the chosen occupational area which is expressed in output terms (or what is done). These first two stages in function analysis will produce a statement or key purpose which is applicable to a whole occupation, organisations, departments and/or individuals (Stewart & Sambrook 1995 p99).

The next process involved in functional analysis consists of segregating the key purpose (or overall function) into statements of competence (or primary functions). This is achieved by posing the question "what needs to happen for this to be achieved?". The process of segregation continues until a list of Units (or sub-functions) which are associated with the work of an individual in a specific role are identified. The functional analysis continues until the unit elements of competency and performance criteria have been identified. Performance criteria are required of

each element of competence in order to describe competent performance in the form of critical outcomes of all the components in the Job of Competency Model (Stewart & Sambrook 1995 p100).

In an analysis of development of National Vocational Qualifications (NVQ's) Ellis (1992 p202) discusses the development of the NVQ standards, which began with establishing descriptions of occupational competencies related to the key purpose in broad terms of an occupational sector using functional analyses. Once the key purpose has been established, further analysis is carried out to break down the key purpose into smaller competencies. Mansfield's Job Competency Model (fig. 5.2) is used to identify the various components in each key purpose. Jessup (1991 p39) suggests that competencies are identified by primarily establishing the key purpose of the overall area of competence, which is then broken down into the primary functions which must be executed in order for the key purpose to be achieved. Once established the primary functions may be further divided into subfunctions, which themselves may again be further subdivided until each element of competence has been identified. Range statements are used to indicate the range of application of an element, providing guidance of what needs to be covered in developing competencies for each element in a range of circumstances. As such these range statements can have the effect of broadening the requirements of an element or conversely they can limit the range of its application.

Elkin (1990 p2) discusses the competency movement in Human Resource Development arguing that the definition of competency is often confused. He analyses the origins of the approach from the USA (Boyatzis) and its subsequent usage in the UK context. Elkin suggests that the current distinction of competencies include; 'macro' or generic competencies which relates to underlying characteristics of a person/people, whilst 'micro' competencies are detailed list of job or task competencies which are required to perform a specific job or role. He proposes that the competencies approach should focus to the identification of key competencies, which are themselves job/role specific and as such different competencies will be of key importance to different types of jobs.

In the identification of key competencies Elkin (1990 p5) recognises that there are three components to key competencies which include initial or orientation competencies which are largely micro competencies (or minimum criteria for recruitment), job competencies (also known as core competencies) which are those competencies which facilitate long term employment and development competencies which enables individuals, once core competencies have been achieved and maintained, to aspire to further growth. In the transition from core competencies to development competencies macro competencies become significant.

In conclusion Elkin (1990 p6) contends that within the competency framework focus should be directed to the identification of key competencies which relate to both the underlying characteristics of the individual and the specific task required to be performed.

Since the early 1980's the UK Government have made attempts to establish programmes as an initiative to create technically competent workforce in various industrial sectors. This has been illustrated through the development of National Vocational Qualifications (NVQ's) and Scottish Vocational Qualifications (SVQ's) based on the principles of 'competency' at the workplace. Watson (1992 p6) suggests that the reasoning behind the extensive use of the competencies approach in the field of training and education is because:

> ".... the opportunities presented by the competencies trend include the vital one of getting away from assessing people in terms of what formal academic knowledge they can learn and reproduce on paper. Instead we assess them in terms of what they can actually do ....".

In 1988 the UK government established a policy on vocational education which identified national standard of outcome for all occupations using the competency approach. The White Paper (HMSO 1988 p3) suggests that due to the increasing rapid changes which are occurring in the world in terms of demographics, technology, market opportunities and skill requirements, there is an increasing urgency for national powers to have a direct influence on training and skill offered by its workforce, through its framework of enterprise and economic progress. The analysis of UK competitors (particularly the USA, Germany and the Far East)

indicate that these countries are developing education and training systems to suit their own countries needs. The study proposed that these countries in particular value practical competencies as well as theoretical knowledge, with a belief of continuing education and training throughout life (HMSO 1988 p29).

The aim of the 1988 White Paper was to establish frameworks which recognise standards of competence in each job relevant to employment. These standards of competence are to be established by industry-led organisations covering all occupational groups and will be validated nationally (HMSO 1988 p30). The aim is thus to develop systems which allow individuals to build on their skills and experience throughout their working life; meeting the needs of individuals and employees (HMSO 1988 p32).

With regards to vocational education and training needs in the UK the White Paper (HMSO 1988 p32) states that:

> ".... a flexible and diversified training framework requires a system of nationally recognised qualifications which embody the standards of competencies required by employers and which allow for maximum mobility ....".

The National Council for Vocational Qualifications (NCVQ) was established by the UK Government in 1986 to develop and recognise national qualifications. The NVQ's were to be based on competence levels determined by the employers in industry and should have sufficient breadth to be the basis of further proposed development. It is anticipated that such a system of competence based qualifications will enable employers to focus their training efforts more precisely, encouraging individuals to build on their skills. Recognised NVQ's based on competencies are concerned with the performance requirements of individuals to do their work successfully and satisfactorily rather than concentrating upon knowledge (HMSO 1988).

The use of the competencies approach acts as the means by which key skill requirements and training needs can be defined, maintained and reviewed and it provides the lead in establishing standards of key occupations and for assessing and

accrediting learning achievements (HMSO 1988 p33).

The National Council for Vocational Qualifications (NCVQ) defines competence as:

> ".... the ability to perform the activities within an occupational area to the level of performance expected in employment....".
>
> (Jessup 1991 p25)

Jessup (1991 p25) recognises that this definition refers to the standards required in order to successfully perform an activity or function. He contrasts the meaning of competence in different work sectors and states:

> "In manufacturing this would relate to quality control standards required to produce a satisfactory product. In the performance of a service, it means meeting the requirements of a customer or client".

Jessup (1991) identifies that competency in a job is different from competency in an occupation or profession. The former competency refers to a person who is competent in a particular role and may mean that their competence is limited to a particular role in a particular organisation or environment. Occupation or professional competency is used to describe a person who possesses skills, knowledge and understanding which may be applied to a range of contexts in a variety of organisations or environments.

Jessup (1991 p16) analyses the definition of NVQ's provided by the NCVQ (1989) suggesting that the statements of competence used concentrates upon 'performance' which itself is central to the concept of competence, but also acknowledges that skills, knowledge and understanding are underpinning requirements to achieve performance. As such the national standards which have been incorporated into the NVQ's for a particular employment function are generally applicable to all organisations and contexts where that function is executed. Jessup (1991 p27-29) suggests that the use of such competencies according to function concentrates on purpose and outcomes of work activity. A critique of this approach is that as emphasis is being placed upon competency and performance, it is expected to be at the expense of knowledge and understanding of the principles which underpin competent performance. He identifies

however that knowledge of how performance will need to vary to more difficult circumstances are minimum requirements for competency standards at all levels.

A further suggested criticism of the approach is that the changes in technology and procedures are not explicitly accounted for in such training techniques. It is argued however that as such training techniques are based upon outputs and purpose rather than their inputs, changes in technology will be automatically accommodated for. According to Jessup (1991 p28):

> "specifying competency in respect to employment functions and outcomes, is helpful for they are less likely to change than the technology, the methods and procedures of achieving these outcomes".

With regards to the job competency model (fig. 5.2) Jessup (1991 p28) proposes that emphasis on role/environmental skill, task management and contingency management will result in the development of "core skill" associated with the job/role. These 'competencies' are considered to remain relevant as technology and working practices advance in a particular role or job. Such core skills are components of competence which are common to most roles/jobs and are therefore often referred to as generic competencies (Jessup 1991 p30).

Jessup (1991 p16-17) and Ellis (1992 p20) discuss the statement of competence used in the NVQ system recognising that they must meet certain technical requirements in order to fulfil the functions for which they have been designed. Each statement of competence in an occupation is presented in a common format, consists of a title, unit of competence and the elements of competence and performance criteria (see fig. 5.3). The statement of competence therefore explicitly details what a candidate must demonstrate in order to achieve an award of an NVQ and the performance criteria against which the candidate will be judged (Jessup 1991 p12).

In Figure 5.3 the title relates to the area of competence encompassed by the qualification at a particular level and describes an outcome accurately and consistently. The units of competence form a discrete activity or sub area of competence which are self contained achievements consisting of several elements of

competence that are required to carry out the overall job or area of work. Elements of competence provide detailed specifications of the competence and the performance criteria to be met and the range of circumstances in which the competence applies. The statement of competence is therefore a description of an action, behaviour, or outcome which a person should be able to demonstrate in a given job or role (Jessup 1991 p16-17, Ellis 1992, p200).

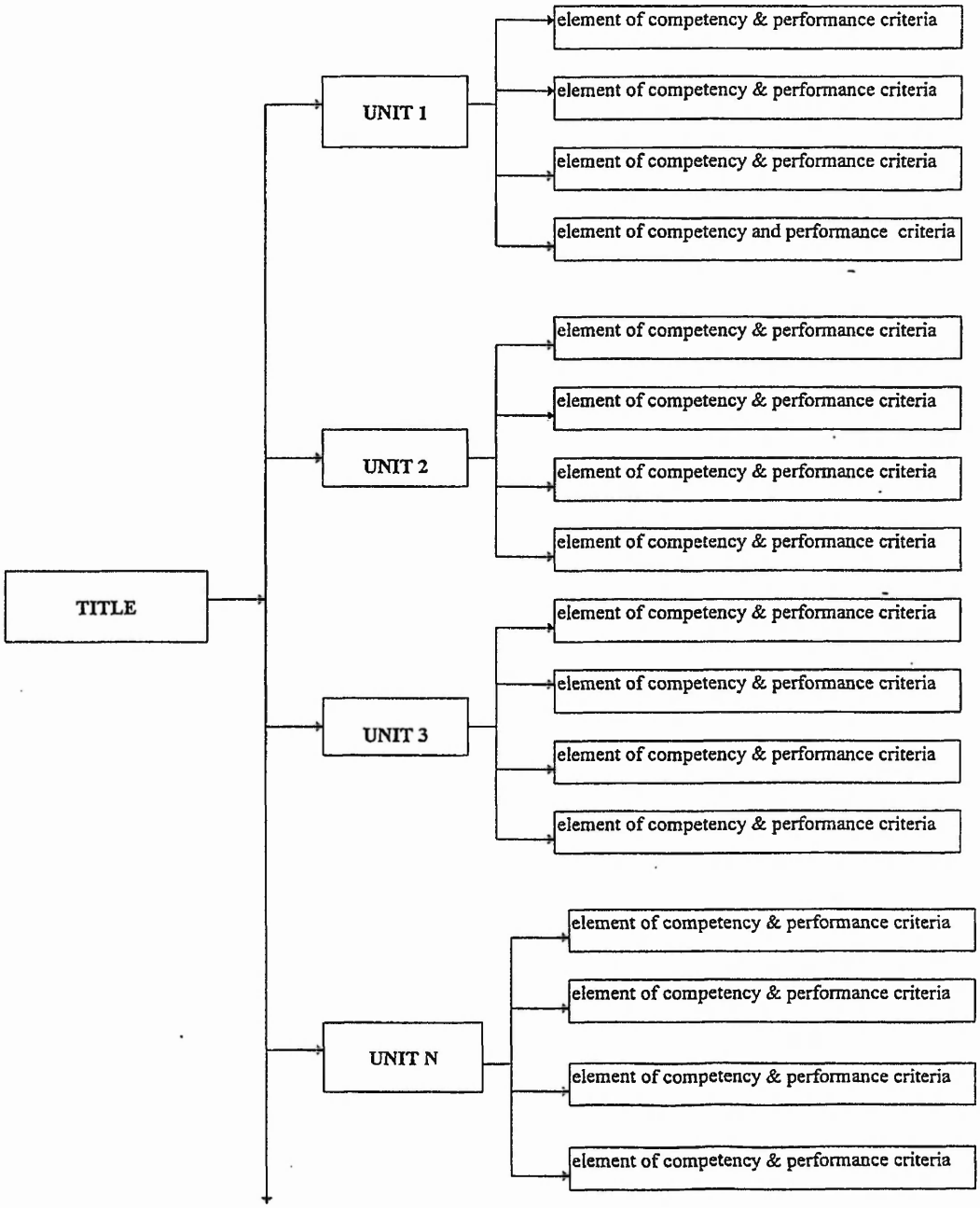

Fig 5.3: Format of the Statement of Competence of and NVQ.
Source: Jessup (1991 p17)

In discussion of the benefits of this approach Ellis (1992 p201) concludes that the performance criteria (which describes how well an element must be performed in a particular role or job) is a quality statement attached to the function detailed in the element. Multiple criteria are attached to each function, with each criteria representing a distinctive quality which is to be attained by the trainee. The complexity of the occupational requirements should all be represented in the statement of competence. Jessup (1991 p17) recognises that the element and performance criteria in the statement of competence influences the 'breadth' of competence included in the statement. He goes on to suggest that a major feature of such a system is that the NVQ statement of competence are derived from analysis of employment requirements. The concentration of NVQ's upon outputs and employment requirements has resulted in a direct need for employees and their representatives from industry to take part in the establishment of statements of competence. As such employers through institutions such as lead bodies, trade associations, professional institutions have a responsibility for determining the competencies which are required in a particular job or role (Jessup 1991 p18). Institutions are therefore involved in the supply of competencies which are being demanded within an industry. As these institutions have representatives from the employment sector the requirements of employees may continually be matched with the development of new competencies within the industry. The development process involved in creating a competent workforce is a dynamic one requiring continual updating and readjustment to meet the needs of the continually changing employment sector.

Jessup (1991 p40) recognises that during the early years of establishing NVQ's (1986-1987) there was limited understanding of how to establish and analyse occupational requirements and competencies. He identifies the importance of standards for qualifications and training being set by industry through industry lead bodies or other institutions within an industry. The lead bodies have normally been designed to set standards of competence for their respective industrial sector. The establishment of industry lead bodies have been carried out in the UK by the Government Training Agency, which contributes towards the funding for lead bodies and advice on their structure and direction. Elkin (1990 p1) and Jessup (1991 p40) maintain that other institutions such as professional institutions and trade associations have also

contributed in establishing standards, filling any gap in an industry and ensuing occupational coverage. According to Jessup (1991 p41):

> "Some professional bodies involved, either setting standards within their own sphere, or supporting standards setting in occupations for which they have some responsibility ..... fortunately, professions tend to be defined in respect to employment function rather than industry and will thus fit more readily into a competency broad framework".

Ellis (1992 p199) and Moohan (1992) further analyse how the responsibility for determining what competence is required for a particular occupational area is placed in the hands of the relevant sector of employment. They recognise that trade unions, professional bodies, and representatives of employer work in association with industry lead bodies in an endeavour to determine the competence and standards of performance required in industry. The study by Ennis, Lloyd and Patterson (1993a p2) investigates the competencies of a professional in the UK construction industry illustrating that professional institutions ensure that a professional consultant possesses a high degree of competence in a particular technical area. The authors also recognise that the various sector lead bodies are setting standards for these technical competencies to be achieved. With particular regards to the activities of professional institutions and their role in establishing levels of competency the authors state:

> "The professional institutions go beyond the learned society role of educating their members and expanding the areas of knowledge and understanding. Their members are the only ones able to identify incompetent performance. They also enforce standards to be observed by the members in their duties to come with clients and society at large"
>
> (Ennis, Lloyd & Patterson 1993a p14)

The lead body for the construction industry the Construction Industry Standing Conference (CISC) in 1994 established a range of standards which are a measure of what operatives and consultants should achieve in the workplace in the UK construction industry context. The standards are an associated development from an initiative known as the New Training Initiative (NTI) launched in 1981 by the Manpower Services Commissioner in the UK, which called for improvements in the training of the UK workers in an endeavour to establish a highly skilled and

technically competent workforce. NVQ's have since been developed to establish core competencies for employees of the UK construction industry (CISC 1994 p5).

CISC established in 1990 are a lead body consisting of groupings of employers, professional institutions and experienced practitioners representing the construction industry in the UK particularly for professional, managerial and technical occupation. The Construction Industry Training Board (CITB) are the lead body responsible for establishing craft and operative standards and contribute to the development of national qualifications including NVQ's and SVQ's (CISC 1994 p5).

The CISC's Occupational Standards (1994 p7) have been developed by analysing the defined purpose of the UK construction industry, and identifies the "key functions" which are required in order to achieve the purpose of the industry and finally to establish the competencies required to fulfil the key functions identified. The definition proposed by CISC (1994 p7) for the purpose of the construction industry is to:

> ".... establish, maintain and modify the use of the natural and built environment, balancing the requirement of the client, users and the community ....".

From this definition key functions have been identified which are required to advance the development of the industry. These functions include:

i) Formulate and implement strategies and polices for the development, improvement and use of the environment.

ii) Develop proposals for the development, improvement and use of the natural and built environment.

iii) Construct, maintain and modify the natural and built environment.

iv) Initiate, resource and control projects for development and implementation of the natural and built environment.

v) Facilitate the use of property, systems and services.

vi) Contribute to the operational effectiveness of organisations and individuals operating within the natural and built environment.

These functions have again each been sub-divided into further sub-sections, by posing the question; "what needs to be done in order to achieve this key function?". This process continues until a level of detail is reached which approximates the unit of competence which is necessary to carry our the key function identified (CISC 1994 p9).

In parallel with the work of CISC, the CITB have also been developing NVQ's in various craft and operative fields. The CITB (1995a) have recently produced a draft of the variety of competencies which should be incorporated into the training schemes of construction works. The draft guidelines relate to the minimum activities construction operative should be expected to perform to achieve industry accreditation at various levels. The activities identified for competency assessment include for; piling workers, bricklayers, painters and decorators, partitioning fixers, roof slaters and tilers, bench joiners, carpenters and joiners, formworkers, shop fitters, wood machinists, ceiling fixers, floor layers, glaziers, mastic asphalters, wall and floor tilers, sheet and cladding workers, single ply roofers, built up felt roofers, dry liners, plasterers, stone masons, facade cleaners, mason paviours, plant mechanics, steel fixers and construction operators in general (including drain layers, paviour, concrete places and steelworks). Within each level of competency in all of the above occupations a range of key functions are identified which are specific to each task. These key functions broadly include the ability of the operative to read drawings and take off information, competently prepare the area of work, carry out each required tasks in executing a particular operation and communicating and co-ordinating their own work through liaising with other occupations and supervisors.

The CITB have established the Construction Skills Certification Scheme (CSCS) which aims to provide a registration facility for the majority of occupations with the construction industry.

The principle of the schemes is to achieve:

> "improvement of the quality of workmanship and standards of health and safety which follow from the creation a more qualified workforce"
> (CITB 1995b p3).

A number of construction industry institutions have been involved in the development of the CSCS in the UK including the Building Employers Confederation, Federation of Civil Engineers and Contractors, Federation of Master Builders, GMB Trade Union, National Specialist Contractors Council, Transport and General Workers Union (Building Crafts Section) and the Union of Construction Allied Trade and Technicians. The aim of such a scheme is to maintain records of operative in the construction industry who have achieved a recognised level of competence, to promote the use of skilled works in construction, to raise the skills base of the UK industry and to provide a method of recognition of qualifications in other countries in Europe (CITB 1995b p4). The benefit of introducing such competence based qualifications have been recognised by the CITB (1995B p5) to include:

> "recognition of skills, competence and qualifications, improve health and safety awareness .... identification of training needs to improve or add to existing skills, ... raising the quality of workmanship .... a move towards an increasingly qualified workforce. Thus improving customer satisfaction and the industry's image".

Critique of the Competency approach

The 'competencies' approach has been widely used and subsequently criticised in the education and training field (Watson 1992 p2 & Moohan 1992). Watson (1992 p3) highlights concerns regarding such use of the competence approach particularly in relation to management education and training, and identifies the distinction between overall competence and a competency. He suggests that competency is one of the elements of overall competence. Watson defines competence from the work of Boyatzis (1982) and goes on to suggest that competencies include skills, knowledge and also values, attitudes, understanding and motivation. In order therefore to have overall professional competence an appropriate group of competencies are required (Watson 1992 p4). In conclusion Watson (1992 p9) suggests that if this approach is

to be adopted in the assessment of courses and professionals (particularly managers) it needs to recognise that in order to do a 'job' well in a 'professional' manner, requires competencies in terms of skills and knowledge, but also, understanding, motivates, commitment, social and political sensitivity and professional judgement. Having discussed his reservations of this approach Watson recognises that the competency approach has several advantages which includes the benefit of not assessing individuals in terms of what formal academic knowledge they can learn and reproduce on paper (Watson 1992 p6).

The work of Mangham and Pye (1991 p132) suggests that the competence approach has limited applications, and highlights some of the problems. They suggest that competence and effectiveness is measured through performance, and performance itself involves a continuity of action which means that:

> "....the idea that any such performance can be broken down into component parts, being illustrative of this or that competence, exposes the central nonsense of the conceptualisation."

Edmond and Teh (1990) and Ellis (1992) propose however that the use of the competency approach has the distinct advantage of concentrating upon what must be achieved while facilitating individuals with a considerable amount of freedom to develop their own personal style of responding to the work role. As such individuals are aware of their own weaknesses and strengths and are able to optimise the way of meeting different circumstances, working effectively with the mix of styles in an organisation in achieving a desired outcome.

Stewart & Hamlin (1992b p9) summarise their earlier critique of the competency philosophy (Stewart & Hamlin 1992a p30) as:-

i) Although the approach is suggested to be employer led, competence based qualifications have not arisen as a result of employers demands. The use of lead bodies has not amplified employees involvement in the establishment of competencies but it has simply provided a platform for employees to be representatives.

ii) The definition and meaning of competencies concept is often confused.

iii) The problems inherent in applying generic standards to specific contexts are not adequately recognised or acknowledged in competency based qualifications.

iv) Use of work based assessments and assessors tends to ignore the established relationship between assessors and trainees which can influence objectivity and standards.

v) The competency approach and its implementation through NVQ's has increased the administrative burden and costs of qualified-based education and training.

vi) Competence standards which are incorporated into NVQ's are not written in 'output' terms but are process orientated, identifying procedural steps or actions which should be taken.

In response to this criticism, Mansfield (1993 p19) acknowledges that the term 'competence' is often open to misinterpretation and that the system of developing NVQ's can be susceptible to extensive administrative burdens and bureaucracy. He does not however agree with the criticisms focused at the use of functional analysis methodology as suggested by Stewart & Hamlin (1992a p30). He acknowledges that this analysis is frequently misused but supports it as a valuable methodology to be used in competency based qualifications. Functional analysis identifies achievements which are based on judgements of best current practice and anticipate future requirements. In the development of such standards of achievement it is essential to consult with key personnel who are aware of current good practice and the way in which the occupation and industry are developing. As such the approach has no claims to "objectivity" and is not associated with American social sciences theory known as "Structural Functionalism" which has been criticised for being reductionist, behaviourist and empiricist in nature.

Mansfield (1993 p20) supports his argument by stating that:

> "The key process of functional analysis - identifying a value base, agreeing key purpose statements, developing the framework by close consultation with practitioners, the process of iteration and dynamic change to the structure - are all indicators that the methodology is quite opposite to the reductionist and objectified approaches".

Mansfield (1993 p20) further maintains that functional analysis considers "outcomes" which are a result of actions rather than "outputs" as proposed by Stewart & Hamlin. He suggests that essential to functional analysis is the use of the Job Competency Model (fig. 5.2) which takes account of the 'job' or 'technical' components of the work as well as the social context in which the job occurs. Finally, Mansfield (1993 p22) confirms that functional analysis involves a process of the separation of functions at different levels of generality and detail involving knowledge and development rather than a hierarchical listing of activities as proposed by Stewart & Hamlin.

The Key Competency Model and Procurement Systems

Having discussed the origins of the competency approach and considered its application into developing standards of education and occupational standards in the UK construction industry, the approach is applied to procurement systems. Figure 5.4 illustrates that in order to operate a particular category of procurement system effectively in a specific country, a range of generic, common and specific key competencies must be available. Generic key competencies have been identified as those competencies which apply to all categories of procurement systems. As such these are essential minimum competencies which must be in place to operate any procurement system effectively. Specific key competencies are associated with the operation of a particular indigenous procurement system, and are therefore system specific. Common key competencies are those array of competencies which are required to be available in order to operate a range of procurement systems and are automatically identified by examining the array of generic and specific competencies which are required. Common key competencies therefore relate to each category of procurement system (as previously identified by Masterman 1992) whilst specific key competencies are those which allow the operation of a particular procurement system within a category of systems. The specific competencies therefore allow a particular system to operate effectively. In order to operate a particular procurement system effectively in a country a combination of generic and specific competencies must be available. If these competencies are not indigenously available the procurement system will only operate at an ineffective level.

It is acknowledged that the operational characteristics and therefore the precise competencies required for each procurement system will vary from country to country and that they are heavily influenced by the political, economic, social and technical characteristics of a country. Although dominant procurement systems which have been identified by the PSM's exist in a range of countries, each country has its own specific mechanisms to operate such procurement systems (see Chapter four). For example lump sum general contracting approach of design, tender, construction is used in Japan, UK, USA, France, India and Malaysia, however the use of this system in each country is influenced and moulded by each country's operational characteristics.

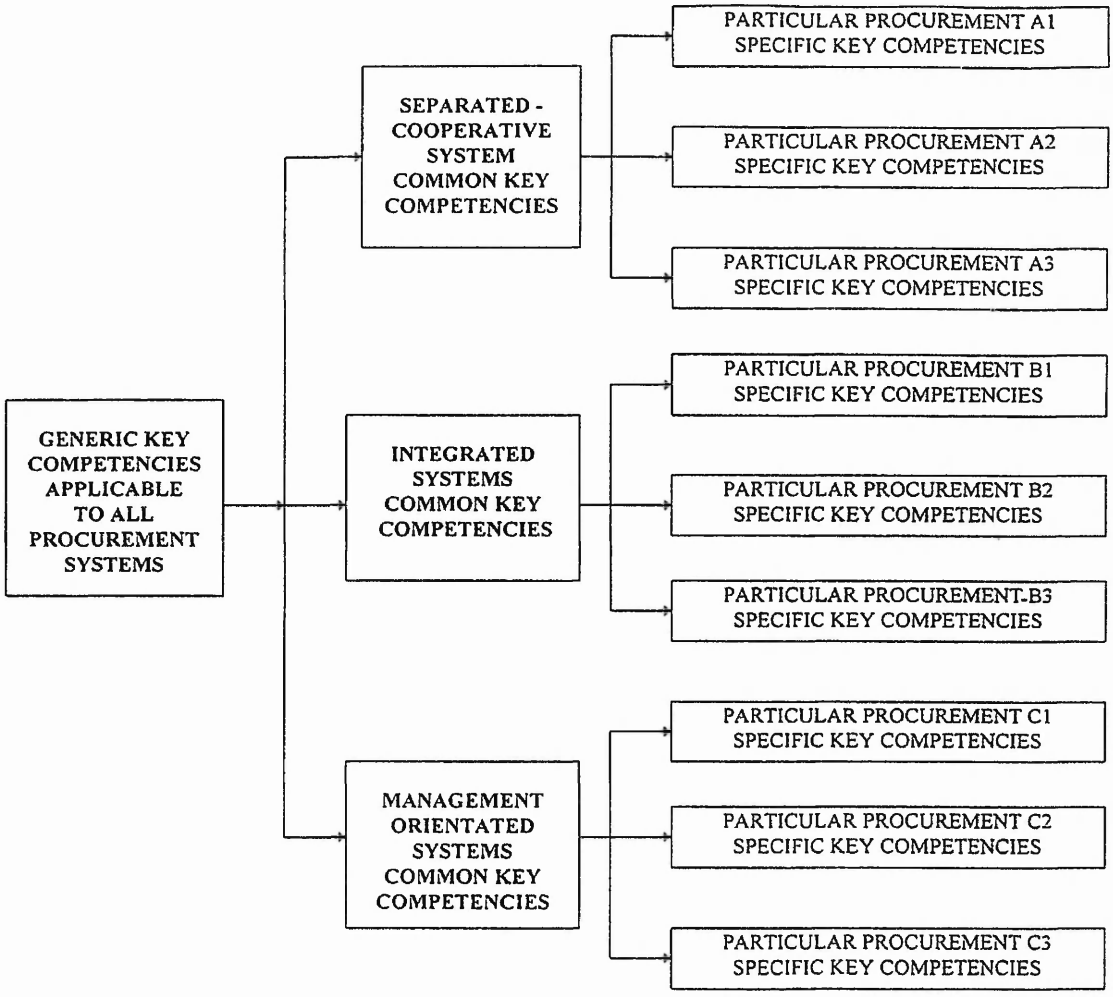

Figure 5.4: Key Competencies and the Effective Operation of a Procurement System

As identified in Chapter 3 there are five generic functions to all procurement systems. The analysis of the various procurement systems investigated in France, UK, Japan, USA, India and Malaysia, have been based upon the Procurement Systems Model (PSM) which uses the functions of initiate/promote, fund, design, construction and allocation of risk. It is recognised that although the competencies approach has limitations, it can be used to identify the array of key competencies which are required for the effective operation of the identified dominant procurement systems models.

The Key Competencies Model

It is clear that the competency approach and its application to vocational education and training has distinct advantages in establishing competency requirements in various employment sectors. The use of functional analysis to identify the key purposes of an occupation and the elements of competency required to carry out that occupation clearly shifts emphasis to "what" is achieved rather than "how", thereby concentrating upon competence or skills and not exclusively on knowledge.

The application of functional analysis to procurement systems has facilitated the identification of the range of key competencies are required to operate a particular procurement system in a country. These key competencies have been identified by analysing the generic functions in the procurement process and posing the question, "what need to happen for this function to be achieved?". The development, validation and subsequent verification of the PSM's provides the basis upon which the functions of procurement have been identified. The functions of all procurement systems include: to initiate/promote, fund, design, construct and allocation of risk. The analysis of dominant building procurement systems in the countries under investigation using the PSM's has identified that the systems identified may be categorised into separated and co-operative procurement system, integrated procurement systems and management orientated procurement systems. The examination of the five functions of procurement has facilitated establishment of generic key competencies, which are required to allow any/all procurement systems to operate.

The identification of generic key competencies has encouraged the further analysis of specific key competencies through the application of functional analysis. The key competencies identified are competencies which are required to be available to operate a particular procurement system effectively. It is important to recognise that no claim is made to identify the complete or exhaustive array of generic or specific key competencies which are required in order to operate a particular procurement system. The investigation particularly seeks to analyse the variety of minimum key competencies which are an essential array of competencies which must be available in a country in order to operate a particular procurement system.

The identification of generic and specific key competencies which are required to operate a procurement system has been established through analysis of literature relating to the five generic functions of procurement. The identification of these competencies has automatically facilitated the identification of the key competencies which are common to more than one procurement system. The generic and specific key competencies have been further verified through interviews with respondents in each of the countries under investigation.

The analysis of dominant building procurement systems by the PSM (as discussed in Chapter Four volume two) has identified that certain systems are common to more than one country. By examining the three frameworks which make up the PSM each dominant procurement system modeled may be analyses to identify whether the design and construction functions are carried out by separate organisation, whether both the design and construction function are carried out by a single organisation or whether there is an independent management function involved within the procurement system. This has facilitated the categorisation of systems into separated and cooperative, integrated and management orientated procurement systems. Having categorised each PSM into the above procurement system category each common system has been examined to establish what range of generic and specific key competencies which need to be available in order to effectively operate each particular procurement system in each country using functional analysis.

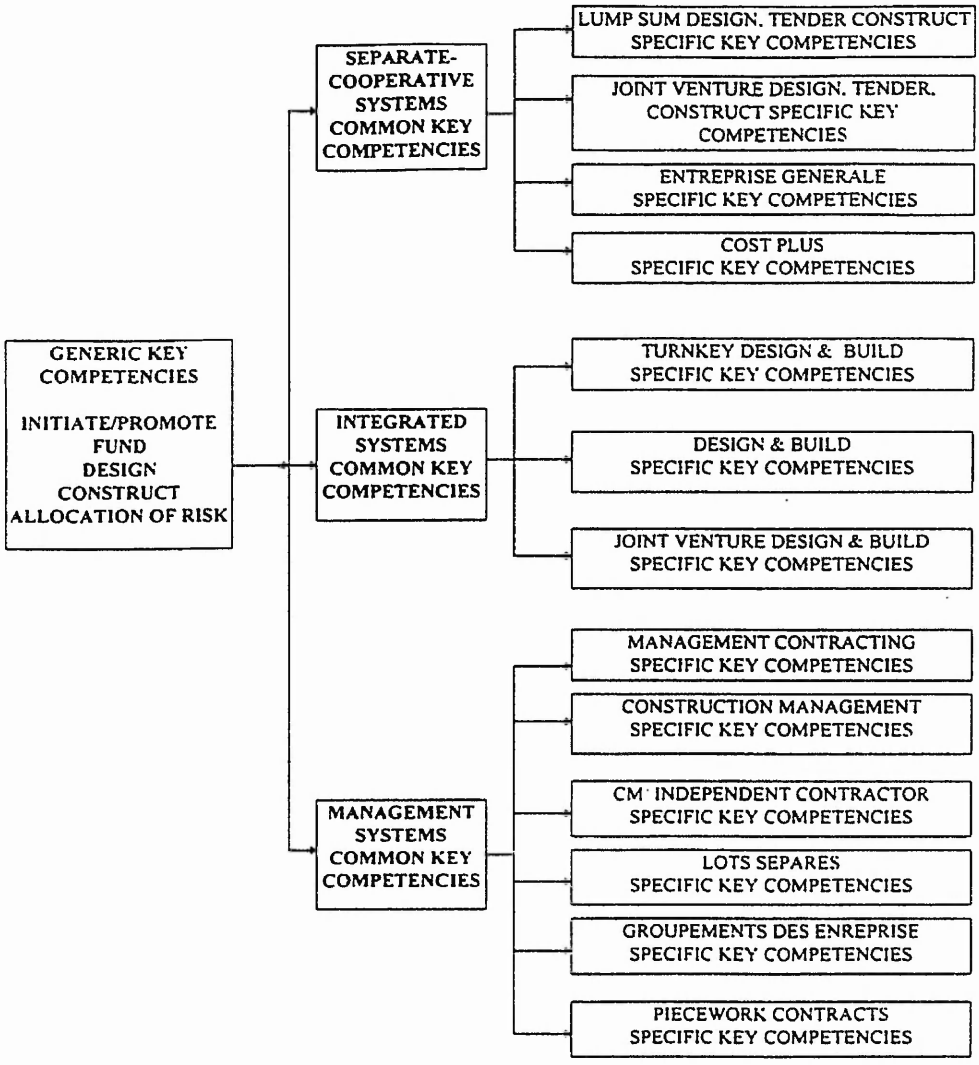

Fig 5.5: Application of functional analysis to identify the key specific competencies required to operate a particular dominant procurement system

Figure 5.5 indicates that the common key competencies are those which are common to a procurement category. These competencies are not specific to the operation of a particular procurement system but may be used in the operation of a range of procurement systems within one of the three categories identified. The benefit of highlighting these key common competencies is to inform a country of the array of competencies which are already in place and which will allow or facilitate the effective use of a new procurement system indigenously by developing certain specific key competencies.

The generic key competencies are required to effectively operate all procurement systems and are essential competencies needed to be in place in all countries. Each of the specific key competencies can further be analyses to identify element of competence required to carry out each key specific competence (this is however beyond the scope of this research). The identification of key specific competencies allows a country to identify the array of specific competencies which need to be available in order to operate a particular procurement system effectively. By observing the existence of generic and common key competencies which are available in any particular country, advice can be provided on the development or accessibility to specific key competencies which will allow existing or new procurement system to operate effectively.

Figure 5.6 illustrates that generic key competencies are required in order to operate all procurement systems. In order to allow a particular category of procurement system to operate a range of common key competencies are needed. These competencies are the minimal array of competencies which are required to operate for the operation of a variety of procurement systems. Therefore in order to operate a particular procurement system specific competencies must be available and combined with the common competencies and the generic competencies.

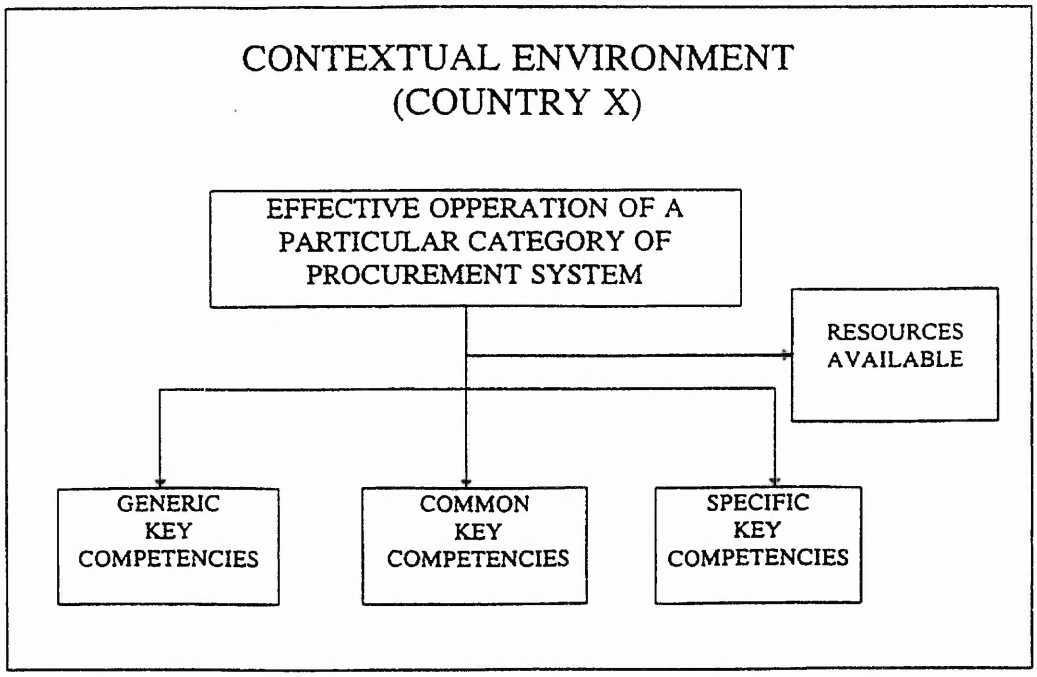

Fig: 5.6: Identification of Country X's Possible Procurement Strategy

Identification of the Key Functional Competencies

It is contended above that in order to operate any procurement system in a country, there are a number of generic, common and specific key competencies which are required to be in place. In this section, literature is examined to identify the key functional competencies which are required to be available in order to operate a particular procurement system effectively. The competencies which are analysed are generic competencies which are applicable to all procurement systems and are a minimum arrangement of competencies which must be available in any country in order to operate any procurement systems effectively. From identifying the generic key competencies, the specific competencies which are associated with a particular procurement system exists in more than one country in this study are examined and identified. As common key competencies are related to a category of procurement systems they will automatically be determined by the examination of specific key competencies which are required for the operation of each indigenous dominant building procurement system.

The importance of the availability of competencies has been illustrated by Walker (1989 p1) who suggests:

> ".... the way in which available skills are used is of paramount importance in providing what clients expect from their buildings. There is little point in the construction industry developing the special skills of its members if no one is going to amalgamate them in the best manner to meet a particular clients objectives ....".

Each of the functions of procurement are examined to identify the generic key competencies which are required to be available in any country in order to carry out each function. These are now discussed.

Initiate/Promote

The competency of the initiator/promoter has been discussed by NEDO (1979 p15) and is suggested to begin with the decision of making an investment in building and to appoint professional consultant to assist in the process where necessary. The

NEDO report (1979) illustrates that the client (initiator/promoter) is often referred to as an individual although it is acknowledged that there are a wide variety of initiator/promoters who may be involved with the building industry. These clients will vary in size, organisational structures, building/construction experience, understanding of how to obtain a building and may be either from the public or private sector. Moxley (1993 p41) also indicates that the decision regarding the need for a new building facility will usually be made by a committee, group or an individual with the latter being the least often.

The crucial process which must be executed by the initiator/ promoter is to establish the initial briefs, which is a statement of the needs of the initiator/promoter, and how the building facility will be used. During this process it is essential to identify the initiator's prime requirements and to distinguish between these and possible preferences. The brief should therefore state the initiator/promoters objectives in terms of concept, time, cost and functionality. This role of setting on effective initial brief is considered to be crucial to ultimate success of the project (NEDO 1979 p11-12).

Walker (1989) and Bennett (1991 p55) suggest that there are a series of "decision points" which produce a hierarchy of stages during the initiation/promotion stages of a building project. Walker (1989 p112) suggests that the primary 'decision points' during this process include the decision that additional property is required and the establishment of the nature of the real property needed. It is suggested therefore that the client is the 'body' which has the authority to approve expenditure on the project, the form which the project will take and the period in which the project will be completed (Walker 1989 p63).

NEDO (1975) and Walker (1989) p64) both confirm that the clients role in the building process is crucial. Walker (1989 p64) states:

> ".... clients have important responsibilities to fill which cannot be delegated to the project team ....".

Walker (1989 p69-70) recognises that the 'need' for a new building will normally result form demands out of the client's organisations primary activity. As it becomes apparent that a new building is required to satisfy the clients requirements a brief will begin to be formed, establishing the clients priorities and requirements. Allen (1984) also indicates that at the onset of a project the following are assumed:

i) The client has recognised the need for a new building.

ii) The client is to draw up a schedule of his requirements for the building, in terms of performance and space.

iii) The client will assess outline proposals produced by the design team in response to the clients requirements in terms of specifications, time and costs and will approve, modify or reject such proposals.

Allen (1984) argues that this assumes that the clients knowledge in terms of his needs are clearly defined and understood, which he recognises is not often the case.

Turner (1991 p170) suggests that the initiator of a building/construction project is commonly referred to as 'the client' and is the person or body who commissions the design and construction of a building. Franks (1990 p6) also recognises that the first competency in the procurement process is for the client to recognise that there is a 'need' for a new building. Franks (1990 p60), Turner (1991 p43) and Masterman (1992 p28) acknowledge that with the all procurement system the initiator/promoters must have the ability to recognise that a new building facility is required and understand how to initiate the process of obtaining the new building facility. As such the role of the initiator/promoter (client) had traditionally been suggested to be:

> ".... the most crucial role to play in the production of a new building, that of electing the method, negotiating the finance, choosing the architect and his team, deciding the brief and encouraging the enterprise for construction ...."
>
> (Moxley 1993 p40)

Bah Nea (1976 chapter 6) further recognises that in the UK industry the responsibility for securing project finance has traditionally been the responsibility of the client. As the size and complexity of projects has advanced, this traditional situation has begun to change with finance being arranged by various parties involved in the procurement process.

Gray, Hughes and Bennett (1994 p21-23) cite that the role of the initiator is significant throughout the procurement process, and suggest that the level of involvement will frequently vary. The highest involvement will be during the briefing, concept, feasibility and scheme design stage, and will decline after this period, until the end of the construction phase, when the initiator begins to consider the occupation of the building. The authors conclude by stating that:

> ".... the most important phase is initiation of the project, as decisions made at this point will set the pattern for all subsequent activity ....".
> (Gray, Hughes & Bennett 1994 p54)

The Construction Industry Council (CIC 1996 p6-7) identifies the variety of key competencies associated with the function of initiation. The study proposes that the key competencies include; the ability to understand the principles of regulations and legislation associated with construction, the ability to secure finance for the project from commercially available finance to institutions which provide finance at a local, national and international level; the ability to define the scope of the project, assessments of overall programmes and costs, estimations of revenues and financing costs, analysis of project viability and the objective assessment of project risks, and the ability to produce a project brief.

Generic Key Competencies

In Summary the generic key competencies involved in the process of initiation promotion are:

The ability to understand the need for the project and to be able to express that need.

Having the authority to approve expenditure on the project.

The ability to define the project in terms of cost, time and performance/quality requirements.

The ability to understand the procurement process or to understand how to initiate the process.

The ability to obtain and secure adequate funding.

The ability to appoint consultants and/or constructors when required.

The ability to analyse the project viability and the objective assessment of project risks.

The ability to understand the principles of regulations and legislation associated with construction.

Funding

Project finance has been defined by Bah Nea (1976 chapter 6) as:

> ".... the funds to be raised usually by the client, which are required to finance successfully the design, erection and completion of his/her project by contractors .....".

Along with the initiator/promoter being able to obtain funding, funding bodies must exist to provide finance for construction projects. The work of Brownlie and Harris (1987) identify the various sources of finance available for construction projects. They suggested that the primary sources of finance are banks, whilst for overseas projects government loans or overseas aid through international agencies were the most likely sources.

The importance of finance recognised by Bennett (1991 p56) who states:

> " .... unless someone recognises a development need or opportunity and assembles the finance necessary to satisfy the need or realise the opportunity, there will be no construction project".

Bennett (1991 p56) goes on to suggest that:

> "there must be sufficient finance to fund all the inevitable costs which may be incurred during the project and once the project is completed".

With regards to countries which are major importers of construction services one of the major limitations on their construction industry has been lack of finance available for construction projects. The traditional sources of finance included government sources direct loans form commercial banks and from international development agencies. Increasingly there has been reluctance on the part of commercial banks and international agencies to lend to highly indebted and politically unstable developing countries which has resulted in constraining construction activity in such countries (Seymour 1987 p232).

Seymour (1987 p235) also discusses the general types of finance required for construction projects and suggests that they include working capital; which is required by the constructor to maintain production and production facilities and project finance which is needed by the initiator/promoter during the preconstruction and construction periods, to finance the construction of the final project.

Bennet (1991 p58-59) discusses how finance is required in order to enable construction/building projects to be undertaken, and recognises that when finance is required for construction consideration must be given to the inherent risk associated with the project and general risks which include interest rates, inflation rates, business confidence, tax regulations and costs, all of which will depend upon the experts judgement and advice, calculation and instinct.

During the process of construction the 'risk' and the type of finance required varies according to the projects state of development. In the initial stages of the project,

before construction has commenced, risks are high due to the multitude of possible events which could potentially stop or delay the project and consequently results in finance being expensive. As the project comes into fruition, there is less risk involved as most of the costs have been established or are known and so the completion finance becomes easier to arrange (Bennett 1991 p58).

The NEDC publication (1992 p19) makes reference to the importance of finance in the construction process and suggests that an understanding of the manner in which financial backing is obtained is invaluable throughout the building process, particularly during the initiation and design stages. Knowledge of financial concerns is vital to understand the needs of initiators, funders and constructors since design decisions are seldom made without ramifications on commercial issues. The competencies required in funding include understanding methods of financing, project appraisal, relationships between risk and required rates of return, and the way that capital costs and life cycle costs relate (NEDC 1992 p19).

Generic Key Competency

In summary generic key competencies involved in Funding are:

The ability to obtain and assemble finance.

The ability to understand the nature of the funding process and funding strategy.

The ability to understand the relationship between risk and required rates of return.

The ability to understand capital costs and life cycle costs.

The ability to obtaining finance when needed at various stages through the design and the construction process.

Design

The 'Design' process is defined as:

> ".... the entire sequence of events which lead from the first inception of a project to its final completion ...."
>
> (Broadbent 1969 p15)

Stone (1983 p172) advocates that the design process involves the ability to design a building or construction project which enables the facility to perform its intended purpose with maximum efficiency and in the most economic manner throughout the life of the building. He recognises that within the design function balance is needed between the fitness of the building for its intended purpose and the need for adaptability to meet future needs. Stone concludes that before the design function can commence a clear brief which expresses the clients requirements should be established.

Asimow (1962) discusses design theory and suggests that the design process is a methodical sequential process. This 'design morphology' consists of an entire sequence of design events starting from inception and ends with the final completion of the building, in which decisions are made step by step at each point in the sequence before moving to the next and as such the process can be learnt.

A well known and commonly referred to pattern of procedures for designs in the preparation and implementation of design in the building process is the Royal Institute of British Architects Plan of Work (RIBA 1980). This document provides a breakdown of all key design operations during the design of construction projects, and indicates the roles of the various member of the design team in each of the stages of design. The first stage within the design process is regarded as "inception" which involves the establishment of the general outline of the clients requirements with regards to the new construction facility and to plan future action. Key issues which are considered at this stage include the nature, size and function of the proposed building, the time and financial limits relating to the project and site specific information.

The feasibility stage involves the examination of technical, functional and financial aspects of the project and to provide advice to the client regarding the overall feasibility of the project. The third stage involves the development of outline proposals and alternative schemes are proposed and compared to establish the general approach to the layout, design and construction of the proposed building. This stage invariably involves close collaboration between the client and the various members of the design team to achieve the best results. The "scheme design" stage is where the outline design proposal is critically examined in terms of appearance, methods of construction, outline specifications and the preparation of cost information, along with obtaining the necessary statutory approvals (such as planning permission). The "detailed design" stage involves the in depth development of the design and where decisions are made on the various components which together form the complete structure. At this stage production information and tender documentation will be produced along with setting the procedures involved in tendering.

As such the process of design is considered to be composed of establishing the initiator/promoters requirements and translating these into a physical design in terms of drawings or models. This involves the definition of needs, creating ideas, making choices and choosing options by evaluation and discussion making (NEDO 1979 p9). The study of the design process conducted by Cross (1984) and the work of Davis (1985) suggests that across different design professions, there is a "designerly" way of thinking and working. Cross (1986 p57) goes on to develop this theory and concludes that an underlying competency of designers is to "think like designers", and advocates the education rather than training of designers.

The process of design should consider aesthetics as well as the technical aspects of design including construction aspects, material selection and manufacturing requirements of a building (Cooper and Lybrand 1988 p5). Turner (1990 p171) defines design as:

> ".... the exercise of those functions that use scientific principles, technical information and imagination to define a project capable of meeting specified requirements with economy and efficiency ....".

This process involves many decisions which will be made by groups of competent designers. The design process is a complex one and involves the co-ordination and integration from various individual designers of different design disciplines (NEDO 1979 p12, Bennett 1991 p64). NEDO (1979 p12-13) suggest that designers can often lack the understanding of their colleagues contribution to the design process, thus failing to appreciate the mutual dependency within the whole design function. This situation often results in the production of design solutions which are not compatible with the whole projects, and the initiator/ promoters best interests. Bennett (1991 p59) states that:

> "..modern construction draws on a vast range of technologies and it is part of the skill of great designers to be able to co-ordinate a vast orchestra of specialists and for the resulting product to be harmonious".

As Bennett (1991 p59) highlights the range of knowledge and experience required in this stage in the construction process is usually more than that found in a single individual, so a variety of individuals will be involved in the process. Each individual will contribute their own specialism to the design process.

The process of establishing the conceptual design, which is the initial stages of the design process has been discussed by Bennett (1991 p63) who applies the work of Broadbent (1973) to the building design process. The authors identify the four categories of design as:

i) Pragmatic design, working through trial and error using knowledge about the properties of materials and their previous usage to design the new structure.

ii) Iconic design; which consists of using tried and tested design forms.

iii) Analogical design which is considered to be the central mechanism of creativity and involves the creation of new forms by using the ones which already exist, and modifying them.

iv) Canonic design which involves the use of patterns, grids or other geometric systems.

Once the concept design has been approved, the next sequence in the design process involves the designing of the structural systems, the space dividing systems, the services systems and the fitting out systems which is collectively termed detailed design (Bennett 1991 p64).

The core skills of 'design' as identified by NEDC (1992 p17) are based on the understanding that good design must be achieved within the constraints of time, cost, and that specified standards of performance must be met. The study acknowledges that the design process is an integrated one, and that the concept of 'design' has different meanings for different professionals, and state that:

> "..... to the engineer, design means analysis, but to the architect design is concerned with concept as art is doing, and science is knowing ....".

The various 'professionals' participating in the design process along with the increased levels of specialisation needed to design and to build modern complex buildings has contributed to the increased fragmentation of the constructions industry. This is illustrated by observing upon the UK construction industry over the last century, which has witnessed the role of the Master Builder being fractured and taken over by the Architect, the Quantity Surveyor, the Structural, Mechanical and Electrical Engineer (NEDC 1992 p4-5).

Designers therefore need to have a core understanding of the cost and time implications of their outputs in terms of material selection and type, ease of construction, labour content, ease and/or ability of prefabrication. Designers are thus expected to have knowledge of history of architecture, town planning and urban design, the general theory of building design, fundamental structural principles, masonry, timber, concrete and steel construction, non-structural elements eg roofing, curtain walling and health and drainage requirements, commonly used electric and mechanical systems, forms of environmental pollution, the importance of energy

efficiency, material characteristics and performance, construction methods and processes, causes of building failures and codes of practice used by all disciplines. (NEDC 1992 p18).

The study conducted by Broadbent (1969 p15) and Kelly, Mcpherson and Male (1992), comments upon the two popular apposing views on design the "glass box theory" and the "black box theory". The 'black box' approach suggests that design is a mystery, something which happens in the brain of the designer and cannot be rationally explained and is therefore concerned with creativity. As a consequence the design process is not susceptible to analysis. The 'glass box' theory however, suggests that design can be systemised and analysed, and involves a logical explicable decision making process. Kelly, Mcpherson and Male (1992) examine the work of Markus (1969) and Maver (1990) regarding the 'glass box' theory, formulating an alternative design model. The model indicates that the various stages of design process involve analysis, synthesis, appraisal and decision making, all of which are encapsulated in an interactive process.

Gray, Hughes and Bennett (1994 p1) identify that the essence of design is to take a client brief and use design skills to develop a three dimensional interpretation which other designers use as the basis for their own work. The authors suggest that there is no single way of designing or managing all projects, and discuss the current level of understanding of the design process. They propose that a successful outcome to the design process is dependant upon the clear definition of the boundaries surrounding the problem and stress the importance of establishing the clients needs in an accurate brief (Gray, Hughes & Bennett 1994 p4). A integral part of the communication process of design is the production of drawings which forms one of the representational mediums used by designers. It is suggested that the design and construction brief is segmented into four stages, all which are triggered by the clients initial need for a new facility. The stages include:

i) The approval of the functional briefs

ii) The approval of the scheme design

iii) The completion of the detailed (engineering design and the appointment of a single constructor or groups of constructors) and

iv) The final acceptance and handover of the completed project (Gray, Hughes & Bennett 1994 p15).

Gray, Hughes and Bennett (1994 p15) indicate that the following processes are interrelated through the clients decision marking process:

> "1. The client initiates the project and is required to make the decisions to proceed at each of the design and procurement stages.
> 2. The concept designer assists in the development of the briefs and produces the concepts which if approved, is developed by the design team and other specialists into the scheme and eventually into the working component fabrication drawings and specifications".

Once the initiator has realise the 'need ' for a new building, the primary step is the production of a 'statement of need' which may be interpreted into design concepts for development by the designer (Gray, Hughes & Bennett 1994 p18). As discussed previously, the level of experience of the initiator/promoter will influence the ease of this process. On this issue Gray, Hughes and Bennett (1994 p18) express the view that:

> ".... experienced clients produce very detailed briefing documents developed from a very clear statement of their needs for specific building uses, the completed work environment, use of space and quality standards ....".

It is from this document that the concept design is developed. Once the initiator has approved that it meets his/her requirements, the detailed (engineering) design stage may begin. This process involves the full production of information, pre site production, involving the transformation of the designs into working information (Gray, Hughes & Bennett 1994 p61).

The key competencies associated with the design function identified by CIC (1996b p9-13) include the ability to understand the process through which design is developed from initial feasibility study to the production of construction drawings, the sequence of design activities for a construction project, and the ability to understand the basic structure of the design process and the methods used to plan, document, review, monitor and control design work.

The Generic key Competency

In summary the generic key competencies involved in design are:

The ability to interpret the needs of the initiator/promoter and to communicate those needs through a process resulting in a building which meets the functional, physical and economic parameters established or presumed.

Ability to understand the principles and the practice of building construction, form and function, site selection and design implications.

The ability to apply and analytical approach towards the appraisal of material selection in construction design.

The ability to use valuation methods for price determination in respect of design changes.

The ability to prepare tender documentation, to know sources of cost data, to appraise the reliability of cost data for estimates and to control costs within the design process.

The ability to understand the basic structure of the design process and the methods used to plan, document, review, monitor and control the design work.

The ability to understand the process through which design is developed from initial feasibility study to the production of construction drawings.

Construction

Seymour (1987 p59-63) develops a model of the construction process and suggests that the construction process is concerned with the transformation of raw materials to a final product (building), which is executed by the constructor. The final building is thus a combination of manufactured components/products (materials), and the intermediate product of the constructors, who assembles and manages to form the final product (building). Seymour (1987 p62) expounds the view that the 'product' that the contractor offers in the building process is ultimately involved in technical and managerial competence and experience. As such the contractor is involved in translating designs and written specifications into a physical construction format, using manufactured raw materials and his/her own technical knowledge and experience to produce the proposed building facility.

Bennett (1991 p65) discusses the stages in the construction process and illustrates that construction is a process of assembling all the physical parts (materials) required to produce the end product (building) and indicates that this process is carried out on site as well as in factories. According to Bennett (1991 p69):

> ".... construction is essentially a sequenced process of assembling components which provide the support for subsequent components. Support at intermediate stages is provided by temporary works, plant, equipment and the muscle power of workers....".

The CISC (1993 p7) first working draft of the 'Occupational Standards Document', defines the third "key function" of the construction process as to:

> "... construct, maintain and modify the natural and built environment".

The study identifies "hands on" functions which have been established by the CITB and from the Mechanical Engineering Services industry lead body. The core competencies identified for the key function of construction include to:

i) Provide facilities for construction work; which includes the provision of construction facilities (including plant and equipment, install accommodation,

provide temporary structures, install services), administration services (including carry out clerical support, carry out construction supervisory support, provide financial services) and to provide site security.

ii) Provide Materials for Construction Work; which includes the provision of materials and components (consisting of evaluating technical documents, purchase materials and components, programme delivery of materials), delivery of materials and components (load and unload materials and components, project materials and components from damage, transport materials and components), and the production of components from procured materials (which involves dimensional positioning, shape materials to form profiled components, assemble components to form products, provide surface finishing).

iii) Construct and Maintain the Structured Fabric; which involves preparing the ground conditions to support the structure (including dimensional positioning, provide ground services, provide ground works, and the removal of existing structures), to provide dimensional positioning for setting out site for construction activities (including evaluate technical documentation, record and maintain survey information, establish control stations), fabricate and maintenance of the structure (involving dimensional positioning for the structural fabric, carry out structural survey, prepare structural components, and installing structural fabric components) and to provide surface finishing to structural fabric (which involves the application of materials, prepare background surfaces and the positioning and securing of components).

iv) Provide Infrastructure and Environmental Landscaping: which involves providing dimensional positioning (interpretation of technical documentation, provide reference marks for setting out, record and maintain information), provide surface finishing (preparing background surfaces, applying materials, positioning and securing components), carrying out earthworks (excavate ground conditions, stabilise ground, contour ground, reinstate ground) and the installation of structural components (apply materials, prepare components for installation, position and secure components, prepare background surfaces).

iv) Install and Maintain Components: which includes the installing of finishing components (select materials, prepare components, prepare materials, repair surface defects, and initiate fault checks).

v) Install and Maintain Services: which includes the installing of services to structural fabric (route service, prepare components, apply materials, position and secure components), install, commission, decommission and maintain service systems and equipment (install and rest the components of a system; commission and decommission systems; maintain the effective operation of systems) (CISC 1993 p16-17).

The Construction Industry Council (CIC 1996a) have summarised the competencies for those involved in the management of construction. They have identifies a summary of generic competencies that can be applied to any construction project and the accompanying management functions. The CIC (1996b p2) identify that the aim of the study is to define the skills and competencies which are basic and achievable in nature to facilitate delivery of projects on time, within budget and to quality. The identification of such generic competencies may then serve the purpose as a guide for formal training schemes and/or qualifications for managers of the construction process. It is specifically stated that a generic approach in defining skills and competencies has been incorporated to avoid any reference to specific project procedures of roles of professionals which operate within a country's industry (CIC 1996b p3). With particular regards to the management of construction the CIC study identifies that the competencies required include; an ability to understand the basic process and sequence of fabrication, construction and commissioning of a project, as well as the ability to plan, co-ordinate, monitor and control construction work. As the management of construction is achieved by effective communication through the project organisation, CIC propose that competencies associated with the principle of project organisation, team organisation techniques which introduce the competencies associated with the ability to direct the work of the design or construction team, competencies related to personal organisation, the ability to understand the requirements of technical documents as well as the ability to communicate concisely and accurately in writing and verbally are necessary to execute this function.

The Generic Key Competency

In summary key competencies involved in construction are:

General

The ability to understand the requirements of any design and to adapt such designs through a process of construction to produce a building of acceptable quality, within acceptable tolerances and within an acceptable time frame for a specific initiator/ promoter.

The ability to understand the organisation and practice involving construction. Availability of skills, materials and plans to facilitate construction.

Management

The ability to understand the basic process and sequence of fabrication, construction and commissioning of a project.

The ability to plan, co-ordinate, monitor and control construction work.

The ability to use elementary skills in time management and basic programming techniques.

The ability to understand the principles and practices of cost management and budget forecasting.

The abilities of problem identification, data evaluation, problem analysis and the ability to propose optimal or sub-optimal solutions.

The ability to adequately plan, allocate resources, delegate, time manage, set goals, monitor and to achieve goals.

The ability to recognise the role of a manager of construction.

The ability to understand the principles of project organisation, learn organisational techniques, personal organisation.

The ability to understand the requirements of technical documentation and the ability to communicate concisely.

Product

The ability to understand and use the principles and practices of construction technology.

The ability to provide facilities for construction work.

The ability to provide materials for construction work.

The ability to construct and maintain the structure.

The ability to provide infrastructure and environmental landscaping.

The ability to install and maintain components.

The ability to install and maintain services.

The ability to read drawings and take off information, competently prepare the area of work and communicate and coordinate their own work through liaising with other trades and supervisors.

The possession of the skills required to manage the process of building.

Allocation of Risk

In order to consider the generic competency required in terms of the allocation of risk, it is first necessary to discuss the general concept of risk, its relevance to the construction industry, and how it may be distributed through formal arrangements.

The definition of 'risk' had been the subject for much discussion. Rowe (1977) defines risk as " the potential for unwanted negative consequence of an event or activity". Rosher (1983) defines risk as the chancing of a negative outcome to measure both of its defining components, the chance and the negativity. Cooper and Chapman (1987 p2) state that risk is:

> ".... exposure to the possibility of economic or financial loss or gain, physical damage or injury, or delay, as a consequence of the uncertainty associated with assuring a particular course of action".

Raftery (1994 p5) in his study suggests that risk and uncertainty:

> "..characterise solutions where the actual outcome of a particular event or activity is likely to denote from the estimate or forecast value".

MacGregor (1991 p90) in his definition of risk states that "risk is synonymous with uncertainty". However, risk is a concept which can be measured, whilst uncertainty cannot. The two factors are not synonymous and it is therefore important to distinguish risk form uncertainty.

The construction industry has been recognised by many as being unique, often because each project is different there are special problems associated with the construction, it is difficult to predict the future, and generally the construction is a high risk business (Raftery 1994 p4). NEDO (1979 p33) suggest that the industry generates uncertainty for those operating within it because nearly all conclusion projects are unique. This unique nature of building is due to a variety of reasons:

i) The purpose of the proposal facility

ii) Its surroundings

iii) Needs of individual clients

iv) The requirements of the designers

v) Fluctuations in supply

A more detailed explanation of the unique supply and demand features of the construction industry are analysed by Harvey (1987 p177-180) and by Briscoe (1988 p10-14).

The World Bank (1984 p4) in their analysis of the construction industry is developing countries recognise that construction work involves grave risks. In their analysis of the risks involved in the construction process the World Bank state:

> ".... the construction entrepreneur moves from site to site, organises the logistics for timely assembly of all the inputs there, and follow a custom design for each site. Jobs are usually won by means of specific bids. Costs, therefore have to be estimated for each site, with assumptions made about many variables such as site conditions, weather, productivity of labour, and equipment, the time required for delivery of inputs, etc ....".
>
> (World Bank 1984 p4).

The study suggest that the core issue in the development of a countries construction industry is the generation of the capacity to manage such risks. This is a process which is often more difficult in developing countries due to the limited availability resources, and the "inadequacies of the systems upon which construction relies". According to the World Bank (1984 p5):

> ".... for large complex building, and most civil engineering projects there is a requirement for managers who are capable of evaluating greater risk, and in many countries the necessary managerial and technical ability is generally developed with much greater difficulty and is usually in shorter supply ....".

The study conducted by the Asian Productivity Organisation (1983 p39) regarding the construction industry in a range of countries concluded that constructors which operate in the industry are faced with great risks. This often results in high rates of contractor insolvency due to:

"…. the unjust contract systems, malfunctioning of owners, bottlenecks in projects and the speculative nature of contracts".

Flanagan and Norman (1993 p1) state that the industry is subject to more risk and uncertainty than many other industries, and recognise that management techniques used to identify, analyse and respond to risk have only been applied in the industry during the last decade. The authors recognise that risk in a manufacturing or commercial context, risk is endemic to all investments decisions. In the construction context, the individuals that are involved fall into two key heterogeneous groups:- 'principals' (initiator/promoter) who commission construction and "agents" (designers and constructors) who undertake various activities in the production of a building. Flanagan and Norman (1993 p3) state that:

"…. it is easy for the principals to see the relevance of risk management as ….. the decision to invest in a building must provide a risk/return profile which is competitive with the best that financial markets can provide …… An agent biding for the relevant part of a building project is committing resources - labour and capital - that have other potential uses. Money may have to be borrowed, or reserves used, to cover a gap between income and expenditure, while profit, if it is made, will arise at some time in the future ….".

Risk is therefore a factor of consideration in all construction projects irrespective of project typology, geographical location and/or nature of the project team. The major category of risks which are typical of construction projects have been identified by Flanagan and Norman (1993 p8), and related to:-

i) Failure to keep within cost budget/forecast/estimate/tender.

ii) Failure to keep within the time stipulated for the approvals, design, construction and occupancy.

iii) Failure to meet the required technical standards for quality function, fitness for purpose, safety and environmental preservation.

This simplistic category of risk related to construction projects are considered to be typical of risks which occur on projects internationally. It follows that some form of risk assessment therefore is necessary to be conducted in order for all parties involved in the construction process to realise their respective risks.

Raftery (1994 p16-18) indicates that the process of "Risk Management" in generic terms involves the identification, analysis and response to risks related to projects. Flanagan and Norman (1993 p46) describe the process of risk management as a sequence of activities which deal with risk. The generic process consist of:

a)	Risk identification:	whereby the sources and types of risks are identified.
b)	Risk Classification:	consideration is given to the type of risk and its effect on the parties involved.
c)	Risk Analysis:	the use of analytical techniques to evaluate the consequences associated with the type of risk, or combination of risks.
d)	Risk Attitude:	the attitude of the parties involved which affects the decision about the risk
e)	Risk Response:	involves the consideration of risk and its management; should it be either transferred to another party or should it be retained.

The underlying assumption of risk management is that project performance may be enhanced to the benefits of all parties involved if project risks are managed in an effective manner. The quality of risk management will improve if risks are identified and evaluated in a systematic way (Chapman, Ward and McDonnald 1989 p10.1). Perry and Hayes (1986) reaffirms that it is vital to identify risks early in a projects life in order to enable determination of project constraints and appropriate cost estimates and to focus management on methods of controlling and allocating risk.

Flanagan and Norman (1993 p45) propose that risk management is:

> ".... a matter of common sense, analysis, judgement, intuition, experience, gut feel and a willingness to operate a disciplined approach to one of the most crucial features of any business or project on which risk is generated ....".

The study by Hertz and Thomas (1983) states that:

> ".... to try to eliminate risk in business enterprise is futile. Risk is inherent in the commitment of present resources to future expectations. Indeed, economic progress can be defined as the ability to take greater risks ....".

Once risks have been identified and analysed the final stage in the risk management process involves the allocation of risk, which is considered to take four basic forms. Chapman et al (1989 p10.11) have identified the options available as Risk Elimination (to design or plan out risk), Risk Shrink (to manage the risk into smaller elements), Risk Distribution (to pass the risk to another party) and Risk Acceptance (but to create organisational slack to cope with the impact if they occur). Flanagan and Norman (1993 p61) have also classified the available chances of risk allocation into similar scenarios, Risk Avoidance, Risk Reduction, Risk Transfer, and Risk Retention. The authors indicate that proper allocation of risk must consider the ability to absorb the risk and the incentives being offered to carry it. Beard (1982) considered risk should be allocated to the party best able to anticipate and control that risk.

However, Chapman et al (1989 p10.23) have identified that the above statement is true, but have qualified it by stating that:

> "..... this may not be the party best able to bear it ....".

This issue was acknowledged by Abrahamson (1993 560) when he agreed that:

> ".... one of the problems of the construction industry is that although decisions have to be made about allocation risk, in negotiating contracts and revising standard contract forms vary little considerations has been given to basic principles".

The techniques available for dealing with risk, its management and analysis vary internationally. Many publications have been produced on this area, and further analysis of this topic beyond the scope of this thesis. What is clear however is that risk is an international phenomenon, and the construction industry is faced with many inherent risks (Asian Productivity Organisation 1983, World Bank 1984, Flanagan and Norman 1993).

Methods of allocating risk are through format agreements which are frequently forms of contract. The World Bank (1993 p50) state that:

> ".... the type of contract signed has a significant bearing on the risk taken in construction ...,.".

Chapman et al (1989 p10.17) suggest that:

> ".... initial analysis of project risks should be undertaken by the client to determine how risk should be allocated to contractual parties .... and such ..... analysis of risk should strongly influence the choice of method of payment and form of contract ....".

Construction contracts may be written or may take the form of verbal formal agreements between two or more parties, intended to be enforceable by law. It is therefore an intrinsic consequence that such 'formal agreements' should be developed with consideration and understanding of the a countries law, legal structures and the principles of law making. As identified by Flanagan and Norman (1993 p183):

> ".... the allocation of risk is inherent to the apportionment of legal liabilities".

Within the generic processes of design and construction there are a wide array of contracts (formal agreements) which exist between the parties involved (APO 1983 p 50). Each of these contracts distributes and determines the responsibilities and liabilities of the parties involved and ultimately, each defines the risk carried out by each party. (Flanagan and Norman 1993 p185).

Barber (1989) states that contract documents, in order to be efficient should provide a framework for the allocation of responsibility clearly, providing adequate powers, with effective means of enforcement and to provide for the timely transfer or delivery of information or decisions necessary for the fulfilment of responsibilities. Marsh (1988) suggested that within the contractual framework there is required to be an explicit definition of what is the consequence if the relationship between the various parties fails due to either party not fulfilling their obligations.

Murdock and Hughes (1992 p3-16) begin their analysis of construction contracts by suggesting that they are used to establish legal relationships between the various parties involved in the construction process and contracts identify the mutual rights and duties of the parties involved. They propose that contractual risk concentrates on the process of identifying the nature of risk in construction/ building projects and deciding where to distribute such risks. Consequently, the various types of building contracts available (and the variety of building procurement systems) in a country will allocate risk to different participants in the process. The authors identify that construction is a temporary activity which takes place at a temporary location, involving a variety of participants at different stages of the construction process. As such it is recognised that the characteristics of construction (regarding its impermanence of activity and temporary location) results in the risk associated with such projects being different from other industries. Therefore the forms of contract which are used are also unique to the construction industry. Murdock and Hughes propose that consideration should be given to where liability for the cost of the whole project will reside (either with the initiator, designers, or constructor). They recognise that the positioning of such risk will have an effect on the price of the project.

The state:

> ".... wherever a transfer of risk is to occur from the contractor to the owner, there should be a counterbalancing advantage of price to balance the risk assumed by the owner".
>
> (Murdock & Hughes 1992 p12-13)

Risk therefore cannot be eliminated in construction projects but may be transferred to different participants in the process. This will invariably involve a premium for the party which is transferring the risk. Risk transfer is achieved through the forms and wording of contractual documentation which is used in the construction industry of each country. This risk may either be accepted or avoided by the parties to the contract. Murdock and Hughes (1992 p18) recognise the importance of insurance in this process identifying standard insurable risks in construction projects which include indemnity against third party claims for injury, insurance against fire, loss of liquidated damages and other forms of consequential loss.

Flanagan and Norman (1993 p180) maintain that the generic purpose of construction contracts is to establish the rights, duties, obligations and responsibilities of the parties and to allocate risk. Acceptance of obligations or duties under the contract, also carries the acceptance of a commensurate risk, the risk of being unable to fulfil the obligation or duty because of interference from external sources or events. Hence, the building contract may be considered to be a trade off between the contractor's price for executing the work, and his willingness to accept risks (both controllable and uncontrollable). They conclude by acknowledging that with any contractual agreement the:

> ".... contract defines only the ground rules, the execution of the contract rests on goodwill, intent and the relationship between the parties, ... and .... contractual agreements should be selected on the basis of recognising who is carrying what risk ....".
>
> Flanagan and Norman (1993 p180)

Thus contracts play a major role in the allocation of risk to the various parties involved in the building process. The traditional approach is to pass the risk from the owner to the main contractor. However more frequently risk is being transferred

to specialist contractor who are involved in the contracts. As alternative procurement systems begin to be used it is envisaged that the initiator/promoter also begins to bear a substantial amount of risk involved in the project. This often results in the risk being passed on to parties who are unable to bear that risk due to their size and capacity. Flanagan and Norman (1993 p183) state:

> ".... there is no point in passing a risk, through contract conditions, onto a party who is ill equipped to bear that risk ....".

This has resulted in the use of standard forms of contract on a wide basis, rather than the development of bespoke contracts for each individual project. Chapman et al (1989 p2.4) suggest that such standard contacts have:

> ".... gained wide acceptance amongst employers, contractors, and the professionals involved .....".

Such standard contracts have taken years of discussion to evolve to a stage where they are used in a country's construction industry. In general, they have been developed through a consensus of opinion, and therefore do not recognise the express wishes of all parties involved. According to Murdock and Hughes (1992 p19) the reasons for the standardisation of construction contracts is to simplify relationships between the various participants as contractual complexities in building contracts can be difficult to appreciate. The authors suggest however that the benefits of standard contracts are rarely fully achieved as these contract are frequently amended and changes to suite the specific needs of the individual parties.

Flanagan and Norman (1993 p183) also highlights the benefits of standard forms of contract, by indicating these documents are well understood and it is recognisable who carries the risk in such documents. The list of merits of such standard documents is further exhausted by Chapman et al (1989 p2.5 - 2.6) who identify the features of such a document as being quick, cheap and familiar in the industry as their major attractions.

A major observation made by Asian Productivity Organisation's Survey (1983 p16 & 50) indicated that there is limited use of 'standard' contract documents for the construction industry in its member countries. The survey of the construction industry of a rage of Asian countries highlighted that standard contracts are often produced for/by each department at state level in many member countries, resulting in a proliferation of documents. This has the effect of imposing great strains and risks on indigenous contractors, due to contractors often not being able to understand or scrutinise such unique contact forms in great detail before bidding for work. As a consequence, the survey states that:

> ".... conditions are loaded in favour of the 'owner'. The contractor's position is weakened ....".

The resultant effect of this investigation was for the Asian Productivity Organisation to call for the development of fair and equitable forms of contract in each of their member countries (APO 1983 p27). The World Bank Study (1984 p50) also recognised the lack of equity in construction contracts in 'developing' countries and stated that:

> ".... frequently, 'one-sided' contracts formulated by administrative authorities stem from an erroneous belief that, to ensure good quality at a minimum price, the authorities must have the upper hand in managing the contract. The whole onus of risk is thus placed upon the contractor, who may be required to cater for all eventualities, including some completely outside his control".

A solution to the above situation is to introduce fair and equitable terms in construction contracts, which will result in benefitting the industry by improving the quality, cost and timeliness of production (World Bank 1984 p51). Chapman et al (1989 p2.6) and Flanagan and Norman (1993 p183) suggest that the use of non-standard forms for contract often leads to the distortion of the requirements of the parties involved frequently resulting in suspicion and distrust between the parties involved.

With regards to the competencies associated with the allocation of risk, the CIC (1996b p12-14) identify that key competencies include the ability to understand the

principles upon which contracts are based in a particular country, the ability to understand the process by which risks are allocated in contracts for construction as well as design, the ability to appreciate the role of insurance in the construction process the ability to recognise the legal basis for forms of compensation for non performance and the ability to understand the principles upon which formal methods of resolving disputes are based.

Generic Key Competencies

In summary the generic Key competencies involved in risk allocation include:

The ability to understand types of risk and the implications of risk or the ability to obtain advice about risk, risk allocation and risk management.

The ability to accept risk or to obtain security for that risk (insurance).

The ability to understand and use the procedures involved in formal agreements.

An appreciation of the recognised ethical codes of conduct in practice.

An understanding of the principles of national law, legal structures and the principles of law making.

The ability to understand the nature, purpose and legal requirements of formal agreements and their application.

The ability to allocate responsibilities and duties to the parties to the agreement.

An understanding of the principle and practice of risk analysis and risk avoidance.

The ability to understand the principles upon which formal methods of resolving disputes are based.

The Key Competency Models

From the literature review an array of generic key competencies have been identified as in table 5.1. The competencies are recognised to be the minimum requirements for the effective operation of all procurement systems in any country. The generic key competencies have been identified by applying functional analysis to each of the five functions of the procurement process. There is no claim for these competencies to be exhaustive of the array of competencies which must be in place in all countries, they are specifically recognised to be the key competencies which must be available in order to operate a particular procurement system effectively.

Tables 5.2, 5.3, 5.4, 5.5 and 5.6 indicates the array of specific key competencies which are required to operate the range of procurement systems which have been identified to exist in more than one country. The examination of the PSM produced for the dominant procurement systems in each of the countries has identified that the following procurement systems are common to more than one country: Lump Sum (Design, Tender, Construct), Design and Build, Design and Build (Turnkey) Management Contracting and Construction Management. Consequently where a procurement system is common to more than one country the specific key competencies have been identified.

Table 5.1: Procurement Generic Key Competencies

Function	Generic Key Competencies
Initiate/promote	The ability to understand the need for the project and to be able to express that need. Having the authority to approve expenditure on the project. The ability to understand the procurement process or to understand how to initiate the process. The ability to define the project in terms of cost, time and performance/quality requirements. The ability to obtain adequate funding. The ability to appoint consultants and/or constructor/s when required.
Fund	The ability to obtain and assemble finance. The ability to understand the nature of the funding process and funding strategy and the ability to provide funds to the project on demand. The ability to understand the relationship between risk and required rates of return. The ability to understand capital costs and life cycle costs. The ability to obtain finance when needed at various stages throughout the design and construction function.
Design	The ability to interpret the needs of the initiator/promoter and to communicate those needs through a process resulting in a building which meets the functional, physical and economic parameters established or presumed. Ability to understand the principles and the practice of building construction, form and function, site selection and design implications. The ability to understand the process through which design is developed from initial feasibility study to the production of construction drawings. The ability to understand the basic design process and the methods used to plan, document, review, monitor and control the design work. The ability to apply an analytical approach towards the appraisal of material selection in construction design. The ability to use valuation methods for price determination in respect of design changes. The ability to prepare tender documentation, to know sources of cost data, to appraise the reliability of cost data for estimates and to control costs within the design process. The ability to use valuation methods for price determination in respect of design changes.

Construct	General	The ability to understand the requirements of any design and to adapt such designs through a process of construction to produce a building of acceptable quality, within acceptable tolerances and within an acceptable time frame for a specific initiator/ promoter. The ability to understand the organisation and practice involving construction.
	Management	The ability to understand the basic process and sequence of fabrication, construction and commissioning of the project. The ability to plan, coordinate, monitor and control construction work. The ability to use elementary skills in time management and basic programming techniques. The ability to understand the principles and practices of cost management and budget forecasting. The abilities of problem identification, data evaluation, problem analysis and the ability to propose optimal or sub-optimal solutions. The ability to adequately plan, allocate resources, delegate, time manage, set goals, monitor and to achieve goals. The ability to recognise the role of a manager of construction. The ability to understand the principles of project organisation, team organisation techniques, personal organisation The ability understand the requirements of technical documentation and the ability to communicate concisely.
	Product	The ability to understand and use the principles and practices of construction technology. The ability to provide facilities for construction. The ability to provide materials for construction. The ability to construct and maintain the structure. The ability to provide infrastructure and environmental landscaping. The ability to install and maintain components and services. The ability to read drawings and take off information. The ability to competently prepare the area of work, carry out the task and communicate and coordinate their trade through liaising with other trades and supervisors.
Risk		The ability to understand types of risk and the implications of risk or the ability to obtain advice about risk, risk allocation and risk management. The ability to accept risk or to obtain security for that risk (insurance). The ability to understand and use the procedures involved in formal agreements. An appreciation of the recognised ethical codes of conduct in practice. An understanding of the principles of national law, legal structures and the principles of law making. The ability to understand the nature, purpose and legal requirements of formal agreements and their application. The ability to allocate responsibilities and duties to the parties to the agreement. An understanding of the principle and practice of risk analysis and risk avoidance. The ability to understand the principles upon which formal methods of resolving disputes are based.

Table 5.2: Lump Sum (Design, Tender, Construct) Specific Key Competencies

Function		Lump Sum Specific Key Competencies (which are in addition to the Generic Key Competencies identified)
Initiate/promote		The ability to appoint and co ordinate consultants in order to interpret the needs of the initiator promoter to establish a detailed descriptive document which reflects the requirements of the project in terms of its functional, physical and economic parameters presumed. The ability to appoint concept, detailed (usually the same individual or group) and/or specialist designers to produce fixed design solutions. The ability to appoint a single constructor producer to manage the process of construction and to produce the construction facility.
Fund		
Design	Concept	The ability for the initiator/promoter to appoint approved or accepted designers to carry out the concept design function.
	Detailed	The ability for the initiator/promoter to appoint approved or accepted designers to carry out the detailed design function, producing completed design drawings and details.
	Specialist	The ability for the initiator/promoter to appoint approved or accepted designers to carry out the specialist design function, producing completed design drawings and details.
Construct	General	
	Management	The ability of the single selected constructor producer to possess, or have the ability to appoint the necessary skills required to manage the process of construction as well as carry out the construction production process.
	Product	The ability of the selected constructor to agree to construct the project in accordance with the completed designs, within a certain time period, and for a predetermined cost.
Risk		The ability for the initiator/promoter to enter into a formal relationship with a funder to provide the finance for the proposed project (if external finance is required). The ability for the initiator/promoter to enter into a formal relationships with the concept, detailed (usually the same individual or group) and specialist designers to complete all design work before the process of construction commences. The ability of the designers (concept detailed and specialist) to accept the risk of failure of designs drawings and details. The ability of the initiator/promoter to enter into a formal relationship with a constructor who will carry the risk of constructing the building in accordance to the completed designs produced by the designers. The ability for the constructor producer to accept the risk of escalations in construction costs and construction time.

Table 5.3: Design and Build Specific Key Competencies

Function		Design and Build Specific Key Competencies (which are in addition to the Generic Key Competencies identified)
Initiate/promote		The ability to appoint and co ordinate a concept design consultant in order to interpret the needs of the initiator/promoter to establish the general requirements of the project in terms of its functional, physical and economic parameters presumed. The ability to appoint a single constructor who can develop the concept designs produced by the concept designer and who can produce detailed design solutions and construct the proposed building.
Fund		
Design	Concept	The ability to appoint licensed or approved design consultants.
	Detailed	The ability to appoint a single constructor producer who can use in house or has the ability to specifically appoint designers to carry out the detailed design function.
	Specialist	The ability for a constructor producer to use in house or to have the ability to appoint approved or accepted designers to carry out the specialist design function.
Construct	General	The ability for the constructor to design and also produce the proposed building.
	Management	The ability of the single selected constructor producer to possess, or have the ability to appoint the necessary skills required to manage the process of construction as well as carry out the construction production process.
	Product	The ability for the selected constructor to produce detailed designs and also construct the proposed building.
Risk		The ability for the initiator/promoter to enter into a formal relationship with a funder to provide the finance for the proposed project (if external finance is required). The ability for the initiator/promoter to enter into a formal relationships with the concept designers to carry out the design work which illustrates the general requirements of the proposed building in terms of functional, physical and economic parameters. The ability for the initiator/promoter to enter into a single formal relationship with one constructor producer who will accept risk for the design, construction and will give certainty of completion costs and time of the proposed building facility. The ability for the constructor producer to enter into formal relationships with detailed and/or specialist designers (as required) in order to produce designs for the building which meets the initiator/promoters functional, physical and economic parameters established or presumed.

Table 5.4: Turnkey Design and Build Specific Key Competencies

Function		Turnkey Design and Build Specific Key Competencies (which are in addition to the Generic Key Competencies identified)
Initiate/promote		The ability to appoint a single constructor who can interpret the needs of the initiator/prompter and who can design and construct the proposed building.
Fund		
Design	Concept	The ability for a constructor producer to use in house or to have the ability to appoint approved or accepted designers to carry out the concept design function.
	Detailed	The ability for a constructor producer to use in house or to have the ability to appoint approved or accepted designers to carry out the detailed design function.
	Specialist	The ability for the constructor producer to appoint specialist designers to carry out this design function.
Construct	General	The ability for the constructor to design and also produce the proposed building.
	Management	The ability of the single selected constructor producer to posses, or have the ability to appoint the necessary skills required to manage the process of construction as well as carry out the construction production process.
	Product	The ability to design as well as construct the proposed building facility. The ability to appoint works constructors and suppliers of materials and machinery.
Risk		The ability for the initiator/promoter to enter into a formal relationship with a funder to provide the finance for the proposed project (if external finance is required). The ability for the initiator/promoter to enter into a single formal relationship with one constructor producer who will accept risk for the design, construction time and certainty of completion costs of the proposed building facility. The ability for the constructor producer to enter into formal relationships with concept, detailed and/or specialist designers (as required) in order to produce designs for the building which meets the initiator/promoters functional, physical and economic parameters established or presumed and within an established time.

Table 5.5: Management Contracting Specific Key Competencies

Function		Management Contracting Specific Key Competencies (which are in addition to the Generic Key Competencies identified)
Initiate/promote		The ability to appoint and co ordinate consultants in order to interpret the needs of the initiator promoter to establish a detailed descriptive document which reflects the requirements of the project in terms of its functional, physical and economic parameters presumed. The ability to appoint concept, detailed (usually the same individual or group) and/or specialist designers to produce fixed design solutions. The ability to a single constructor manager to co ordinate and manage the process of construction in order to obtain the proposed construction facility.
Fund		
Design	Concept	The ability for the initiator/promoter to appoint approved or accepted designers to carry out the concept design function.
	Detailed	The ability for the initiator/promoter to appoint approved or accepted designers to carry out the detailed design function, producing completed design drawings and details.
	Specialist	The ability for the initiator/promoter to appoint approved or accepted designers to carry out the specialist design function, producing completed design drawings and details.
Construct	General	
	Management	The ability for the manager of construction to appoint various trade package constructors to carry out the construction production function. The ability to appoint a manager of construction who will manage and co-ordinate the production of the building for the initiator/promoter, for a fee.
	Product	The ability to appoint trade package constructors to carry out the construction production function.

Risk	The ability for the initiator/promoter to enter into a formal relationship with a funder to provide the finance for the proposed project (if external finance is required). The ability for the initiator/promoter to enter into a formal relationships with the concept, detailed (usually the same individual or group) and specialist designers to carry out the design work which may be fully completed during the process of construction. The ability of the designers (concept, detailed and specialist) to accept the risk of failure of designs drawings and details. The ability of the initiator/promoter to enter into a formal relationship with the manager of construction for the management and co-ordination of the project. The ability of the manager of construction to accept a proportion of the risk associated with escalations in planned construction time, and the quality of work. The ability of the manager of construction to enter into formal relationships with each of the various trade constructor producers required to build the proposed building. The ability of each of the trade constructor producers to accept the risk of possible increases in costs, time, and poor quality workmanship, when building in accordance with original unamended designs. The ability of the initiator/promoter to accept the risk of non certainty of construction costs and time at the onset of the construction process.

Table 5.6: Construction Management Specific Key Competencies

Function		Construction Management Specific Key Competencies (which are in addition to the Generic Key Competencies identified)
Initiate/promote		The ability to appoint and co ordinate consultants in order to interpret the needs of the initiator promoter to establish a detailed descriptive document which reflects the requirements of the project in terms of its functional, physical and economic parameters presumed. The ability to appoint concept, detailed (usually the same individual or group) and/or specialist designers to produce fixed design solutions. The ability to appoint a construction manager, as a consultant, to advise on the administration, co-ordination and management of the proposed project. The ability to appoint various trade constructor producers to carry out the process of construction and to produce the construction facility.
Fund		
Design	Concept	The ability for the initiator/promoter to appoint approved or accepted designers to carry out the concept design function.
	Detailed	The ability for the initiator/promoter to appoint approved or accepted designers to carry out the detailed design function, producing completed design drawings and details.
	Specialist	The ability for the initiator/promoter to appoint approved or accepted designers to carry out the specialist design function, producing completed design drawings and details.
Construct	General	
	Management	The ability of the initiator/promoter to manage, co-ordinate and administer the construction process, with advice from the construction manager.
	Product	The ability to appoint many various trade constructor producers to execute the various packages of work included in the construction of the building.
Risk		The ability for the initiator/promoter to enter into a formal relationship with a funder to provide the finance for the proposed project (if external finance is required). The ability for the initiator/promoter to enter into a formal relationships with the concept, detailed (usually the same individual or group) and specialist designers to carry out the design work which may be fully completed during the process of construction. The ability of the designers (concept detailed and specialist) to accept the risk of failure of designs drawings and details. The ability for the initiator/promoter to enter into a formal relationship with a construction manager, on a fee basis. The ability of the initiator promoter to accept the risk of possible escalations in project costs and completion time. The ability of the initiator/promoter to enter into formal relationships with various trade constructor producers, for the construction of parts of the works. The ability of the selected works constructor producers to accept the risk of possible increases in construction costs and time for their respective package of work.

The analysis of Generic and Specific Competencies

Having discussed the competency approach and its application to procurement systems it is recognised that in order to operate particular procurement systems effectively, a range of generic, common and specific key competencies are required to be indigenously available. The analysis of literature has identified that in order to effectively operate any of the three categories of procurement systems (separated and co-operative, integrated and management orientated) a range of key competencies are required. In order to operate a particular procurement system from one of the above categories specific key competencies are needed.

A series of interviews have been conducted with a range of respondents from each country under investigation to verify the availability of competencies in each country. Each respondent was asked to identify the categories of procurement systems which were available indigenously and asked to comment upon the existence or absence of generic and specific key competencies identified through literature which are shown in tables 5.1, 5.2, 5.3, 5.4, 5.5 and 5.6.

The interviews revealed that in France, the USA and Japan the range of generic and specific key competencies which are required to operate each countries dominant procurement systems are available (see Appendix B). With regards to India and Malaysia the interviews confirmed the unavailability of various key competencies which impact upon the effective operation of indigenous procurement systems. Each country in discussed to examine the availability of key competencies.

USA

Table B1 (i,ii,iii,iv, v, vi,vii and viii) in Appendix B identify that the variety of generic and specific competencies which are required to execute the indigenous procurement systems effectively are available.

France

Table B3 (i,ii,iii,iv, v, vi,vii and viii) in Appendix B indicates that the generic and specific competencies are available.

Japan

Table B2 (i,ii,iii,iv, v, vi,vii and viii) in Appendix B identify that the variety of generic and specific competencies which are required to execute the indigenous procurement systems effectively are available.

The Japan interviewees were asked to identify why management orientated procurement systems are not frequently used indigenously. The results from the interviews indicated that the major reason for the lack of such systems in Japan is due primarily to clients not wishing to assume the risk which are associated with management orientated procurement systems. The dominant procurement systems which are currently used in Japan pass minimal risk to the initiator/promoter, whilst the constructor assumes the majority of the risk. As such Japanese initiator/promoter are reluctant to accept/assume uncertainty on their projects and demand the use of procurement systems which either provide a single point of responsibility for both design and construction or systems which allocate design responsibility to designers and construction responsibility to constructors. The long term trusting relationships which are established between participants within the industry heavily influence the procurement systems which are used. Negotiation was identified as a key process in Japanese procurement systems so design & build or design, tender construction systems are widely used. Once a budget for the project is established it is very important that it is maintained. It was identified by many interviewees that Japanese clients do not like uncertainty. The interviews stated that:

> "There is a great deal of preplanning and estimating before a budget is set for a project and once set the budget should be the same as the final costs. Once the budget is established changes should be minimised during the course of construction. Japanese clients are risk adverse." (Interview 1 table B2 i)

> "Management procurement systems are not used in Japan because i) attitudes of the risk adverse client and ii) attitude and expertise of subcontractors who traditionally work under the management and control of the general contractor.....Japanese clients will choose an expensive but fixed price rather than a cheap and variable one". (Interview 7 table B2 i)

> "We have worked with the same construction company for many years, so we have a long standing relationship that has developed over time and involves mutual trust and respect. It is against our philosophy to work directly with suppliers (subcontractors) or contractors that we have not had previous dealings with".
>
> (Interview 8 table B2 i)

In Japan the client is known as "King" in business, and client satisfaction is a key priority for contractors as they are assumed to be always right and their demands are always met. When clients pass risks onto the contractors through the various procurement systems which are used, constructors will price for this increased risk they are assuming on projects.

> "It is a social and general custom that the general contractor will cover the risks involved in a project. So the Japanese contracting system operates by having greater profit margins to compensate for uncertainties and risk shifts from the client to the contractor.
>
> (Interview 10 table B2 i)

The interviews also highlighted that the management of construction is not considered to be a separate function to be undertaken by an independent party in the construction process in Japan. Indeed this function is assumed by the general contractor who has the role of managing and coordinating the various trade and specialist subcontractors on site:

> "The role of the general contractor in Japan is to supervise and coordinate the work of the subcontractors. They carry out little construction work themselves. The management of the construction is done by the general contractor"
>
> (Interview 5 table B2 vi)

> "Independent management companies do not exist in Japan because the major construction companies have performed in their general duties as contractors"
>
> (Interview 6 table B2 vi)

The relationship which exists between general contractors and subcontractors in the Japanese construction industry was identified to be unique and influence the types of dominant procurement systems which are used indigenously.

The interviewees stated:

> ".....much use is made of subcontracting in the industry. Each large company has its own collection of subcontractors who work exclusively for the general contractor. The subcontracting system is on an allegiance basis, contractors do not shop around for subcontractors as occurs in the UK".
>
> (Interview 3 table B2 vii)

> "Subcontractors generally do not have the skills to coordinate themselves and also do not have the ability to accept the responsibility of the whole project. This is why the work with the parent contractor.
>
> (Interview 7 table B2 vii)

India

Table B4 (i,ii,iii,iv, v, vi,vii and viii) in Appendix B identify that the availability of the various generic and specific competencies required to execute the indigenous procurement systems effectively. The interviews indicated that there are several generic competencies which are not adequately available within the industry. In particular the interviews all concluded that the major constraints in terms of generic competencies included; the ability to obtain finance at equitable interest rates, poor management of construction, poor construction produces (as the level of skilled labour within the construction industry is low) and finally problems in terms of allocation of risk as the present mechanisms for allocating risk (usually formal contracts) are either bespoke for each client or they are made up of a patchwork of contract clauses adapted from foreign contract documents.

Due to the high degree of consistency of responses from the interviews on India the results are considered collectively. The interviewees confirmed that a major factor which affects the operation of all procurement systems is the ability to secure finance for construction projects. Although finance is available from both public and private sources it is often available at high interest rates and its supply is often restricted. In the private sector, the majority of finance for construction is obtained either from Banks or private money lenders as well as personal savings. As such private sector initiator/promoter are faced with limited avenues to secure finance for construction. When finance is available it is often only secured are high interest rates. The

interviewees identified that high interest rates are charged because the construction sector is considered to be "very risky" and as such financial institutions are reluctant to provide construction finance. With regards to public sector finance the interviewees suggested that the securing of finance is again a major problem in India. Government finance for construction works is often limited in supply, and the supply itself is often unpredictable with projects being frequently abandoned due to the public sector bodies running out of funding. The comments raised included:

> "Securing finance is a major problem: private clients are faced with limited avenues to acquire fiance which is at high interest rates. In the public sector there is the raising and maintaining the flow of finance for projects. If there are any economic problems or other sectors of the economy requiring finance it is taken from the governments construction budget. This is a major reason for time and cost problems in India".
>
> (Interview 5 table B4 ii)

This unpredictable supply of finance at high interest rates has resulted in developers asking clients to provide down payments for their buildings before construction has commenced. During the construction phase, owners are asked to make periodic payments to developers in order to finance the construction of the project.

> "Finance is a very big problem. Public departments do not have adequate flows of finance. Down payments are often obtained from tenants before construction of buildings in the private sector commence, with periodic payments being made during the construction of the project".
>
> (Interview 9 table B4 ii)

The interviews also highlighted that because indigenous finance is so difficult to secure and equitable rates, foreign financial institutions are increasingly providing finance for construction work in India. In particular procurement strategies such as Build Operate Transfer are being used in India which involve foreign companies providing finance for construction work. The interviews revealed that a major reason for both time and cost overruns which is experienced on many building projects in India is due to "financial bottlenecks" created by the difficulties in accessing and securing finance in the long term.

"Finance is available but at high interest rates in the private sector. Financial systems are generally rigid resulting in it being difficult to obtain funding for construction. Foreign finance is obtained for major projects, particularly for infrastructure work.

(Interview 13 table B4 ii)

The interviews results indicate that the generic design competencies are available in India. A range of designers are involved in the building process and posses technical competencies which are demanded within the industry.

The generic competencies of management construction and construction production are both considered to be in limited supply in India. The interviews identified that except for a few of the large general contractors which operate throughout India there are inadequate competencies in terms of the management of construction. Poor competencies in planning, co-ordination, programming and management were highlighted as key deficiencies within the industry.

The interviewees stated:

"Inadequate management skills exist. There are not enough consultants or experienced contractors who have management skills. The problem is that it is difficult to get clients to understand the importance of management skills ..... They just look at us as an additional fee and tend to believe that other consultants like engineers and architects should provide the service".

(Interview 3 table B4 vi)

"The problems of the industry are concentrated around inadequate management, planning and coordination of work. We have experienced qualified technical staff, but we lack the techniques and general understanding of the management of construction. Contractors do not plan work adequately ...".

(Interview 9 table B4 vi)

"There are no real management skills within the industry. The number of skilled professionals within the industry is depleting due to their movement to more lucrative areas of employment. More skilled practitioners are required in the industry which may only be achieved by introducing more training programmes".

(Interview 16 table B4vi)

The interview survey identified that the construction production process is carried out by the general contracts, trade based contractors, specialist contractors and labour only sub-contractors. It was further identified that there is a shortage of skilled workers within the industry, along with the availability of materials and plant also being restricted. The skill basis of construction workers is limited in India. Traditionally construction skills were passed down from father to son, with few formal training systems in place. The interviewees state:

> "Quality is a problem primarily due to lack of skilled labour and materials".
> (Interview 11 table B4 vii)

> "Contractors and trade contractors have limited or no formal education or training. Their skill have been passed down from father to son, with no organised form of certification or qualification. The lack of skilled labour has resulted in poor quality work, time and cost overruns".
> (Interview 14 table B4 vii)

The lack of skilled labour within the construction industry in India is further exacerbated by the poor supply of materials and plans.

One interviewee stated:

> "There is a lack of skilled workers within the industry. Skills have traditionally passed down form father to son on construction sites. This is no longer the case and no formal training institutions exist. There is additionally a poor supply of materials and plant".
> (Interview 16 table B4 vii)

With regards to the generic competencies available for risk allocation the interviews concluded that a major problems within the industry is the use of adopted forms of contract. Contract documents which are used in India have predominantly been adapted from the UK (consisting of RIBA 1963). Although there is no standard form of contract which is used throughout India, standard documents are available in both the public and private sector. These contracts although often termed standard are modified to suit the interests of the individual client. Contracts are often compiled exclusively for private sector clients and generally consist of a patchwork of clauses

from various international standard forms of contract including JCT and FIDIC. The interviewees stated:

> "Each government department and architectural practice produces their own individual forms of contract which are based on the RIBA (1963) with individual modifications. Clients tend to pick up clauses from the various contracts available and make up their own documents to suit their own interests".
>
> (Interview 11 table B4 viii)

> "The contract document used has often been adopted or imposed from the UK. The tradition of using colonial contracts and FIDIC contracts is not appropriate. These documents are not adapted to our working environment. This is a key issue ..... fair and equitable contracts need to be developed".
>
> (Interview 9 table B4 viii)

The analysis of interviews from India concluded that the generic competencies which were not adequately available within the industry included the availability of finance for construction at equitable rates of interest, the availability of managers construction, the availability of skilled construction produces and finally the ability to distribute risk fairly and equitably amongst the participants in the procurement process. The interview concluded that the deficiency of such generic competencies has resulted in the ineffective operation of many procurement systems used in India.

Malaysia

Table B5 (i,ii,iii,iv, v, vi,vii and viii) in Appendix B identify that the availability of the various generic and specific competencies required to execute the indigenous procurement systems effectively. The range of interviews conducted in Malaysia identified that the generic competencies which are limited in availability primarily relate to the availability of managers of the construction function and skilled labour which is needed in the construction production process. Although the risk allocation competency was also recognised to be inappropriate (as most of the contract documents used in Malaysia are based on RIBA 1963), all interviewees recognised the lack of skilled labour within the industry as a major constraint on all building procurement systems.

With regards to management of construction competencies it was revealed that although general contracts often assume the function of manager of construction under the lump sum design, tender and construction procurement system and under the design and build approach, there are few participants that can offer the service of a management contractor. With regards to this specific competency the interviews identified that management training has traditionally been neglected in the industry. The lack of skilled, experienced qualified managers within the industry is recognised as a constraint on the use of management orientated procurement systems in Malaysia. The interviewees stated:

> "Management skills for contractors has tended to be neglected in formal education - it just comes with experience. Most contractors are established and just develop management skills through experience - with little formal training. A lot of the large companies are still firmly owned businesses and skills are passed from father to son. Subcontractors generally have poor management skill. This lack of competence in management extends to many of the main contractors in the industry".
>
> (Interview 1 table B5 vi)

> "The traditional deficiency/problem of contractors in Malaysia has been regarding quality control, safety on site and poor management. The use of management orientated procurement systems is limited by the availability of good management contracting/CM companies. There are only a few in the industry with this expertise".
>
> (Interview 15 table B5 vi)

It was identified that due to 93% employment rate in Malaysia, coupled with the poor image of the construction industry there are acute labour shortages in the industry which has resulted in the influx of foreign works being imported to work in the construction sector in Malaysia. The interviews identified that:

> "There is a big labour shortage in Malaysia as we have 93% employment. We are lacking between 20-30% of labour and skilled craftsmen. We employ many foreign workers as we don't have enough employees within our own country. The biggest problem is the lack of labour. The total number of foreign workers in the country is currently 1.2 million, and we still need more".
>
> (Interview 2 table B5 vii)

> "Our construction industry is faced with two constant problems- materials and labour shortages which affects the coordination and running of the construction industry. There is a labour shortage as generally the industry has a poor image and people are reluctant to work in construction. As a result many of the construction workers are foreign".
>
> (Interview 1 table B5 vii)

The interviews established that many of the labourers which are imported (from Indonesia, Thailand, India and Bangladesh) arrive in Malaysia as unskilled labour. These foreign workers are restricted by government legislation to only work in Malaysia for a maximum of three years. They are employed on construction sites as labourers and begin to learn trades and skill once working on site. After being employed for three years the foreign workers are repatriated to their home countries. This has the effect of continually draining the skilled labour competency within the industry. The interviewees made the following comments:

> "The level of skilled workers within the industry is relatively low, the industry has a poor image so manpower is a problem. As a result skilled Malaysian workers don't wan to work in construction and move to other industries, so the construction industry is made up of many (approximately 95%) foreign labour. These people come and go through the industry and are only allowed to stay for a maximum of 3 years. The biggest problem is that we train them for 3 years and by the end we have skilled labour and then these workers are sent back to their own country. This means that the skills were developing in the country are constantly being taken out, leaving us with mostly semi-skilled or unskilled labour".
>
> (Interview 12 table B5 vii)

> "The subcontractor and trade based contractors are generally not well organised and have poor management, organisational, planning and co-ordination skills. They are often not registered under any trade body, and there is very little control over the supervision of their work. The market allows anyone to set up such a company with no previous experience or expertise in the field of construction".
>
> (Interview 15 table B5 vii)

The underdevelopment of trade based contractors and subcontractors was also recognised as a feature which affected the use of management orientated procurement systems in Malaysia. In particular the specific competency of trade based contracts being able to manage and co-ordinate their own works was highlighted. The

comments made included:

> "The smaller companies in the industry and the largest sector of the construction market generally lack of level of sophistication in management, financial resourcing and planning. These companies have a knowledge of construction skills and how to physically build, but the implementation process is often unorganised and poorly administered/managed. The lack of management and planning skills has affected the overall running of the construction industry".
>
> (Interview 8 table B5 vi)

> "Specialist Subcontractors have developed their management/planning skills in parallel with their specialist trades. However the majority of subcontractors are still trade based, and are not so sophisticated in terms of management. A major problem remains the co-ordination and management of the various specialist and trade contractors on site. It is often the case that contractors are working over each other which results in delays".
>
> (Interview 5 table B5 vi)

The final generic competency which is limited in availability and influences the effective operation of building procurement systems in Malaysia was associated with the allocation of risk competency. The contract documents which are currently being used in Malaysia originate from UK documents such as RIBA 1963. These contracts have frequently been adopted directly from developed countries and used in Malaysia without little modification to suite the indigenous working environment. These contracts have the effects of being biased towards the initiator/promoter rather than the constructor, and can have the effect of causing adversarial relationships to develop. As such the construction industry is calling for the introduction of Malaysian construction contracts which are fair and equitable to the parties involved.

The comments made included:

> "One of the key areas is the contractual documentation which is often used by the construction industry in developing nations has developed and adapted for developed countries. More equitable agreements are required between the parties involved".
>
> (Interview 4 table B5 viii)

"The contract documents have been criticised for not being fair, being too legally orientated and being difficult to understand, but in practice the PAM is not strictly used. Modifications and amendments are always made to the contract. Malaysian culture is non-adversarial and when disputes arise they are discussed, negotiated and finally agreed between the parties - most of the time".

(Interview 14 table B5 viii)

Although all of the interviews revealed that at present the contract documents which are used in Malaysia are biased towards the clients interests, and require modification to make them fair and equitable, the respondents also acknowledged that the personal relationships between the two parties to the contract are of crucial importance. The interviewees commented:

"The construction industry is not very particular on the contracts and legal terminology, this is only half of an agreement. The other half is based on personal contracts/business relationships, negotiation, discussions and agreements between the parties ..... Even though the contracts used have got the potential to be adversarial, the way they are implemented and used within the industry makes them less adversarial. This is because of the nature of society and the culture of the people. The 'Asian' culture is very different from 'Western' culture, and the methods of dealing with disputes is different, they are rarely brought out into the open or in the a court, and they are settles between the parties in private. It is about maintaining trusting relationships and honour".

(Interview 16 table B5 viii)

"Personal contracts and relationships are extremely important in business in Malaysia. Negotiation and discussion between parties is vital to success and the contract is almost secondary".

(Interview 11 table B5 viii)

The interviews conducted in Malaysia highlighted that the major generic competency which was limited in supply in the country was the availability of skilled construction producers. Due to the 93% employment rate and the poor image of the construction industry, the industry comprises of a large amount of small companies which consist of unskilled/semiskilled foreign labour. The interviewees concluded that the lack of skilled labour within the industry is a major problem and affects all procurement systems used indigenously.

Summary

In this chapter the origins of the competency approach have been highlighted along with its application to the effective use of building procurement systems. Published research relating to the competency approach has been analysed and the methodology which supports this approach has been applied to the operation of dominant procurement systems. It has been identified that in order to operate a particular procurement system a range of generic, common and specific key competencies are required to be available with resources to be available in adequate supply and of satisfactory quality at the time they are required. Generic competencies apply to the effective operation of all procurement systems within a country whilst common competencies apply to the operation of a particular category of systems. The availability of specific competencies allows to operation of a particular procurement system within a country. Procurement systems will only operate effectively if generic, common and specific competencies and resources are available.

The key generic and specific competencies and resources identified, using methodology developed within the competency approach, have been established through literature and verified by interviews with a range of respondents from each country in which the particular dominant procurement system is used.

Having identified the broad range of generic, common and specific key competencies and resources which are minimum requirements needed to be available in order to operate either of the three categories of procurement systems, each country, was examined to identify the existence or absence of such competencies. The results identified that with regards to both India and Malaysia a range of generic competencies and resources were in insufficient supply within the industry.

In terms of specific and common competencies the interviewees highlighted the absence of experienced and qualified managers of construction as a major restriction on the effective use of management orientated procurement systems. When such procurement systems are used either the limited availability of qualified participants are involved, or more often the competencies imported from other countries.

The unavailability of generic, common and/or specific competencies indigenously has led many countries to import such competencies. Both India and Malaysia have imported such competencies in order to operate particular procurement systems effectively. The particular use of BOT strategies has been a method by which India is fulfilling its competency gaps. The importation of finance, managers of construction, skilled labour, plant, materials and contractual documents has facilitated the use of particular procurement systems indigenously.

The insufficient availability of competencies may therefore be recognised as gaps or limitations in the supply chain in the countries construction industry. If the generic, common and specific competencies are available indigenously, then a particular procurement system may be operated effectively. The supply of competencies within a country therefore allows a particular procurement system to be effectively used. If however any of the three groups of competencies are unavailable or limited in availability, then a gap in the supply chain is identified. As such unless the competencies are imported or developed indigenously (therefore filling the competency gap) the particular procurement system operated will only work at an ineffective level. The identification of competency gaps or where competencies are limited in supply will facilitate information to be provided to any country on which competencies need to be developed indigenously in order to operate a particular category of procurement system effectively. Such information will allow the country to establish policies or programmes to develop such competencies therefore strengthening the construction industry.

It should be recognised that the competencies which are requested within a countries construction industry are a direct result of the demands of the industry. As such demands on the industry change, so will the competencies which are required within the industry. It is therefore recognised that the 'gaps' in competencies identified will only indicate the limited supply a certain competencies at a certain moment in time. As demand within the industry is dynamic, it is also acknowledged that the competencies within the industry will also change over time. In order to mitigate the voids between the supply of competencies and the demands of the industry, institutions are required to be established with consultations with representatives from the industry to monitor the array of generic, common and specific key competencies

which are being demanded. Institutions will therefore be the focus for the establishment, development, dissemination and sustaining of competencies which are required within a countries construction industry.

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CHAPTER SIX

INSTITUTION FRAMEWORKS

Introduction

By identifying generic functions in the procurement process it has been established that objective models of dominant building procurement systems may be developed. The use of three functional frameworks which identify who does what, what pattern of formal relationships exist and how risk is distributed between the functional participants in a particular system allows a particular system to be modelled. The combination of these three frameworks produces the Procurement Systems Model (PSM). The use of functional analysis rather than professional titles and country specific terminology has facilitated the objective comparison of dominant procurement systems between the countries under investigation.

The process of modelling procurement systems by functional analysis and the application of the competency approach to the effective operation of dominant procurement systems has facilitated the identification of the key competencies and resources which are required to be available in order for a particular procurement system to operate effectively. Chapter five has analysed the existence of these generic, common and specific key competencies and resources which must be available in order to operate a particular dominant procurement system effectively. It has been suggested that if key competencies are not available in a country and a particular procurement system is operated the system may operate at an ineffective level. In order to operate such systems effectively the key competencies may be imported.

The aim of this section is to identify how the key competencies and resources which allow the effective operation of a particular procurement system may be developed indigenously (see figure 1.1). It is contended that the existence of generic, common, and specific key competencies depends upon the establishment and maturing of a variety of institutions indigenously. These institutions include non-industry specific institutions which are concerned with finance, legal systems and client bodies, and also construction industry specific institutions such as education and training institutions, trade associations, professional institutions and research and development institutions. If such institutions do not exist or have been inappropriately structured than the key competencies which are required to operate a particular procurement

system may not be developed, established, disseminated or sustained indigenously. The theoretical concept of Institution Building (IB) and Institutional Development (ID) are examined and applied to the construction industry context. Various industry specific institutions are discussed, identifying how they are involved in establishing, developing, disseminating and sustaining competencies within a country. It is identified that there is no blueprint of standard framework of IB and ID in all countries. The country's political, economic social and technical characteristics must be considered when proposing IB and ID strategies in a country.

Previous research is analysed to illustrate the dependency linkage between the availability and supply of key competencies and resources and the existence and development of indigenous institutions. The key competencies and resources which must be available in order to operate a particular procurement system effectively as identified in chapter five are further analysed to examine how they may be made available indigenously. It is contended that the existence and development of indigenous institutions contribute to the supply of such key competencies and resources.

If a country is deficient of key competencies due to the lack of institutional development, then they may be imported in order to allow a particular task, process or procedure to operate effectively. However, this arrangement does not encourage the development of such competencies indigenously. In order to establish, develop, disseminate and sustain competencies either the process of technology transfer must occur or the building and development of associated institutions which will produce such competencies indigenously is required. The result of developing indigenous institutions is recognised to encourage growth of a countries construction industry and will allow key competencies to be supplied facilitating the effective operation of indigenous dominant procurement systems.

Institution Theory

The role of institutions in society, their establishment and development has been discussed frequently by social scientists. A broad definition of institutions is provided by Rowe (1989 p21-22) who recognises institutions as:

> "..... nothing more than a particular way of acting and believing for some agents who are thus said to be members of, or participants in that social institution".

In defining institutions in this manner, Rowe (1989 p22) proposes that the reason for our choice to conduct our lives within common social institutions such as language, law, marriage, nations, markets etc, is because members of these institutions follow rules which shape behaviour.

The work of Uphoff (1986 p9) discusses institutions as "complexes of norms and behaviours that persist over time by serving collectively valued purposes". He acknowledges that the definition of 'institutions' is however often unclear because the term institution and organisation are frequently used interchangeably. Uphoff (1986 p8) attempts to clarify the difference between institutions and organisations and identifies that there are three categories which include a) organisations which are not institutions, b) institutions which are not organisations and c) organisations that are institutions (and vice versa). To illustrate the distinction of the three categories, he suggests that a new law firm is an organisation that is not (yet) an institution, whilst the 'law' is an institution and not an organisation, but 'courts' are both institutions and organisations (Uphoff 1986 p8). This study is particularly concerned with the latter category or definition of institutions.

McGill (1995 p65) argues that institutions have two primary characteristics: they constitute instruments for action and they provide inherent value to their recipients. As such institutions are fundamental to the development of a society. The lack of 'institutions' in certain societies has often been recognised as the cause of lack of development. Adamolekun (1990 p5) (with reference to sub-saharan Africa) identifies how lack of institutions or as he suggests "institutional weaknesses" in developing countries often results in constraining the development process of such countries.

Salman (1992 p11) further contextualises the importance of institutions in the development process by stating that:

> "..... institutions are central to sustainable and beneficial economic growth. They create the policies, mobilise and manage resources, and deliver the senses which stimulate and sustain development".

In order for an institution to exist in a society or a country, the process of Institution Building (IB) and, or Institutional Development (ID) is required to take place. In essence the IB process is concerned in the creation of new institutions in a society where as ID is involved in developing institutions which already exist in a country/ society to meet with the current development needs of that society/country (Miles & Neale 1991 p8).

Institution Building (IB)

Esman (1972 p21) analyses the concept and purpose of IB in society proposing that it is primarily concerned with planned and guided social change. As such, the objective of IB is to establish effective institutions or organisations which develop support and compliment their environment. He defines IB as:

> "..... the planning, structuring and guidance of new or reconstituted organisations which a) embody changes on value, function, physical and, or social technologies, b) establish foster and protect new normative relationships and action patterns, and c) obtain support and complementarity in the environment".
>
> (Esman 1972 p22)

The IB Framework

Esman (1972 p22) proposes a conceptual framework of the IB process (fig 6.1). The framework assumes three components which are significant to the process of IB in society. These include the institution itself and its organisational structure, the links the institution has with society and transactions or the way in which the institution gains support for itself and operates with an environment (Pooler & Duncan 1972 p184). Each of the components of the framework will be discussed.

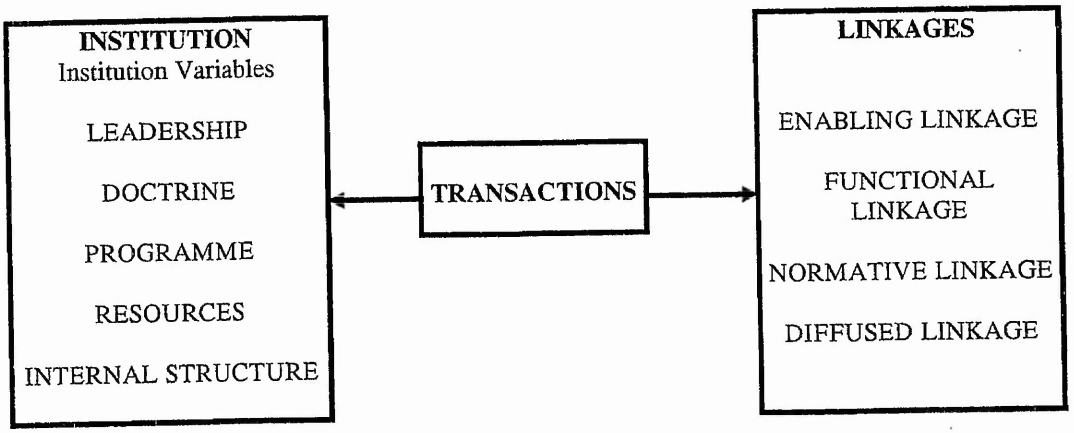

Fig 6.1 The Institution Building Universe
(Source: Esman (1972 p 22) originally from Esman & Blaise (1966))

Esman's framework (Fig 6.1) identify that the institution variables are concerned with the institution itself, whilst the linkage variables are related to the external environment in which the institution is operating. As indicated in Fig 6.1, there are five institutional variables which are considered to be crucial in the process of establishing or building an institution in society. These include:-

a) Leadership. Esman (1972 p 22) recognises this as the most important factor in the IB process as new institutions requires "intensive, skilful and highly committed management" in order to operate. The leader/s formulate a clear understanding of the organisations objectives, operations and relationship with the environment. It is therefore prudent for the leadership of the institution to constantly maintain surveillance on the relationship with its environment to anticipate problems, opportunities and modifications which need to be made to its own policies.

b) Doctrine. This concerns the theme, image and expectations of the institution including the institutions values and style (Miles & Neale 1991 p 9). The doctrine is what the institution stands for and what it hopes to achieve and

therefore motivates staff, establishes expectations about performance, develops standards for decision making, evaluates results, activities and outputs of the institution (Esman 1972 p 29).

c) Programme. The programme establishes the functions to be executed by the institution and therefore it translates the doctrine into activity. The programme is frequently formulated in response to the countries legal mandates and environmental demands. In order for the institution to be established, the programme is required to be designed and managed so as to receive support from society or the environment in which it is to operate. Esman (1972 p 30) observes upon this paradoxical relationship suggesting that often innovative programmes will generate opposition amongst important groups or members of society. Consequently in order for an institution to be accepted the programme must be considered by its clients to offer greater benefits than dissatisfaction.

d) Resources. Resources are frequently scarce and include the financial, physical, human, technical and information inputs of the organisation. The effectiveness of an institution within a country is often determined by its access to resources. Without these resources an institution is unable to execute its programme or to achieve its desired doctrine no matter how strong its leadership. Esman (1972 p 30) recognises that there is a correlation between the institutions programme and the resources available and therefore the development of a programme must be consistent with the resources available at any single point in time. The claiming and mobilisation of additional resources by an institution is however determined by its ability to deliver or provide demanded services effectively thereby obtaining support in society.

e) Internal structure. This refers to the framework or structure within which the institution is managed and is acknowledged to have strong cultural dimensions so must therefore be devised to suit the needs of the local environment (Miles & Neale 1991 p 10). Esman (1972 p 32) recognises that in order for the institution to operate effectively the internal structure must be appropriate,

establishing formal and informal patterns of authority, divisions of labour, and channels of communications and methods of resolving any disputes which may occur.

In concluding on the essential features of an institution in the IB process, Esman (1972 p 32) observes that in order for the institution to be effective it must achieve technical competence and cohesion between its variables. As such the institution is contended to be a vehicle for the IB process, allowing the permeation of innovations and outputs into society.

The framework proposed by Esman (fig 6.1) illustrates that institutions do not exist in isolation, but establish links with their environment in order to survive and function. The framework (fig 6.1) suggests that relationships are established between the institution and the environment by four linkages. These include:

a) Enabling linkages, which govern the allocation of authority and resources, required to function the institution (particularly during its initial period of establishment) and protecting it against attack from other institutions in society.

b) Functional linkages with other complementary institutions in society assist in the institution achieving its desired objective (doctrine) by providing support and information and using its outputs.

c) Normative linkage; correspond to linkages with institutions involved in similar themes, which may either be helpful or hostile.

d) Diffused linkages are relationships with influential individuals or groups who are not directly involved in the aims and services of the institution, but could be most valuable to the institution due to their credibility and acceptability in a society/nation.

The transactions (referred to in fig 6.1) represents the way in which the institution guides its external relations, facilitating the operation of the institution, gaining support, overcoming resistance and bringing about change with associated institutions in its environment.

The Aim of IB

The aim of the IB process and the establishment of a new institution in society is to achieve "institutionality". The concept of institutionality is recognised as being when certain relationships and action patterns are valued with an institution and by the society in which they exist. These relationships and action patterns are therefore incorporated into the behaviour of linked organisations and groups (Esman 1972 p 28).

The Frameworks Limitations and Assumptions

In investigating the Institution Building Universe concept it is necessary to draw upon the assumptions and limitations of the framework. In analysing the framework, Esman (1972 p25) recognises that it is not a universal framework for social change, and has certain weaknesses. He does acknowledge however that the framework may be applied to understand the IB process. In particular, the institution building universe framework may be applied to circumstances where; i) the change agent is an official body (such as the government) ii) the society under consideration facilitates the process of innovation without force or restrictions and iii) in an environment where formal institutions are used as a vehicle to develop, guide, sustain the innovation (or end product).

A number of assumptions are made by Esman in the development of this framework. Primarily the framework assumes that the environment or society in which the innovations are induced and the formal institutions themselves are static and remain constant themselves. In fact, in all country's both the characteristics of the environment are likely to be dynamic and constantly changing. The environment in which innovations are introduced are significantly influenced by the country's political, economic, social and technical characteristics. Additionally, institutions

themselves are not static but are dynamic being modified and developed continually and are influenced by the environment in which they operate.

The framework proposed by Esman also assumes that innovations are induced rather than being evolved or created spontaneously in society. Such innovations are often governed by unpredictable events in a society which are uncontrollable. With the aim of the IB process achieving "institutionality" the framework further assumes that the value of the institution to society is greater than the actual task undertaken. This infers that the institution possess a favourable or even prestigious image in society. The creation and existence of institutions in a society or country is often problematic, due to the limited availability of resources, the distribution of authority between them, and the potential conflict that may occur between institutions in a society.

The Role of Technical Assistance

Technical assistance is the process by which support and help is provided to facilitate the IB process to occur. Esman (1972 p39) recognises that the process of IB is affected by technical or external assistance (particularly from the government or international agencies). Pooler & Duncan (1972 p183 - 185) go on to consider how the IB process in developing societies is encouraged by the transfer of technology, skills, and knowledge through the process of technical assistance. They state that:

> "Technical assistance involves an international transfer of knowledge and skill through individuals of agencies of a donor in accomplishment of mutually agreed objectives ..... and .... the standard programme of major technical assistance agencies involves the provision of personnel, training and equipment. The focus is usually on the achieving of some particular development objective".
>
> (Pooler & Duncan 1972 p185)

In analysing the function of technical assistance in the IB process in a range of projects, Pooler & Duncan (1972 p216-217) concluded that successful projects were identified as those in which technical assistance personnel were involved in the creation of a new institution in a country. The authors recognised that such personnel encouraged the establishment of an enduring structure in addition to providing the much needed skills, knowledge and new technology which is deficient in the recipient

environment. The benefit of this form of technical assistance is further acknowledged to be most suitable as a short term measure. Pooler and Duncan recognised that technical assistance in this manner will eventually be phased out once the institution is created, so it is essential to establish indigenous mechanisms which ensure the continual existence of the institution during its operation by local personnel. As such in the initial stages of the IB process, technical assistance is frequently required in establishing the institution, training indigenous personnel, and establishing links to exert influence on the indigenous society in order to secure resources and to ensure that a level of authority are made available to the institution. After this stage (in the medium term), the role of technical assistance is predominately in an advisory capacity involving the establishment of procedures, designed to strengthen and build the institution itself as well as its reputation in society. Finally, (in the long term), the role of technical assistance should diminish as the institution becomes "quasi-independent functioning entirely in the society" by indigenous staff (Pooler & Duncan 1972 p218).

Esman (1972 p37) corroborates the findings of Pooler & Duncan, acknowledging that technical assistance in the IB process is not merely a question of adopting institutions or technologies from one nation to another. He states:

> "The IB perspective explicitly rejects the notion that meaningful change can be a straight forward transfer of technology or the installation of prepackaged know how or organisational forms from one culture to another whether managed entirely by indigenous innovators or assisted by foreign advisors".

The technical assistance process is acknowledged by Esman as being a valuable tool to facilitate the establishment of institutions in a country or society. When technical assistance is provided it should not merely comprise the adoption of the donor country's institutions, technologies and skills but is a process which is required to be learnt, adapted and modified to suite the needs of its indigenous recipients operating environment and needs.

Institutional Development

The study by McGill (1995 p68) examining institutional theory refers to the work of Buych (1991 p5) who states that:

> "ID is the creation or reinforcement of the capacity of an organisation to generate, allocate and use human and financial resources effectively to attain development objectives, public or private. It includes not only the building and strengthening of institutions but also their retrenchment or liquidation in the pursuit of institutional, sectoral or government wide rationalisation ....".

McGill (1995 p71) discusses the concept of institutional development (ID) concluding that it is a learning process concerned with the relationship which exists between an institution and its "clients" in society rather than a prescriptive 'blue print' approach (Uphoff 1986 p192, Salman 1992 p5). It involves intervention and adjustments in the institutions organisational structure, its processes and regulatory environment which should be tailored to suite the local political, economic and social conditions (Horberry & Le Marchant 1991 p385, Blase 1986 p340). As such, McGill proposes that ID is centrally concerned with ensuring sustainability of the institution and it functions in a society (Brinkerhoff, 1994 p151 & Honaindle 1982 p178).

Technical Assistance in ID

McGill (1995 p74) further recognises that technical assistance is important in the ID process. He examines the findings of Blase (1986 p404) and Buych (1991 p14) who are critical of the traditional approach to technical assistance which consists of technical assistant donors prescribing to indigenous recipient what is necessary for the ID process. Both authors recognise that this strategy is inappropriate as each country has specific characteristics which should be considered before deciding on the form of technical assistance which is most suitable for a particular recipient country. What is recommended is a more explanatory and participatory approach to technical assistance allowing great involvement by the indigenous recipients in order to secure long item sustainability of local institutions.

Hancock (1987 p12-13) identifies that in the selection of contractual arrangement for building projects environmental considerations must be taken into consideration. In particular he identifies four external environmental factors which should be examined before a contractual arrangements are selected. These include:- Political, Economic,Legal and Technical factors. Hancock (1987 p12) proposes that the generic type of factors which may influence the construction industry of a particular country include:

> "Political; government expenditure on defence, housing, education, import and export regulations, planning law, office development grants, trade union movements, rate capping and similar policies. Economic; interest rates, land costs, tax benefits, investment policy, markets, financial loopholes, and opportunity costs. Legal; employment law, contract law, case history (precedent), cost of legal redress, safety regulations, arbitration law and administration law. Technological; innovative materials, re-fabrication industrialised buildings, production processes, new machinery and computerisation".

Newcombe, Langford and Fellows (1990 p33-39) further analyse the environmental factors which affect the operation of a country's construction industry. The authors proposes that the general environmental features which affect all organisations in a country include Politics and Law, Economics, Sociology and Technology and refereed to such features as PEST. Newcombe, Langford and Fellows (1990 p33) provided definitions for each of these environmental factors. The first of these factors includes Politics which is suggested to determine policies and actions on issues such as monetary policy, fiscal policy, employment and industrial development. The construction industry of any country is therefore heavily dependent upon a variety of political factors with the most important being economic, employment and industrial policies. The authors defined politics as:

> ".... the science of State organisations, affairs of State and perhaps more practically, questions of policy ..... Politics is a factor not only of central and local government but also it pervades all institutions and organisations. It is a process of attempting 'manipulations' of peoples behaviour in striving for particular ends which the politician desires".
> (Newcombe, Langford, Fellows 1990 p34).

With regards to Law Newcombe, Langford and Fellows (1990 p35) identify that this environmental factor:

> "..... provides a general framework for and prescribes boundaries within which people's actions occur, wether as individuals or on behalf of others or of organisations. The law is the ultimate arena for the settlement of disputes (litigation)".

As such the legal environment needs to be recognised, and heavily influences the operation of construction firms within the country.

Economic factors are considered to be determined by policies of indigenous governments, foreign governments as well as international trades and speculators. Newcombe, Langford and Fellows (1990 p36) particularly identifies fiscal and monetary policies as crucial in economic factors with the former being concerned with patterns of government expenditure and income, whilst the latter policies are concerned with the supply of money and credit facilities, are particularly rates of interest. The authors state that:

> "Fiscal policy effects the industry directly through its effects on the demand for new building works, whilst monetary policy has an indirect effect, particularly through changes in the rate of interest increases reduce the demand on construction and make construction more expensive".
>
> (Newcombe, Langford & Fellows 1990 p36)

The third environmental factor is sociology which considerers culture, sociology and ethics of a country and is associated to how individuals behave, their norms and values therefore forming the social context for construction activity and firms operating within a particular environment or country. The importance of this environmental factor is therefore suggested to be that:

> "People determine whether building s are constructed, what buildings are produced, where, why and how. Urban development and the forms of buildings are functions of society .....The society of a country and/or its 'coloniser' is fundamental in the determination of the country's laws and legal system".
>
> (Newcombe, Langford & Fellows 1990 p37-38)

Finally with regards to technology factors the authors state that:

> "Technology is a basic determinant of what and how the industry can build. Also, technology determines where it is possible to construct - dewatering, ground stabilisation, foundation engineering, etc. Generally technology advances so the range of construction possibilities ..... Technology affects productivity; often major increases in productivity are associated with technological advances, notably increased/more efficient use of plant".
>
> (Newcombe, Langford & Fellows 1990 p38)

Institution Building and Development which affect the Construction Industry

There are many types of institutions which exist in a country. This investigation is primarily concerned with institutions which influence the operation of a country's construction industry. Within any country there are common institutions which support all industries, and there may be industry specific institutions related to the particular sector of the economy. The establishment and improvement of all institutions within a country is specifically related to the country's political, economic, social and technical characteristics at any point in time. The process of IB/ID are therefore dynamic and are required to be continually modified and reviewed.

The institutions which influence the operation of a country's construction sector but which are not of a construction-specific nature include those which are concerned with finance, the law, human resource development and those which represent public and/or private sector clients in a country. These institutions are not industry specific, but will provide key competencies which are needed to allow the operation of all sectors or industries within a country.

Construction industry specific institutions are those which allow, facilitate and encourage the establishment and sustaining of competencies which are required in the construction sector of a particular country. A broad classification of such specific institutions include; i) learned societies, ii) trade associations, iii) training, research and development institutions. Learned societies will include professional institutions which are often self governed, financed and run by their members. The principle aim

of such institutions is to advance the professional knowledge and skills of their members, primarily through educational and qualifying roles. Trade Associations aim to represent their members within the industry in an endeavour to facilitate the exchange of information and knowledge. Their activities range from political to legal issues within the industry, in an endeavour to meet the needs of their members. Training, Research and Development Institutions are established within an industry in order to introduce new perspectives and ideas and to build the knowledge base of the industry's practitioners (Miles & Neale 1991 p2-3).

Miles & Neale (1991) apply Esman's (1972) Institution-Building Universe conceptual framework in their analysis of institutional development of organisation in the construction industry of four countries which they studied including Singapore, India, Srilanka and the Philippines. The authors recognise that development of a country's construction industry cannot be stimulated by investment in discrete projects alone. They propose that:

> ".... a more effective strategy for development is to create institutions which will provide an intellectual and administrative infrastructure to underpin future growth".
>
> (Miles & Neale 1991 p8)

Miles and Neale (1991 p8) recognise that IB and ID are central to a country's development and use Esman's (1972) framework as a basis upon which to analyse and discuss the creation and maturing of institutions in the four countries under investigation. Concurrently with this research programme the work of McDermott and Quinn (1995) also apply the framework proposal by Esman (1972) to aspects of the UK construction industry.

Before discussing the literature considering the role of institutions within the construction industry, it must be maintained that the development of institutions in a country is directly related to and dependent upon the nations political, economic, social and technological characteristics. Muspratt (1987 p48) Hancock (1987 p12) and Newcombe, Langford & Fellows (1990 p33-39) identified these issues as being crucial determinants on the level of development within a country.

The Construction Industry and the IB and ID concepts

The increasingly complex nature of the construction industry in many countries in terms of the processes, procedures and participants has resulted in the need in recent years to establish and maintain formal institutions to support the industry. Turin (1973) remarks upon how traditionally the construction industry was often planned, coordinated, managed and developed by government ministries or departments. This process has however become increasingly confused and complex as the size and the nature of the industry expands (Ofori 1985a p 33). The study conducted by the Asian Productivity Organisation (1983 p9) and discussed by Kamweru & Robertson (1990 p 316) recommended that the construction industry of its member countries could be improved by each encouraging country's government to play a pivotal role in establishing and regulating policies and procedures in the industry. The APO (1983) study suggested that this could be achieved by creating various formal institutions to improve upon the countries training facilities. Specifically, the study highlighted the need to improve upon existing training facilities by establishing new institutions which will collect and disseminate information throughout the industry, and to strengthen contractor associations within the industry as well as train construction workers (APO 1983 p10-13). The study states that as a result of changes in construction in terms of methods, materials and technology:

> ".... there is need for reinforcement and institutionalisation of the existing training programmes and introducing training in construction trade and skills, and an increase in the number in all training institutes".
>
> (APO 1983 p11)

The study revealed that the need to develop skills indigenously is further exacerbated by the continual exodus of trained competent construction personnel. Measures should therefore be taken to maintain indigenous employment of trained staff which has traditionally been neglected by the construction industries of its member countries. The attractive employment prospects available to such skilled workers overseas encourages their migration and unless measures are initiated, this dispersion of skilled personnel to countries who offer more attractive conditions will continue. In particular, the investigation identified that there is a deficiency of the skills and

knowledge required to manage the construction process in many of its member countries. The APO (1983 p12) recommended that such competencies should be developed indigenously through education institutions, contractor associations and professional institutions and government departments. The study identified that institutions assist in the development of competencies by establishing and developing courses, offering training facilities and disseminating vital knowledge to members and practitioners within the industry. As such the membership of such institutions is vital with regards to the disseminating of knowledge. Institutions will only disseminate knowledge to their members, and as such the numbers of the membership in each institution is of importance.

One member of the APO (1983 p38) summarised the problems which beset the construction industry in many countries as being as a result of:

> ".... the absence of a basic policy for development of the domestic construction sector .... and the consequential failure to set up an elective support system, emerge as the principle causes for the structural weaknesses and operational inefficiencies in many countries surveyed".

The study by the World Bank (1984 p3) further recognises that a major deficiency in the construction industries of many countries is the lack of management skills, resources and the maturing of systems and institutions which allow the industry to operate. The investigation found that construction in many developing countries suffers from administrative and allocation inefficiencies due to lack of formal institutions and legal arrangements. The role of government bodies, professional and financial institutions in the industry was recognised as requiring reappraisals and modifications as they have often been established by colonising countries with particular interests (World Bank 1984 p7). Such institutions need now to be recognised to meet the specific needs and demands of the indigenous industry. The role and duties of the institutions should therefore be continually modified and reviewed to keep in synchronisity with the changing characteristics of the country in which they exist.

The World Bank (1984 p113-114) advocates that the presence of institutions representing the construction industry will provide platforms for its members to inform the government and wider society on matters affecting the industry's performance. These institutions would provide a forum for the identification and discussion of the constraints which plague the industry, as well as providing managerial and technical skills and knowledge to their members in an endeavour to improve the industries performance. The study states that in relation to overall construction industry development:

> ".... the formation of a representative institution within the industry should be pursued".
>
> (World Bank 1984 p8)

Edmonds & Miles (1984 p118-122) also comment upon the lack of formal institutions which support the industry in many developing countries. They recognise that there is a need to establish and mature indigenous institutions. These institutions are suggested to encourage the development of a strong and matured industry by generating the supply and needed competencies indigenously. The authors propose the formation of a Contractors Development Agency (CDA) as a vehicle for achieving such goals in many developing countries. The CDA would operate with sufficient autonomy from clients and contractors of the industry in an endeavour to encourage the development of competent contractors within a country. The aim of the CDA is to strengthen the capacity of the domestic industry by providing competencies which are rare or deficient within the industry. The reduction of such deficient competencies may be encouraged through the introduction of training provisions, short term finance arrangements, informing the industry on management skills as well as providing plant and materials particularly for financially weak contractors. Edmonds & Miles (1984 p124) recognise that the establishment of a CDA is not a panacea for all the industry's problems. It is only a vehicle by which some of the industry's problems may be reduced. The formation of institutional frameworks in a country requires the development of specific proposals which aims to achieve the industry's needs, which are particular to the socio-economic and political characteristics of each country.

Ofori (1985a p33) also attributes the poor development of the construction industries in many developing country to (amongst other constraints) the lack of institutional support. He suggests that the establishment of institutions to undertake the overall planning, monitoring and development of the industry would be encouraged as country's become aware of the importance of the industry in overall socio-economic development.

The importance of a construction industry's "institutional base" is further addressed by Austen & Neale (1987 p1045). They refer to the earlier studies of the APO (1983) and the World Bank (1984) which highlighted the deficiency of management competency within the industry of many countries. In their analysis Austen & Neale proposed that the establishment of an institutional basis would encourage indigenous development of management competencies necessary for construction. The institutional base would encourage communication, education and training standards and therefore increase the competency level within the industry. The creation of new institutions may not be necessary if existing ones may be adapted or reorganised to encourage the development of needed competencies. The authors appreciate that the institution building process may initially be expensive, complex and time consuming and therefore encourage the development of existing institutions to produce needed competencies rather than the establishment of new institutions.

Aniekwu & Okpala (1987 p3 & 1988 p175) in an inquiry into the construction industry in Nigeria classifies the major problems which plague that country's industry as either "systemic", which result from the adoption of inappropriate systems and procedures, or "structural" which are related to the nature of the industry itself. The authors observe how the structural problems which have infected the industry may only be remedied by "adjustments in the whole societal posture". Aniekwu & Okpala (1987 p7-8) recognised poor management expertise and lack of skilled labour as two major structural variables which are endemic in most developing countries and which need to be urgently improved. The development of specific and appropriate institutions within the industry would provide the basis upon which needed competencies may be developed indigenously.

The theme of institution building and development is further pursued by Chandara (1990), Nagabhushana Rau (1990), Wahab (1990) and Kamweru and Robertson (1990), who acknowledge that long term institutional structures should be developed indigenously to ensure sustainable and qualitative growth of the construction industry.

Kamweru and Robertson (1990 p316-321) suggest that the restructuring of inefficient construction industries institutions is crucial to development of a country's construction industry. These institutions would be involved in monitoring and controlling the industry, advising on improvements, collecting and disseminating information and knowledge regarding procedures, materials and technology and serving as a communication centre for practitioners within the industries. Although some institutions may already exist indigenously, they frequently require restructuring due to their unclearly defined objectives, poor doctrine or lack of resources.

In analysing of the Indian construction industry Chandara (1990 p223) and Nagabhushana Rau (1990 p397) identified that a major constraint on the indigenous construction sector was the lack of institutional development. The authors recommended that the establishment of a macro level institution such as, a Ministry of Construction, to oversee the development and up grading of the domestic industry, is required to allow the indigenous industry to develop. The overall aim in establishing a Ministry of Construction is to encourage planning, co-ordination and management of the industry at a State and central level. In advocating the development of such an institution Nagabhushana Rau highlights the success of similar construction ministries which have been used in Japan and Korea. The need for upgrading management expertise in construction, skilled labour and availability of finance were highlighted as being necessities to encourage growth and development within the construction industry in India. Nagabhushana Rau (1990) acknowledges the attempts being made by the National Institution of Construction Management and Research (NICMAR) in India to improve the level of management competencies within the construction sector. NICMAR is attempting to encourage such developments through the introduction of training courses, workshops, providing consultancy services and the organisation of national conferences on management issues within the construction industry. He also discusses the efforts being made by NICMAR in conjunction with the Builders Association of India, the Institute of

Engineers (India) and the National Productivity Organisation in lobbying the Government of India to recognise construction as an distinctive and important industry within the economy.

Nagabhushana Rau (1990 p400) also proposes that the creation of a National Construction Board (NCB) at State and central level which would provide institutional support for improving training provisions for construction workers, management skills, means of acquiring finance at reasonable rates of interest and to promote the development of equitable forms of contract. The development of an institution such as the NCB would also assume responsibility for the improvement and the development of construction competencies indigenously. He clearly identifies that at present there are a variety of key competencies which are limited in supply within the industry and which consequently influence the overall performance of the industry.

Ofori (1990 p378), Andrews (1990 p473) and Wahab (1990 p438) clearly link the role of institutions with that of human resource development. The authors contend that the importance of education and training organisations within the construction industry is to provide a core knowledge and to supply competencies which are required in the construction process. The role of professional institutions and trade associations is suggested to groom such competencies into maturity and provide specific competencies which are needed to carry out specialist tasks. They recognise that the upgrading and development of existing education institutions will enhance the development of core competencies indigenously. Additionally, the requirement for construction practitioners to undertake Continual Professional Development (CPD) through professional institutions and trade associations further improves and matures the variety of competencies within a countries industry (Wahab 1990 p438-445).

The study by Miles & Neale (1991 p viii) also examines institution development confirming that in many countries the ID process has often been neglected. The authors observe that in many countries are searching for means of accelerating the rate of their ID process to improve the overall Performance of their Construction Industries.

Miles & Neale (1991 p viii) recognise that this is because the ID process will:

> ".... yield significant benefits in terms of improving national capacity and performance, providing they (institutions) focus realistically on the ambitions and needs of their clients rather than engage in fruitless empire building (or academic status building) for its own sake".

The nature of the building process and its final product (buildings) means that the process relies upon a combination of design and construction skills which themselves rely upon the abilities of consultants and practitioners who possess such skills. The increasingly complex nature of the product and process has resulted in a greater number of specialists being involved in the production of a building. As such a variety of institutions are playing an increasing role in development, dissemination and sustaining these specialist skills within the industry. Miles & Neale (1991) argue that institutions within the construction industry are vehicles for changes and modifications in the construction environment of a country. They state that institutions:

> ".... attempt to promote the managerial capabilities and technical competency of the construction industry through human resource development...and that they.... strive to increase the availability of professionally trained manpower at all levels of the construction industry and to upgrade the skills of those already employed in it".
> (Miles & Neale 1991 p74)

As there are various institutions involved in the construction process, what is required is a "coherent and balanced portfolio" of the role and activities of each of the institutions in an endeavour to meet the specific requirements of the country. A country's requirements however are not static but will change over time and so short, medium and long term programmes should be established by various institutions to fulfil the needs of the industry (Miles & Neale 1991 p226 and Pooler & Duncan 1972 p216).

Ofori (1993 p1521) and Kaming et al (1994 p 327) in discussing construction industry development suggest that there has been inadequate consideration of the role of practitioners, professionals and trade associations in the process. They acknowledge

the role of institutions in an industry, but conclude that such institutions are rarely consulted even though they are valuable contributors to the overall process of development.

Institutions such as the Construction Industry Standing Conference (CISC) and the Construction Industry Training Board (CITB) are the industry head bodies responsible for the development of national standards of qualifications at Professional, managerial and technical levels and for craftsmen and construction operatives respectively (CISC 1994 p5). Both of these institutions are made up of groupings of employees, professional institutions and experienced construction practitioners and recognise that during the process of developing occupational standards and qualifications for the construction industry that liaisons is required between industry specific institutions and employers. CISC (1994 p11) states that:

> "standards will always be subject to review, maintenance and revision to reflect changes in needs".

The development of the Construction Skills Certification Scheme (CSCS) by the CITB is to provide a system of registration of all construction operatives in many construction occupations to encourage the improvements of skills by setting benchmarks for future achievements (CITB 1995 p3). Representatives from various construction industry specific institutions including the Builders Employers Confederation, Federation of Civil Engineering Contractors, Federation of Master Builders, GMB Trade Union, National Specialist Constructors Council, Transport and General Workers Union (Building Crafts Section) and Union of Construction Allied Trades and Technicians have come together with the CITB to develop the new construction skills certification scheme in a view to develop and disseminate and sustain a competent workforce within the UK construction industry (CITB 1995 p4).

Concurrently with the progress of this research Betts & Ofori (1994 p204) discussed the role of professional institutions and trade associations in strategic planning in the construction industry. The authors refer to the work of Prahaland & Hamel (1990 p82) who suggested the identification of a consultants "core competency " has been used as a tool for strategic planning. The authors identify that the identification of

core competence is where a particular organisation within an industry concentrates an continuously improving its key abilities and skills, thereby maintaining its core role within the market. With the desire to further increase their role within the industry various professional institutions and trade associations are expanding the array of competencies which they offer. This is regarded as a new form of strategic planning being adopted by professional institutions and trade associations in many of the countries which are major exporters of construction services. By introducing new competencies to their members, such institutions are extending the role of their participant, utilising principles of strategic planning and exploiting their competitive advantages in order to increase their market share of the industry (Betts & Ofori 1994 p205).

Betts & Ofori (1994 p208) acknowledge that as the construction process involves an increased number of specialist skills, the respective professional institutions and trade associations are becoming involved. This is due to the competitive nature of such institutions and associations and desire to expand their role of their members within the industry. Ireland (1985) confirmed that although individual institutions recognised the specific competencies of the various consultants in the industry, there is extensive competition in the area of management and procurement of construction projects. The authors acknowledge that this competition has been accelerated by the introduction of non traditional procurement routes into the construction industries of many countries. Betts and Ofori (1994 p208) propose that professional institutions and trade associations have attempted to secure their members markets by providing them with the necessary skills to assume the procurement consultants role. This has been facilitated through the accreditation of courses, CPD and the collection and dissemination of current information facilitated through education professional and research and development institutions.

Betts & Ofori (1994 p211) provide illustrations of how institutions in the construction sector in the UK such as the Chartered Institute of Building (CIOB) have embraced the task of enhancing the technical competence level of its members. The measures include the publication and dissemination of occasional papers, practice manuals and codes with the aim to develop its members skills in a response to the changing demand conditions of the industry. The authors contrast the role of the CIOB with

that of the American Society of Civil Engineers (ASCE) and the Overseas Contractors Association of Japan Incorporated (OCAJI) who are following similar tactics. Pennoni (1991) acknowledges that although the ASCE is an institution with many specialist divisions, its primary aim is to develop the core competencies of its specialist members. The OCAJI, however, was established in the early 1970's to specifically address the overseas market issues relevant to Japanese contractors, providing support and assistance for contractors in their exporting activities. Although the OCAJI is an independent association of contractors it maintains strong links with the Japanese Ministry of Construction, which allows overseas work to be secured.

Institutions such as The Construction Industry Council (CIC) have been particularly important in developing competencies within the UK construction industry. In recent publication produced by the CIC (1996) the competencies required for those involved in the management of construction are identified. Definitions of the basic skills and competencies which should be demonstrated by those participating in the management of construction are identified providing a summary of the competencies which may be applied to any construction project and accompanying management functions. It is suggested that such competencies have been identified and benchmarked in order to provide a basis upon which industry wide certification schemes may implement formal training programmes and qualifications. (CIC 1996 p2:10).

Country Specific Institutions

The World Bank study (1984 p29) recognised that the structure and organisation of a country's construction industry is often determined by "the degree of development of the country's economy". It is therefore shaped by the nature of the work done in the industry, the technology used and the country's social and economic environment. The study recommended that consideration should be given to: i) the industry's structure, ii) the level of demand in the industry, iii) the informal construction sector, iv) procurement and contract administration procedures, v) the technology used, vi) the profile of practitioners in the industry, vii) the financial and legal characteristics of the country and viii) the exitance and development of institutions within the industry.

Edmonds and Miles (1984 p24) contextualise the effect of a country's characteristics on its construction industry by analysing the UK industry and identifying how it has evolved at a gradual pace along side its associated institutional frameworks. They state:

> " A feature of the British construction industry framework was that it was not imposed from outside, but gradually appeared as a response to the development of the industry. It therefore accommodated the industry rather than constrained it. Its form was in fact tailor-made to suit the needs and priorities of the self confident British contractors and professionals".

The creation and maturing of country-specific institutional frameworks is recommended as a basis for the development of the industry (Edmonds & Miles 1984 p117). A typical policy which has been frequently undertaken is that the pattern of institutional frameworks which predominates in industrialised country's is often replicated in developing countries. Development programmes in colonialised countries have frequently involved the inheritance of ready made institutional frameworks designed to accomplish the needs of their expatriate administrators. Before an institutional framework is proposed an assessment is therefore required of its, legal, social and economic features in order to ensure that the institution will be comparable with its environment and therefore perform the duties which it was intending. (Edmonds & Miles 1984 p111).

In a study by Ofori (1985a p34-40) examining the development of macro level institutions in two countries; the National Construction Council in Tanzania and the Construction Industry Development Board (CIDB) in Singapore, he identifies both of these institutions have been established by taking account of the respective country's political, historical and cultural backgrounds and have been consequently successful in assisting in the development of their country's construction sectors. Although these institutions have been established with the distinct aim of regulation, planning, management and development of their respective nations construction industry at a macro level, they often require assistance from industry specific institutions (such as professional bodies and trade associations)in order to achieve their aims. Austen & Neale (1987 p1049) confirm that of central importance in the process of IB and ID

is that there is no prescriptive "blueprint" for development. As such they confirm that the establishment of institutions within a country's construction industry should reflect that country's social economic and political system.

Following this analysis Ofori (1991 p33) proposes that the structure of professional institutions which have been established in many industrialising countries are adopted and modelled from similar institutions in industrialised countries during the process of colonialisation. In contrast, the political, economic social and technical conditions are often drastically different from those which prevail in industrialising nations and the immediate needs of that indigenous construction industry are also diverse. Ofori recommends the restructuring of many existing institutions in industrialising country's. He suggests that they should be encouraged to amend and re-evaluate their aims and objectives to take account of the specific characteristics of their country and the distinctive needs of their construction industry. A less fragmented approach should be taken to development of the construction industry by the introduction of multi-professional institutions, providing the skills and competencies which are tailored to the specific characteristics and needs of the indigenous construction industry.

Further studies by Ofori (1990 p378), Miles & Neale (1991 p vii, x, 229) and Ofori (1994 p48) reiterate the importance of the relationship between ID and a country's social, economic and political environment. The studies conclude that without taking such environmental factors into account, the roles and activities of institutions will be impaired. In conclusion, Betts and Ofori (1994 p 215) maintain that what is needed in the construction industries of many developing countries is to:

> ".... fundamentally restructure the professions to create institutions which are more appropriate to the needs and circumstances of the country".

Factors affecting the ID processes in the Construction industry

To encourage the creation and growth of institutions within a country's construction industry, its has been identified that primarily the country's social, political, economical and technical characteristics should be taken into account (Muspurat 1987 p47, Hancock 1987 p12-13, Newcombe, Langford & Fellows 1990 p33-39). Having established the contextual characteristics which influence the ID process it should be maintained that there is no "blueprint" to institutional development as consideration must be given to the problems which may be encountered in the ID process.

Esman (1972 p30) recognises the vital importance of the availability of resources in the institution development process. Without adequate resources an institution will not be suitably structured or function efficiently. Ofori (1985 p40-41) in discussing the development of the CIDB & NCC highlights that the creation and development of such institutions is an expensive, time consuming process requiring considerable resources (human and financial). He proposes that consequently ID process should be carefully evaluated against the potential disruption which it may cause in the industry.

Austen & Neale (1987 p1045) identified a further constraint on the IB and ID process is the concern related to the possible creation of institutions which are potentially inefficient bureaucracies. As such many country's are reluctant to develop institutions in fear of creating bureaucratic organisations. The authors identify that such bureaucracies are frequently created in environments in which there is; a) political disinterest of the government and the construction industry, manifesting itself in apathy and a lack of effort to improve matters, or b) the desire by governments not to copy institutional arrangements from industrial nations, but to develop bespoke institutions, or c) lack of demand for institutional support due to the industry's heavy reliance upon government support, or d) the possibility of replication of existing institutions functions, and the fear of adapting an academic and unrealistic approach, or e) where there is a shortage of qualified experienced staff and financial resources.

Kamweru and Robertson (1990 p320-321) also identify that poorly structured, resource deficient and unclearly focused institutions often exist in many developing countries. Such institutions instead of promoting the availability of needed competencies can hinder progress within the industry resulting in lack of development. In order to operate effectively such institutions require restructuring which is an expensive and time consuming process, often involving assistance from the government or international agencies. The effect of such restructuring is to create institutions which will provide the array of competencies which are demanded in the industry.

In an examination of the approaches commonly adopted for construction industry development, Ofori (1993 p1521) highlights them as traditionally being "deterministic" and "symptomatic",generally applicable to all nations in all circumstances. He suggests that this approach although widely replicated in the industry is inappropriate and stifles rather than sustains development of the construction industry. As such, Ofori (1994a p48) advocates the establishment of a single nation specific statutory institution (such as the CIDB or NCC) to assist in the development of a nations industry, but concludes that this is not a panacea for construction industry development. He recognises that each country has specific features and characteristics which must be taken into account when considering a proposal for its development.

Importation of Competencies and the Role of Technology Transfer

The existence of industry specific institutions, along with non-industry specific institutions (such as finance and legal institutions) assist with the development, maturing and sustaining of competencies within the construction industry. The availability of various competencies facilitates the effective operation of particular task, procedure or procurement systems within a particular country.

In many countries which are major importers of construction services there is a lack of ID within the construction sector which has resulted in the restrictive and often deficient development of competencies which are required within the construction process. The increasing demands of indigenous clients coupled with complexity of

building design and construction has highlighted the lack of competencies within the construction industry of such countries. The acquisition of specific competencies which are lacking indigenously in the short term may be achieved through the importation of skills and competencies. This arrangement, however precludes, the indigenous development of the competencies, although it facilitates the immediate access to deficient and needed competencies allowing the procurement process to operate efficiently.

A medium term measure would be to encourage the process of technology transfer to occur between expatriate workers who are providing the needed competencies and the indigenous staff who will be attempting to learn and modify such competencies indigenously. The process of technology transfer must be administered in a manner which allows the importing country to learn, understand, and modify the technology to suite their own country's conditions.

The long term strategy for the development of deficient competencies indigenously is to create institutions or modify existing institutions which will establish the competencies or skills indigenously. This is often achieved through education and research and development institutions which formally establish skills or competencies within a country, and thereafter such competencies may be fostered, matured and sustained through professional institutions and trade associations.

Importation of Competencies

In chapter five of this study the interviews have identified that if the competencies required to carry out a specific task, activity or procedure do not exist indigenously, then they are often imported. Moavenzaden (1978) discusses how complex and specialist projects in industrialising country's are predominantly executed by expatriate firms. The required competencies are not available in indigenous firms and so foreign contractors are used. Indigenous contractors and consultants are frequently assigned to execute repetitive routine work in the industry which they have the competencies to undertake. The effect of this arrangement is to create an indigenous skills vacuum which requires the importation of certain competencies to execute particular tasks, activities or procedures indigenously. Local firms are unable to

permeate this vacuum due to their lack of competency in such areas. As such, the competencies are required to be imported until they are either developed indigenously or no longer required within the industry.

The study by Wells (1986 p 56-57) analyses the issues which influence development of a country's construction industry. She identifies that a major problem is the inability of many developing countries to carry out particular types of projects due to lack of indigenous skills, competencies, materials, finance and technology. As such the 'import component' of many countries is high, particularly in the area of professional, managerial, supervisory and sometimes technical staff. Such skills are considered to be vital for the efficient execution of construction projects and are often severely lacking in industrialising countries. Wells claims that this lack of skills is a major constraint on the expansion of a country's construction activity.

The immediate improvement of a country's construction activity may be achieved through the importation of the required materials, technologies and competencies. A country's dependency on the importation of skills and knowledge can however be problematic. Wells (1986 p34) goes on to identify the potential problem with reliance upon the importation of such resources, as such resources may not always be readily available, and when they are available they are often expensive and require to be paid for in foreign currency, affecting indigenous foreign exchange reserves.

Wahab's (1990 p435-6) analysis of technology transfer contrasts with the studies proposed by Ofori (1989 p117), suggesting that expatriate practitioners and contractors are generally reluctant to pass their skills and knowledge to indigenous firms. Wahab suggests that expatriate companies maintain their competitive edge against local competitors as they possess skills and competencies which are deficient in the market. This reluctance to disseminate skills and knowledge to indigenous practitioners and the stronghold of expatriate contractors is further encouraged by the vast technical, managerial and financial resources which are at the disposal of expatriate contractors provided by their home countries. He goes on to recommend that there is a need for the development of indigenous institutions which would encourage developing countries to be less dependent upon expatriate firms. As such these countries will become self sufficient and self reliant in the long term. The effect

of such improvements would assist in the overall development of the indigenous construction industry (Wahab 1990 p436).

Technology Transfer

Drewer (1980) suggests that many developing countries are often required to import technology, construction skills or competencies needed for non traditional construction activities due to them being unavailable indigenously. Ofori (1994c p383) identifies that this process of technology transfer may occur in several ways. It may occur between; i) individuals, ii) parts of an organisation, iii) between organisations themselves, iv) from research centres or education institutions to the industry and v) between countries. In discussing how the process of technology transfer may take place, Ofori identifies the work of Andrews (1992) who acknowledges that in order for effective transfer the technology it is essential that when it is requested it should be transmitted, received, understood, applied, diffused and widely improved by the recipient country. The study by Oppenheim (1991) discusses this process in relation to Japan. He identified that the early success of the Japanese economy can be attributed to her extensive utilisation of technology imitated from successful industrial country's. As such, Ofori (1994c p380) states that "technology transfer implies the transfer of social structure" between countries.

In examining the transfer of technology from one country to another, Ofori (1994c p389) recognises the importance of this process in the development of a country's construction industry and cites the work of Sharif (1983) stating that:

> ".... new technologies are continually needed to ensure progress and to address mistakes resulting from previous ones".

Madewell (1986 p14) concentrates on technological development in the construction industry, maintains that it involves both imaginative solutions to specific problems and the genesis of alternatives to existing materials and methods. The technology used however should be appropriate to the environment in which it is to be incorporated. The World Bank (1984 p 42-43) examine how many industrialising countries possess an abundance of labour, which should be considered when determining the choice of

technology to be used for construction. The study states:

> ".... in a labour abundant economy, such as India, it led naturally to the use of labour intensive methods and to the establishment of local labour intensive contracting businesses".
>
> (World Bank 1984 p42)

In many country's however appropriate labour intensive technologies have failed due to private sector pressure to use profit maximising technologies (World Bank 1984 p43). The study by the United Nations Centre for Human Settlements (UNCHS 1990) further acknowledges that the use of appropriate construction technology is frequently restricted by the lack of expertise by professionals in its use. Ofori (1994 p 385) highlights the general inappropriateness of imported technology into developing countries due to it often being designed for production processes which are capital intensive, import dependent and which consume high levels of energy. He identifies how transitional corporations which work in developing countries often contribute little to the indigenous industries' development, and moreover their choice of technology and modes of operation do not usually reflect the indigenous social economic requirements.

Podder (1988) highlights the advantages and disadvantages of technology transfer suggesting that the pace of this process differs from one country to another. The process often fails due to the unavailability of resources and an environment which is conducive to the technology transfer process. He suggests that in order for the process of technology transfer to occur effectively, it relies upon the availability of capital and organisations which can take advantage of new technology, appropriate socio-economic conditions, suitable infrastructure and a supportive culture.

In highlighting the obstacles which face construction technology development, Ofori (1994c p381) reflects on the works of Bowley (1966) and Groak & Ire (1986) who recognise the major difficulties in the technology of transfer process are the conservatism and resistance of construction practitioners to participate in the process. In addition the authors identify the fragmented nature of the industry, the trade based nature of the work and the influence of unions in the industry also additional constraints on technological development within a country's construction sector. In

discussing the relevance of technology transfer in developing countries, Streeton (1991) acknowledges that new technologies are important as they often economise on managerial, administrative and supervisory skills which many importing countries lack. The importation of appropriate technology can therefore assist in the overall development of a country's construction industry (Ofori 1991).

Ofori (1994c 383) highlights the work of Ohmae (1990) regarding the impact of Globalisation on the transfer of technology between countries. Foreign enterprises and consortiums are increasingly undertaking major projects in developing countries. With their technical knowledge and expertise, offering the possibility of technology transfer is frequently used as a competitive tool in such markets (Ofori 1994b 383). The increased use of overseas technology in many projects in developing countries has highlighted the technology and skill void which exists between indigenous and foreign firms. Ofori (1994c p 386) proposes that the technology gap or vacuum may be bridged by encouraging joint ventures and co-operation between foreign and indigenous enterprises on construction projects. He discusses the work of Kirpich (1987) and Rosenberg (1990) who propose that managerial expertise is important to disseminate to indigenous contractors rather than project specific technology as it is a major priority for developing countries to improve upon their managerial competencies.

Long term Sustained Development through IB and ID

Turin (1973) and Edmonds and Miles (1984 p35) recognised how the use of foreign technology, materials and procedures is frequently adopted by many industrialising countries due to their own lack of indigenous construction industry development. The authors acknowledge particularly how the construction sector in industrialised countries has evolved gradually developing the skills (competencies), materials, technologies and procedures which meet the requirements of the country over a long term period. In contrast, developing countries often have a neglected construction sector, and are faced with numerous (country specific) problems. These countries, however have frequently adopted the pattern of the construction industry which exists in industrialised countries (Edmonds & Miles 1984 p vii).

Edmonds and Miles (1984) suggest that the pace of indigenous construction industry development is related to the creation and maturing of indigenous institutional frameworks. They contend that the role and skills of UK contractors have evolved and been facilitated by the existence of specific institutional frameworks such as 'trade associations'. The Builders Society, established in 1834, is one of the earliest associations whose aim was to promote and encourage reputable standards of work in the industry and to facilitate the exchange of information. In contrast, Edmonds and Miles (1984 p112) suggest that the development of such associations has been neglected in many developing countries and has resulted in the under development of contracting organisations in such countries. The World Bank (1984 p 6) identified the existence of such institution deficiencies in many developing nations and state:

> ".... construction work in many developing countries also suffers from administrative and allocative inefficiencies .... because of lack of a sound framework of institutional and legal arrangements .... the industry is not shaped to respond quickly and efficiently to the needs of the client".

The solution proposed by the World Bank to overcome these deficiencies includes the encouragement of government commitment to recognise the importance of the construction industry, the introduction of policies to improve the business environment and improve institutional support throughout the industry may be stimulated if construction is recognised as an industry (World Bank 1984 p7).

Wells (1986 p35) in her analysis of the expansion of local construction industries acknowledges that the main vehicle for immediate improvements in construction capacity is by the importation of construction resources (competencies, material, technologies and procedures). She stresses that the alternative to this is to create and mature the resources needed indigenously which will encourage long term sustained growth. She states that this arrangement would:

> "... .reduce a country's dependence on imported materials and skills for the construction sector .... and.... the 'leakage' to the economy that such importation represents".
>
> (Wells 1986 p35)

The development of higher education institutions are therefore essential to improve the competencies of practitioners within the industry. By providing a good technical education to construction practitioners, they will inherently possess a greater potential for growth and development. As such, educational institutions develop core-competencies within the various practitioners in the construction process. These competencies are then refined, matured and developed by indigenous professional and trade based institutions. Kamweru & Robertson (1990 p323) suggest that this may be achieved through training of practitioners with a strong orientation towards construction and the use of control mechanisms in a registration process of construction companies, restricting them to employing only technically competent staff. This procedure would establish a standard for the technical competence required of individuals which seek to participate within the industry. However such standards require continuous monitoring and updating for long term growth of the industry.

Andrews (1990 p478) further recognised that there is a need for education particularly in the area of management with the construction industry. He suggests that higher education institutions are responsible for:

> ".... research and teach(ing) high level strategic matters affecting the industry as a whole, then to determine doctrine - (what is to be taught) - a coordinated set of principles underlying construction management education and training; and policies for implementing them in all other institutions serving the industry".
>
> (Andrews 1990 p481)

Indigenous Institution Frameworks

The range of institutions which may exist in order to establish or promote the development and sustainability of competencies are shown in Table 6.1. The table shows each of the functions of procurement with the primary forms of institutions or organisations which are required to exist in order to establish and supply the competencies required to operate any procurement system indigenously. Institutions such as government, corporate groups or individuals promotes or promoting agencies who have the authority (or delegated authority) to promote or initiate construction

must exist as institutions which allow the competencies of the initiator/promoter to be established, developed and sustained indigenously. With regard to funding institutions, the existence of government funding agencies banks, individuals, and other financial institutions (including building societies, pension funds, private money lenders, sale of stock and shares and internally collected finance) are necessary to obtain indigenous or imported finance upon demand and these institutions facilitate the competencies associated with funding to exist. In order to supply the competencies associated with design institutions which promote recognised licensed, approved or accepted design individuals or corporate design groups must exist within a country. It has been further identified that for the existence or availability of competencies associated with the management of construction some form of training programme and accreditation system is required to qualify individuals to manage the construction process. The existence of registration facilities training programmes and trade organisations is the institutional support required to supply the competence associated with the construction production function. Finally, table 1 identifies the institutions which are required in order to allocate risk within a particular procurement system. Such institutions will establish policies to distribute risk through the provisions of contractual documents and the means by which security is provided for these risks (insurance provisions) and also the forms of legislative controls which are imposed on the industry by the government.

Figure 6.1: Indigenous Institutions Framework

Function		Organisational Support Structures
Initiate/promote		The existence of government, corporate, group or individual promoters or promoting agencies who own or have authority or delegated authority to promote or to initiate construction. The existence of Public and private, primary, secondary, experienced, inexperienced clients, and the extent.
Fund		The existence of government funding agencies, banks, individuals, other financial institutions (building societies, pension funds, insurance companies, private money lenders, sale of stocks and shares, internal finance) able to obtain indigenous or imported finance upon demand.
Design	Concept	Indigenously, recognised, licensed, approved or accepted design individuals or corporate design groups. Including recognised design institutions, and boards. (predominantly boards and institutions of architects)
	Detailed	Indigenously, recognised, licensed, approved or accepted design individuals or corporate design groups. Including recognised design institutions, and boards.(predominantly boards and institutions of engineers)
	Specialist	Indigenously, recognised, licensed, approved or accepted design individuals or corporate design groups. Including recognised design institutions, and boards.(predominantly boards and institutions of specialist engineers). The existence of collateral warranties.
Construct	General	The availability of individuals, bodies or corporate groups possessing the skilled labour, and having the ability to obtain the appropriate materials and/or machinery necessary to produce the construction facility.
	manage	The possession of the skills required to manage the process of construction. Training programmes which encourage the skill to develop.
	Product	Existence of registration facilities and/or trade organisations for constructors. Training provisions which encourage a structured organised approach to the development of skills within the industry.
Risk Management		Risk allocation systems; this will include formal relationships documents (Contract documents, and verbal agreements) which reliably allocate risk. Assessments will be made on the ability to accept risk and provide security for that risk (insurance provisions). Legislative controls imposed on the industry by the government.

Results of Interviews regarding Institution Development

The analysis of secondary data and the collection of primary data through interviews regarding the existence of primary institutions in each country identified that in the UK, Japan, France and USA most functional institutions exist. The interviews identified that in both India and Malaysia however there are primary institutional gaps within the industry which affect the supply and availability of key competencies within the industry.

Due to the degree of consistence of responses from the interviews the results are considered collectively. The interviews conducted with the major exporters of construction services confirmed that the primary institutions indicated in figure 1 are in place in each country. The interviews confirmed that the existence and continual development of these primary institutions has led to the supply of competencies which allow indigenous procurement systems to operate effectively. The results of the interviews to verify the existence of institutions are shown in Appendix C. The interview results from the USA are in Table C1 (i), (ii), (iii), (iv), (v) and (vi), from France in Table C2 (i), (ii), (iii), (iv), (v) and (vi), and from Japan in Table C3 (i), (ii), (iii), (iv), (v) and (vi).

The interview conducted with the major importers of construction services identified that there are particular primary institutions which are not developed adequately and therefore influence the supply of associated key competencies. With regards to India, the interviews survey identified that there are several institutions which need to be further developed to encourage the supply, dissemination and sustainability of indigenous competencies. These included; financial institutions, institutions associated with management of construction, construction production institutions and institutions which are concerned with the allocation of risk.

The interviews conducted with the respondents from Malaysia identified that the industry is faced with institutional constraints regarding the manager of construction and construction producer institutions.

The results of the interviews to verify the existence or absence of institutions are shown in Appendix C. The interview results from India are in Table C4 (i), (ii), (iii), (iv), (v) and (vi), from Malaysia in Table C5 (i), (ii), (iii), (iv), (v) and (vi).

India Interview Analysis

With regard to India the interviews identified that a major limitation within the industry is the lack of institutions which provide finance for construction. The interviews confirmed that the majority of finance for construction/building projects is provided by the government (for public sector initiated projects) and from banks, private money lenders and personal savings (for private sector initiated projects). The limited avenues or institutions available to facilitate the competencies associated with funding to exist is suggested to be a major constraint on construction/building projects in India. The interviews identified that:

> "Government departments, banks and private financial institutions in India need to be developed further to allow easier acquisition to finance".
>
> (Interview 4 table C4(ii))

> "More institutions which provide finance for construction are needed. There is a lack of developed financial institutions".
>
> (Interview 7 table C4 (ii))

> "More equitable arrangements and new institutions are required to provide finance for construction".
>
> (Interview 12 table C4 (ii))

The interviews also recognised that due to the lack of development of indigenous financial institutions, the competency related to funding is increasingly being imported. In particular the interviews revealed that international agencies and finance institutions are providing sources of finance for construction and building work in India. The interviews identified that:

> "Few financial institutions lend to construction. The availability and supply of finance is problematic. Increasingly finance is being arranged from external international sources".
>
> (Interview 8 table C4 (ii))

"Foreign finance is increasingly being used for major projects".

(Interview 13 table C4 (ii))

"Finance is being obtained through bilateral and international loans and aid".

(Interview 14 table C4 (ii))

"There is a growing trend for the private sector to be involved in the construction of infrastructure projects within India through BOT schemes. In such cases foreign finance is being obtained".

(Interview 15 table C4 (ii))

With regard to the management of construction, the interviewees further identified that there are inadequate training programmes and qualification systems available to supply the competencies associated with the management of construction within the industry. The inadequate training programmes which qualify managers of construction was identified as a major constrain within the industry. Although all the respondents identified the activities of NICMAR (National Institute of Construction Management and research) as being crucial to the development of such competencies within the industry, they identified that great institutional support was required. The comments from the interviews included:

"Management training is required. NICMAR has established a number of courses and education programmes to develop such skills in India".

(Interview 9 table C4 (iv))

"Adequate management training is not provided in the formal education of construction professionals. Recently there has been the development of several construction and project management courses at universities. It is hoped that those institutions will begin to defuse the importance of management in the construction industry".

(Interview 5 table C4 (iv))

"Urgent training is required in the area of management and planning for all construction practitioners. There has traditionally been no formal education or training in this area. During the last decade construction management has become increasingly important. There are now few education and training institutions which are providing formal qualifications in this expertise (including NICMAR). The number of qualified and experienced managers within the industry is very few".

(Interview 14 table C4 (iv))

The existence of training provisions for construction works was also identified as a major constraint on the development and dissemination of construction production competencies within the industry. The interview identified that traditionally construction skills have been passed down from father to son, with little/ few formal training programmes in the industry. The poor availability of materials and machinery was identified for the low construction production competency with the industry. The lack of trade associations was also identified as an institutional constraint of the construction industry in India. The interviews highlighted that:

> "Traditionally there has been poor formal training for construction workers. There is no training scheme for various trades to produce skilled labour. Many attempts have been made by both the public sector and NICMAR to establish training programmes for workers but they have failed".
>
> (Interview 9 table C4 (v))

> "There are poor/limited training programmes for construction workers. Skills tend to be passed down from father to son along with bad habits which has resulted in poor quality construction in the country. Attention should be given to establish training schools and programmes for all trades within construction....The vast majority of contractors within the industry are not licensed, approved or registered. The MBAI (Master Builders Association of India) has approved some contracts but these are only a fraction of those which operate within the Industry".
>
> (Interview 14 table C4 (v))

Finally, the majority of interviewees considered that the current methods of risk allocation within the industry were unsuitable and required immediate modification. The need to develop institutions which would assume responsibility for developing new equitable forms of contract which are suited to the construction industry of India was identified as a major requirement. The lack of a national standard form of construction for the whole of the construction industry was identified to result in various government departments and private sector clients amending existing contract documents to suite their own needs.

The comments raised included:

> "Most contracts used in the industry have their roots in RIBA 1963 or FIDIC contracts. Standard contracts are often drafted by each government department and each architectural practice. There is no nationally recognised standard form of contract in the industry".
>
> (Interview 13 table C4 (vi))

> "Need to develop equitable forms of contract which are suitable to the nations working environment." (Interview 9 table C4 (vi))

> "There is no nationally recognised standard form of contract in the industry."
>
> (Interview 13 table C4 (vi))

The interviews also confirmed however that there have been calls to develop such standard contracts within the construction industry. In particular the activities of NICMAR and the Builders Association of India were identified as they have drafted a anew standard form of contract for the construction industry which is currently being reviewed by the industry's members and government departments. The comments included:

> "Appropriate and equitable forms of contract are being developed by the MBAI and NICMAR to be used as standard document within the industry This will be specific to the legal system and the operating environment of the Indian industry."
>
> (Interview 12 table C4 (vi))

> "The MBAI and NICMAR have drafted a new standard form of contract for the Indian construction sector which is currently being reviewed by various government departments. The Central Public Works Department are convinced that an equitable standard form of contract is required within the industry".
>
> (Interview 14 table C4 (vi))

Malaysia Interview Analysis

The interviews regarding institutional structures in the Malaysian construction industry identified that in general institutions responsible for promoting competencies associated with initiation/promotion, funding , designing and risk allocation are available and supply the competencies which are being currently demanded. The interviews particularly highlighted the lack of institutions which provide skilled

construction producers and managers of construction as requiring upgrading within the industry.

With regards to institutions which promote the supply of competencies related to the management of construction the survey confirmed that at present there are limited institutions which train construction practitioners in the general area of management and planning. The interviews highlighted the limited supply of skilled management consultants within the industry. The interviews stated:

> "There has been little formal training of construction practitioners in the area of management and planning".
>
> (Interview 1 table C5 (iv))

> "Management procurement systems are beginning to be introduced into the industry but many of the professionals and their respective institutions are reluctant to change as their positions are safeguarded with the use of conventional systems".
>
> (Interview 3 table C5 (iv))

> "Management orientated procurement systems are gaining more attention in the private sector but these systems have not caught on. The skills are not in place. There are few experienced management companies in the industry and the subcontractors are not adequately experienced. There is a general lack of management training in the industry".
>
> (Interview 10 table C5 (iv))

> "Moves are being made to establish a Construction Academy modelled on the Australian system to concentrate on construction issues including skills, training, management, planning, etc".
>
> (Interview 12 table C5(iv))

Although the Master Builders Association of Malaysia (MBMA), the Malaysian Chartered Institute of Builders (MCIB), and the Bumiputra Contractors Association (PKK) have traditionally registered contracts operating within the industry, many contractors have been practising without being registered. The establishment of the Construction Industry Development Board (CIDB) has however made it mandatory for all contractors and subcontractors to register in order to operate and practice within the industry.

The aim of the CIDB registration scheme is to establish a basis of, approved, qualified contractors which operate within the industry for all trades, thereby increasing the level of quality and general confidence regarding the construction industry in Malaysia. The registration of constructor producers by institutions such as the MBAM, MCIB, (PKK) and the CIDB has been on the basis of analyses of the ability, resources, financial stability and expertise of individual construction competencies within the industry. The aim of the CIDB is to establish a uniform basis upon which contractors within the industry may be registered and also to provide a single institution which is responsible for registering all contractors operating within the industry.

The development of training programmes for construction workers was identified as a constraint on the development and sustaining of competencies within the industry. The lack of formal training schemes was recognised as an institutional constraint which has influenced the supply of construction producer competencies within the construction sector. The respondents stated:

> "In terms of formal training facilities for trade workers there are limited courses and training centres available. Generally each contractor runs his own training programme to train staff and there are no real central training programmes for construction workers".
>
> (Interview 1 table C5 (v))

> "There is limited training facilities provided for trade contractors such as colleges and technical institutions. There is currently no apprentice system for construction workers".
>
> (Interview 3 table C5 (v))

> "Subcontractors are not formally trained. Skills tend to be passed from father to son. This informal tradition of passing skills is now beginning to change. Organisations are beginning to be established which are addressing the need for formal education and training of craftsmen".
>
> (Interview 5 table C5 (v))

> "Trade contractors have limited formal training organisations which provide skilled workers. This has been a limitation in our country and the CIDB have recognised this and are making efforts to introduce more training schools and qualification systems for skilled construction workers".
>
> (Interview 7 table C5 (v))

> "Technical colleges which are vocational schools provide such training for construction workers. However the training is very general and there not many training centres. The main problem is that the graduates leaving such technical colleges are not going into the construction industry once they have been trained, they tend to move to other industries. The construction industry has a poor public image and is considered to be a dirt, dangerous and a dispersed industry".
>
> (Interview 12 table C5 (v))

The interviews concluded that the role of the CIDB will include the promotion of standards of quality, skills and competency within the construction sector. The introduction of registration requirements for all contractors operating in the industry, coupled with the establishment of training programmes for construction workers is the institutional support required in order to develop, disseminate and sustain construction production competencies within the construction industry of Malaysia.

Summary

This chapter has considered the importance of institution building and institution development in the establishment, development, dissemination and sustainability of competencies within a country. The study conducted by Esman (1972) clearly recognises that changes in a country (and particularly developing countries) are deliberately planned through IB and ID. Landau (1972 p91) refers to this process as being "engineered" with the introduction of such changes occurring through the building of formal institutions. He concludes that such institutions seek to foster, sustain, promote and protect innovations which results in development in a society or country. Once an institution has reached its goals it is regarded as achieving 'institutionality' and is considered to be meaningful and valued in a society.

McGill (1995) corroborates the analysis provided by Esman and Landau regarding the IB process, and recognises the importance of institutional development. He proposes that ID is a learning explorative process which results in sustainability of an institution in a country or society.

Both institution building and institutional developments are affected by technical assistance from donor agencies or countries. Technical assistance facilitates and encourages the process of IB and ID and is often recognised as a vital ingredient in these activities. The process of Technical assistance can be viewed in the short, medium and long term to facilitate the IB and ID process. It is further acknowledged that this assistance should not be a blueprint for IB or ID but as a proposal for how these two procedures may be achieved and should involve learning, adaptation and modification of technology to meet the specific needs of the indigenous country with regards to its political, social, economic and technical characteristics (Muspratt 1987, Hancock 1987, Newcombe, Langford & Fellows 1994).

The concept of institution building and institutional development has been recognised as been essential to assisting a country develop its construction industry. The establishment of industry specific and non specific institutions facilitate the indigenous development of generic, common and specific key competencies which are required for the effective operation of a particular system of procurement. The process of IB and ID is dependent upon the contextual political, economic, social and technical conditions affecting the construction industry of any country. As such when new institutions are created or existing ones restructured consideration should be given to the country's specific contextual conditions.

In relation to the construction industry, non specific institutions supply competencies which are applicable and used by all sectors of the economy. Industry specific institutions assist in the establishment, development and promotion of competencies within a particular industry. At a macro level these institutions may include a Construction Industry Development Board or Ministry of Construction which regulate and monitor construction the industry collectively. Institutions at a micro level such as professional institutions, trade associations, educational and training institutions and research and development institutions are involved in establishing, developing, disseminating and sustaining competencies within the industry.

The development of competencies indigenously encourages the effective operation of the country's industry. The practices, procedures and skills needed and utilised within an industry are not constant but are required to be continually modified and

improved in order to enhance the performance of a country's construction industry. To maintain the required array of competencies within a country the institutions which supply them must also be continually upgraded to ensure that they are supplying the competencies which are being demanded. As such the process of ID is recognised to be dynamic and should be continually modified in order to ensure the supply of demanded competencies and promote new competencies which will facilitate the effective operation of indigenous procurement systems.

If competencies are not available indigenously it is acknowledged that the industry is unable to execute specific tasks, procedures or services effectively. If institutions do not exist or do not supply the competencies required to operate a particular procurement system effectively, then such competencies may be imported. The importation of competencies is dependent upon the ability to procure such competencies from other countries, and the indigenous country's ability to purchase them. The importation of competencies which are finite or limited in supply is a short term measure as it frequently neglects the development, promotion and sustainability of such competencies indigenously. To encourage the indigenous development of imported competencies relies on them being learnt, understood and adapted by the recipient country and can be achieved through the process of IB or ID (long term measure).

In the long term competencies are required to be developed indigenously to encourage sustained growth of a country's construction sector. This can be achieved through the process of creating new indigenous institutions or by modifying existing ones. The processes of IB and ID are therefore crucial in the development of a country's construction industry. It is acknowledged that there is however no blueprint or universally approved model for IB or ID. The process of building and developing institutions must be appropriate to a country's specific characteristics in order to successfully meet the needs of the industry.

The construction industry in each country under study has been examined to identify the existence of primary institutions which supply key competencies which facilitate the effective operation of indigenous procurement systems (identified in table 1). An analysis of literature and the collection of primary data through interviews was

undertaken to establish the existence or absence of such primary institutions within each country. The secondary data and interviews have confirmed that institutional which supply key competencies demanded in the construction industry are in place in the UK, USA, France and Japan. It is identified that in India and Malaysia are currently suffering from the lack of institution development in ceratin sectors. With regards to Malaysia there is a lack in supply of competencies associated with the management of construction and construction production. In India lack of financial institutions, institutions which promote the managers of construction, construction producers and institutions responsible for the development of risk allocation mechanisms were identifies as limiting the supply of associated competencies. The interviews identified that the development of institutions which promote the supply of the associated competencies is essential for the development of the indigenous construction industry.

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CHAPTER SEVEN

CONCLUSION

Conventional methods used to classify building procurement systems and terms used to describe their operation are often country specific and can be misleading when used to compare systems across countries. It has been established in this thesis that functions are consistent across procurement systems, enabling comparison by functional analysis.

Chapters two and four have illustrated how building procurement systems can be modelled in an objective way using functional analysis. The resultant models were then validated by a questionnaire survey and verified by a series of interviews conducted with respondents from the countries under investigation. This validation and verification of the PSM's provided evidence that the systems model can successfully facilitate the modelling, identification and comparison of dominant systems between countries. Although it is acknowledged that the intricate operating procedures of each system will be country specific, the PSM's have allowed the comparison of models to identify the major characteristics of dominant procurement systems which are common to more than one country under study.

The process of modelling by functional analysis has therefore supported Hypothesis 1: building procurement systems can be objectively modelled by the use of a theoretical functional framework.

The modelling of procurement systems using the PSM allows countries which are pursuing rapid or sustained economic growth to see the potential array of procurement systems that could be used, and thus to identify which system may be appropriate for them. The analysis of procurement systems using this approach can also provide crucial market information to major exporters on the nature of procurement systems that are currently being used by emerging (importing) countries.

Furthermore, the use of functional analysis to create the PSM's has facilitated the identification, using competency theory, of the key competencies and resources required to operate each dominant procurement system in an effective way.

In chapter five evidence is provided to support the contention that the effective use of a particular procurement system relies upon the availability of key competencies and the supply of resources in adequate amounts, of a satisfactory quality, at the time they are required. The application of the competency approach to procurement systems has identified that a range of generic, common and specific key competencies need to be available indigenously in order to operate a particular procurement system effectively. In applying this approach the key competencies and resources identified have been established from the analysis of literature and have been subsequently verified through interviews with respondents from each country in which the particular dominant procurement system is used.

Analysis of procurement system by the identification of key competencies has facilitated examination of the indigenous supply chain of competencies within a country. It has been established therefore that in order to operate a particular procurement system effectively within any country the supply chain of key competencies must be in place and these must be allied to the necessary resources. Without such competencies the resources cannot be effectively utilised within the particular procurement system adopted.

The grouping of the dominant procurement systems modelled in accordance with the classification system proposed by Masterman (1992) of separated and cooperative, integrated and management orientated procurement systems has encouraged the identification of the array of key competencies (generic, common and specific) which must be available within a country to deliver a category of procurement system effectively.

The research has shown that if there is a breakdown or gap within the supply chain of such key competencies then the particular procurement system may not operate effectively. The examination of such gaps or deficiencies within the supply chain will enable information to be provided on the particular generic, common and specific key competencies which must be available in order to effectively operate a particular procurement system. In the short term this may be achieved by the importation of competencies from countries which may be major exporters of construction services and the investigation has confirmed that if key competencies and/or resources are not

available indigenously they may be imported.

The verification of the need for key competencies and resources supports hypothesis 2 which proposes that: effective operation of a specific procurement system relies upon the availability of competencies and resources.

The identification of the array of key competencies required to operate a particular procurement system establishes the range of key competencies (generic, common and specific) which need to be developed to operate existing or new procurement systems effectively. For long-term growth in the construction industry to be sustained the development of mechanisms to supply the demanded competencies is necessary. Previous research cited in this study has indicated the dependence of competencies upon the existence and development of institutions which establish, develop and disseminate competencies in their membership. The linkage between competencies and institutions has been examined and allied to the analysis of procurement systems in the countries under study. This has been validated by the examination of the institutions which do exist within the countries and verified by interviews with respondents from the construction industry in the respective countries.

The question of how key competencies and resources may be developed has been addressed initially by evaluating Institute Building and Institution Development theories. Construction industry specific and non-specific institutions have been identified as encouraging the establishment, development, sustainment and dissemination of generic, common and specific key competencies within the construction industry of a particular country. The dissemination and sustainability of competencies has been found to be crucial in maintaining the indigenous supply of competencies facilitating the effective operation of the various procurement systems.

A variety of institutions are important in the development of competencies within a country. The primary institutions which have been identified as encouraging the development of key competencies include training organisations, professional institutions, trade associations, research and development institutions. The examination of these institutions has identified that where they are absent or where their structure is inappropriate (in relation to their operating environment) key

competencies are not being established or developed, disseminated or sustained to an adequate standard.

It is acknowledged however that if institutions do not exist indigenously or are unable to supply the array of competencies required for the operation of a particular procurement system then the unavailable competencies may be imported from countries which possess the particular key competencies (usually countries which are major exporters of construction services).

The process of importing key competencies facilitates the immediate supply of competencies within a country. It is maintained, however, that the importation of competencies is only a short term measure for a country. Unless these competencies are encouraged and promoted indigenously the importing country will rely upon its ability to obtain such competencies from other countries thus remaining dependant upon exporting countries providing these competencies. As such if the imported competencies are not disseminated and sustained indigenously, when the donor country relocates, perhaps due to the recipient countries inability to pay for their services or as other markets become more lucrative, then the associated key competencies are removed, creating a competency void within the indigenous country.

The development of imported competencies may be encouraged through the process of technology transfer between two countries. In order for competencies to be developed during the process of technology transfer the recipient country must understand, learn and apply the technology transferred so that it becomes adapted to the local environment. If this process does not occur than technology transfer is ineffective and competencies will not be developed or sustained indigenously. By adapting and learning these competencies countries are able to take control of their own industry, allowing them to use particular procurement systems effectively, and thereby enabling the achievement of projected economic growth targets or sustained growth.

It has been recognised in this investigation that some form of institutional support is required to disseminate and sustain the array of key competencies which are required in order for the country to operate a particular procurement system effectively. The

organisational structure and development of institutions has been recognised to be inconsistent across countries. The process of institutional development in developing countries has often involved the establishment of institutions which are identical to those which have evolved and developed in developed countries. This is often inappropriate as the institution development process must be suited to a country's political, economic, social and technical (PEST) 'climate'. The examination of a country's PEST climate when undertaking the process of institution development will encourage the ID process facilitating the development, dissemination and sustaining of key competencies which are being demanded in the country at a specific point in time.

The development of institutions encourages the supply chain of key competencies to be maintained and develop further, so allowing economic growth to be achieved. This is particularly important to countries which have set growth targets or are on programmes of rapid economic expansion. This study has particularly concentrated on India and Malaysia although South Africa, for example, has also recognised the importance of this supply chain and is rapidly developing institutions to encourage the supply of competencies which will allow projected growth targets to be achieved.

Unless the indigenous supply chain is recognised as being of crucial importance in developing competencies, such targets of projected growth may not be achieved. Each country has its own pattern and targets of economic growth and consequently the supply side of each country need to be considered separately. There is no form or pattern of institution which is appropriate to all countries. The PEST climate of the country needs to be taken into account when developing such institutions. Both the variety of key competencies that are being demanded and the arrangement of institutions which supply such competencies within any country must be continually monitored and revised to ensure that demand is being satisfied. The development of institutions, competencies and the use of procurement systems is not a static process, but is continually changing in line with the political, economic, social and technical characteristics of a country.

Hypothesis 3 proposes that: the supply of key competencies are dependent upon the existence of indigenous institutions. This is rejected, as competencies may be imported as indicated above.

The overall consequence of the thesis has therefore been to identify how procurement systems may be operated more effectively within a country to meet the economic demands of that country. By developing institutions indigenously, the supply of competencies is encouraged and sustained - thereby allowing the effective use of a particular procurement system which will allow economic growth targets to be achieved.

The Dependency Linkages (Figure 7.1) illustrates the interrelationship between the three hypothesis in this thesis. Objective modelling of procurement systems can be carried out by using functional analysis and the examination of such systems in this way will further allow the comparative analysis of dominant procurement systems in a range of countries. The effective operation of a particular procurement system will, however, be dependent on the availability of resources and the key competencies which are necessary to operate the particular system and this is related to the countries political, economic, social and technical characteristics. Indigenous institutions will assist with the establishment, development, dissemination and sustaining of competencies. If a particular procurement system requires the supply of competencies which are not developed indigenously, then in order for the system to operate effectively, competencies must be imported. Such imported competencies are frequently supplied by the major exporters of construction services.

Recommendations for Future Research

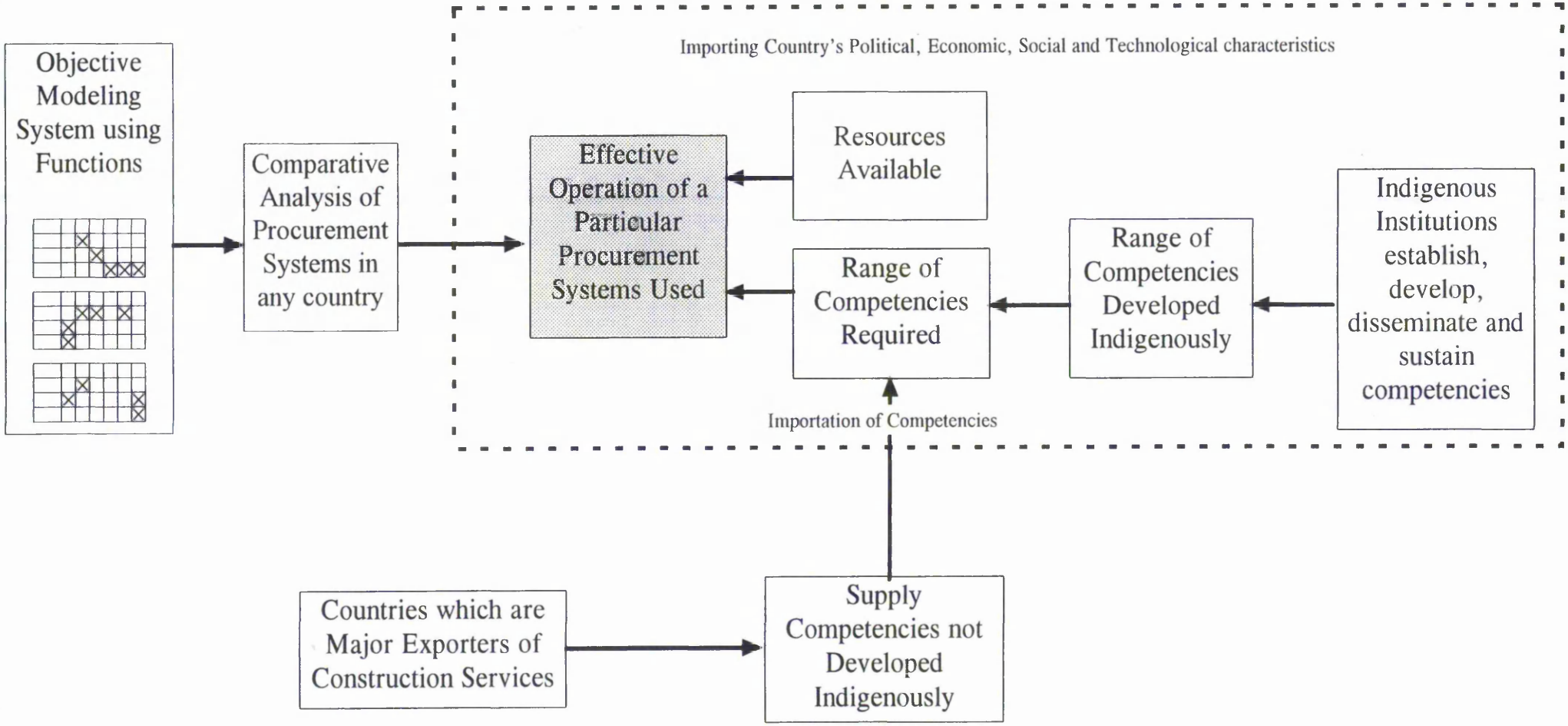
This study has concluded that it is possible to model dominant building procurement systems by analysing functions. The use of the PSM allows the identification and comparison of procurement systems across countries. The study has also identified that there are a variety of generic, common and specific key competencies and resources which are required to be available in a country in order to operate a particular procurement system effectively.

Procurement systems depend on the availability of competencies and resources and these are vital for a system to operate effectively. The impact of constraints in the supply chain of competencies and or resources will affect the operation of procurement systems. For instance, if there are constraints on labour or particular key competencies in a country, this will affect the delivery or operation of a particular procurement system. This has been shown to be the case in India and Malaysia, where constraints on the availability of finance, the lack of managerial skills and the general shortage in supply of skilled construction operatives were identified to influence the effective operation of dominant procurement systems. As such future research is required to investigate the impact of constraints in the supply chains relating to the operation of procurement systems and their effective operation.

Further research in this area might usefully progress by examining the comprehensive supply chain of competencies which are required to operate a procurement system effectively within a country. Concentration on the supply of competencies would lead to the production of a fuller framework of the common and specific competencies which need to be supplied in order to implement a particular procurement system effectively.

Further research may be undertaken to test whether the model should modified to include management of design within the design function, and to asses whether the coordinational role of within a procurement system should also be included in the PSM frameworks. The PSM's could also be administered on a wider range of countries to further verify the robustness of the model.

Figure 7.1:The Dependency Linkages



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A Functional Analysis of Building Procurement Systems and Strategies in an International Context

ASIF SHARIF

APPENDICES

October 1996

Volume 2

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APPENDIX A

Results of the Questionnaires and Interviews for the Validation and Verification of The Procurement Systems Models

Questionnaire Coding System:

USA	Table A1 (i, ii, iii, iv, v and vi)
Japan	Table A2 (i, ii, iii, iv, and v)
France	Table A3 (i, ii, iii, iv and v)
India	Table A4 (i, ii, iii, iv and v)
Malaysia	Table A5 (i, ii, iii, iv and v)

	QUESTIONNAIRE CODING SYSTEM		
Number	**Question**	**Answer**	**Code**
1	Client using this procurement system	Public	1
		Private	2
		Private Owner Occupier	3
		Private Developer	4
		Private Investor	5
		Other	6
		Public and Private	7
		Public more than Private	8
		Private more than Public	9
2	Sources of finance	Government	1
		Individuals	2
		Banks	3
		Pension Funds	4
		Insurance Companies	5
		Other	6
		All	7
		Government and Banks	8
		Government, Individuals and Banks	9
		Government, Individuals, Banks, Pension Funds	10
		Government, Banks and Pension Funds	11
		Individuals and Banks	12
		Banks, Pension Funds and Insurance Companies	13
		Government, Banks and Insurance Companies	14
		Individuals, Banks, Pension Funds, Insurance companies	15
3	Who produces concept design	Designer	1
		Constructor	2
		Other	3
		Designer and Constructor	4
4	Who produces detailed design	Designer	1
		Constructor	2
		Other	3
		Designer and Constructor	4
5	Who produces specialist designs	Designer	1
		Constructor	2
		Other	3
		Designer and Constructor	4
6	Who is responsible for the specification of design standards	Initiator/ Promoter	1
		Funder	2
		Designer	3
		Constructor	4
		Other	5
		Initiator/ Promoter and Designer	6
		Designer and Constructor	7
7	With whom does the concept designer enter into a formal relationship	Initiator/ Promoter	1
		Funder	2
		Detailed Designer	3
		Specialist Designer	4
		Manager of Construction	5
		Construction Producer	6
		Other	7
8	With whom does the detailed designer enter into a formal relationship	Initiator/ Promoter	1
		Funder	2
		Concept/ Schematic Designer	3
		Specialist Designer	4
		Manager of Construction	5
		Construction Producer	6
		Other	7

9	**With whom does the specialist designer enter into a formal relationship**	Initiator/ Promoter	1
		Funder	2
		Detailed Designer	3
		Concept/ Schematic Designer	4
		Manager of Construction	5
		Construction Producer	6
		Other	7
10	**Number of producers in the construction process**	One	1
		Many	2
11	**Number of producers in a formal relationship with the initiator/ promoter**	One	1
		Many	2
12	**Is the management of construction separat from construction production process**	Yes	1
		No	2
13	**Risk of completing to a completion date**	Initiator/ Promoter	1
		Funder	2
		Manager of Construction	3
		Construction Producer	4
		Other	5
		Construction Producer and Initiator/ Promoter	6
		Construction Producer > Initiator Promoter	7
		Initiator/ Promoter > Construction Producer	8
		Manager of Construction and Construction Producer	9
		Initiator/ Promoter and Manager of Construction	10
14	**Risk of certainty of total building price**	Initiator/ Promoter	1
		Manager of Construction	2
		Construction Producer	3
		Other	4
		Initiator/ Promoter and Construction Producer	5
		Initiator/ Promoter and Manager of Construction	6
15	**Risk of functionality**	Initiator/ Promoter	1
		Concept/ Schematic Designer	2
		Detailed Designer	3
		Specialist Designer	4
		Manager of Construction	5
		Construction Producer	6
		Other	7
		Designers	8
		Initiator/ Promoter and Designers	9
		Initiator/ Promoter and Constructor Producer	10
		Initiator/ Promoter, Construction Producer, Designer	11
		Construction Producer and Designer	12
16	**Risk of quality of workmanship**	Manager of Construction	1
		Construction Producer	2
		Other	3
		Manager of construction and Construction Producer	4
17	**If there is a separate manager of construction with whom do they a formal relationship**	Initiator/ Promoter	1
		Concept/ Schematic Designer	2
		Detailed Designer	3
		Specialist Designer	4
		Construction Producer	5
		Other	6
		Initiator/ Promoter and Construction Producer	7
18	**With whom does the construction producer have a formal relationship**	Initiator/ Promoter	1
		Concept/ Schematic Designer	2
		Detailed Designer	3
		Specialist Designer	4
		Manager of Construction	5
		Other	6
		Initiator/ Promoter and Designer	7
		Initiator/promoter and Construction Producer	8

Table A1(i): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE LUMP SUM PROCUREMENT SYSTEM IN THE USA

USA 1																			
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	4	8	7	1	1	2	4	1	1	6	2	1	2	4	3	8	2	*	1
2	4	7	9	1	1	3	3	1	1	1	2	1	2	4	3	12	2	*	1
3	3	7	9	1	1	2	3	1	1	6	2	1	2	4	3	12	2	*	1
4	4	1	1	1	1	2	3	1	3	3	2	1	2	4	3	8	2	*	1
5	4	1	1	1	1	1	3	1	1	4	2	1	2	4	1	8	2	*	1
6	5	7	7	1	1	1	3	1	1	1	2	1	2	4	3	3	2	*	1
7	5	7	7	1	1	1	3	1	1	1	2	1	2	4	3	3	2	*	1
8	5	7	7	1	1	1	3	1	1	1	2	1	2	4	3	3	2	*	1
9	4	8	8	1	1	1	3	1	1	3	2	1	2	4	1	12	2	*	1
10	4	1	1	1	1	1	3	1	1	3	2	1	2	4	3	1	2	*	1
11	5	7	7	1	1	2	3	1	1	3	2	1	2	4	3	12	3	*	1
12	5	7	10	1	1	1	3	1	1	1	2	1	2	4	3	3	2	*	1
13	5	1	1	1	1	1	3	1	1	1	2	1	2	4	3	3	2	*	1
14	5	1	1	1	1	1	3	1	1	1	2	1	2	4	3	3	2	*	1
15	5	1	1	1	1	1	3	1	1	1	2	1	2	4	3	1	2	*	1
16	2	1	1	1	1	1	1	1	1	3	2	1	2	4	3	3	2	*	1
17	2	1	1	1	1	1	1	1	1	3	2	1	2	4	3	8	2	*	1
18	5	7	13	1	1	2	3	1	1	3	2	1	2	4	3	3	2	*	1
19	5	4	3	1	2	1	3	1	1	3	2	1	2	4	3	3	3	*	1
20	5	1	1	1	1	1	3	1	1	3	2	1	2	7	5	8	1	*	1
21	4	7	8	1	1	1	3	1	1	1	2	1	2	4	3	3	2	*	1
Summary of Predominant responses		7		1	1	1	3	1	1	1/3	2	1	2	4	3	3/8	2		1

Table A1(ii): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE DESIGN AND BUILD PROCUREMENT SYSTEM IN THE USA

USA 2																				
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	4	9	15	1	2	2	4	1	6	6	2	1	2	4	3	6	2	*	1
2	4	9	12	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
3	3	9	12	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
4	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
5	4	9	12	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
6	5	9	12	1	2	2	1	1	6	6	1	1	2	4	3	1	2	*	7
7	5	9	12	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
8	5	9	12	1	2	2	4	1	6	6	2	1	2	4	3	1	2	*	7
9	4	4	3	1	2	2	4	1	6	6	2	1	2	4	3	1	2	*	1
10	4	1	1	1	4	2	1	1	6	6	2	1	2	4	3	1	2	*	1
11	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12	5	3	12	1	2	2	1	1	6	6	1	1	2	4	3	1	2	*	1
13	5	4	3	1	4	2	4	1	6	6	2	1	2	4	3	1	2	*	1
14	5	4	3	1	2	2	1	1	6	6	2	1	2	4	3	1	2	*	1
15	5	4	3	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
16	2	1	1	1	2	2	4	6	6	6	1	1	2	4	3	1	2	*	1
17	2	1	1	1	2	2	4	1	6	6	2	1	2	4	3	1	2	*	7
18	5	3	3	2	2	2	4	6	6	6	2	1	2	4	3	1	2	*	1
19	5	3	3	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
20	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Summary of Predominant responses		9	12	1	2	2	4	1	6	6	2	1	2	4	3	1/10	2		1

Table A1(iii): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE TURNKEY DESIGN AND BUILD PROCUREMENT SYSTEM IN THE USA

USA 3																				
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	4	2	15	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
2	4	2	12	2	2	2	4	6	6	6	2	1	2	4	3	1	2	*	1
3	3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
4	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
5	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
6	5	3	13	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	7
7	5	3	13	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
8	5	3	13	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	7
9	4	3	3	2	2	2	4	6	6	6	2	1	2	4	3	1	2	*	1
10	4	1	1	4	2	2	1	6	6	6	2	1	2	4	3	10	2	*	1
11	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12	5	2	13	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
13	5	4	3	4	2	2	4	6	6	6	2	1	2	4	3	1	2	*	1
14	5	4	3	2	2	2	4	6	6	6	2	1	2	4	3	1	2	*	1
15	5	4	3	2	2	2	4	6	6	6	2	1	2	4	3	1	2	*	1
16	2	1	1	1	2	2	4	6	6	6	2	1	2	4	3	1	2	*	7
17	2	1	1	2	2	2	4	6	6	6	2	1	2	4	3	1	2	*	1
18	5	3	3	1	2	2	4	6	6	6	2	1	2	4	3	10	2	*	7
19	5	4	3	2	2	2	4	6	6	6	2	1	2	4	3	1	2	*	1
20	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Summary of Predominant responses		3	13	2	2	2	4	6	6	6	2	1	2	4	3	1/10	2		1

Table A1 (iv): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE CONSTRUCTION MANAGEMENT/ INDEPENDENT CONTRACTOR PROCUREMENT SYSTEM IN THE USA

USA 4																			
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	4	9	7	1	1	2	3	1	1	6	2	1	1	9	2	8	2	7	5
2	4	4	3	1	1	4	3	1	1	3	2	1	1	1	2	3	2	7	5
3	3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
4	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
5	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
6	5	2	13	1	1	4	3	1	1	6	2	1	1	9	2	9	2	7	5
7	5	2	13	1	1	1	3	1	1	3	2	1	1	9	2	9	2	7	5
8	5	2	13	1	1	4	3	1	1	6	2	1	1	9	2	9	2	7	5
9	4	3	3	1	1	1	3	1	1	3	2	1	1	3	1	8	1	7	5
10	4	2	13	1	1	1	1	1	1	3	2	1	1	3	2	1	1	7	5
11	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12	5	2	13	1	1	1	3	1	1	3	2	1	1	3	1	1	2	7	5
13	5	2	3	1	1	1	3	1	1	3	2	1	1	3	5	8	1	7	5
14	5	2	3	1	1	1	3	1	1	3	2	1	1	3	2	8	2	7	5
15	5	2	3	1	1	1	3	1	1	3	2	1	1	3	2	8	2	7	5
16	2	1	1	1	1	1	3	1	1	3	2	1	1	3	2	1	2	7	5
17	2	1	1	1	1	1	3	1	1	3	2	1	1	3	2	1	1	7	5
18	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19	5	2	3	1	1	2	3	1	1	6	2	1	1	3	2	1	2	7	5
20	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Summary of Predominant responses		**2**	**13**	**1**	**1**	**1**	**3**	**1**	**1**	**3**	**2**	**1**	**1**	**3**	**2**	**8/1**	**2/1**	**7**	**5**

Table A1 (v): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE PURE CONSTRUCTION MANAGEMENT PROCUREMENT SYSTEM IN THE USA

USA 5																			
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	4	2	15	1	1	2	3	1	1	6	2	2	1	4	1	8	2	1	1
2	4	2	13	1	1	1	3	1	1	3	2	2	1	4	1	8	2	1	1
3	3	2	3	1	1	1	3	1	3	3	2	2	1	6	5	8	2	1	1
4	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
5	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
6	5	7	10	1	1	2	3	1	1	1	2	2	1	9	1	3	2	1	1
7	5	7	10	1	1	2	3	1	1	1	2	2	1	9	1	3	2	1	1
8	5	7	10	1	1	1	3	1	1	1	2	2	1	9	5	3	2	1	1
9	4	3	3	1	1	1	3	1	1	3	2	2	1	6	1	3	2	1	1
10	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12	5	2	13	1	1	2	3	1	1	3	2	2	1	4	1	3	2	1	1
13	5	2	3	1	1	1	3	1	1	1	2	2	1	9	1	8	2	1	1
14	5	2	3	1	1	1	3	1	1	1	2	2	1	9	1	8	1	1	1
15	5	2	3	1	1	1	3	1	1	1	2	2	1	9	5	8	2	1	1
16	2	5	5	1	1	1	3	1	1	3	2	2	1	4	1	8	1	1	1
17	2	5	5	1	1	1	3	1	1	3	2	2	1	4	5	8	1	1	1
18	5	2	12	1	1	1	3	1	1	3	2	2	1	4	5	8	2	1	1
19	5	1	1	1	1	2	3	1	3	1	2	2	1	1	1	1	2	1	1
20	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Summary of Predominant responses		**2**	**3**	**1**	**1**	**1/2**	**3**	**1**	**1**	**1/3**	**2**	**2**	**1**	**4/9**	**1/5**	**8**	**2**	**1**	**1**

Interview Number	USA Interviews Name and Company
1	Mr Nicholas Renny, President Chesterton International, New York
2	Mr Denis Higston, Executive Vice President, Tillyards, New York
3	Mr Wilson C Barns, Principle Lecturer, Department of construction Management, College of Engineering and Design, Florida International University.
4	Mr John Robbins Architects, Cost Engineers, Florida
5	Mr Karl Marriot, Project Manager, Abacus Project Management, Arizona
6	Mr Alister Roberts, President, Ackroyd Cost Control Consultants, Seatle

Interview	Table A1: USA Verification of the Procurement Systems Models
1	Dominant procurement systems in the public sector include the lump sum traditional system although CM and design and build are sometimes used. In the private sector a variety of systems are used including the traditional lump sum (and GMP contracts, design and build, construction management (pure) and construction management/independent designer. There are many form of these two types of CM system in operation in the USA. The traditional lump sum system is still the most widely used by the majority of clients in the USA, although if speed is of importance fast track systems are used the CM approaches or D & B. The CM approach is particularly used where speed and quality are of importance to the client. Under the CM/ Independent contractor approach the construction manager is a contractor who is appointed at the onset of the project and takes the role of a CM until designs and specifications are nearly completed giving the client a GMP to complete the project. The CM then takes the role of a general contractor to complete the works for the client within the agreed price. The CM/independent contractor enters into formal relationships with the trade contractors.
2	The Lump sum traditional system is the most widely project delivery system in the USA both in the public and private sector. The benefit of this arrangement is that the client is given time and cost certainty by the general contractor before the project is constructed. The design and build approach is increasingly being used in the USA particularly on industrial and commercial project but to the simplicity of the arrangement as there is a single organisation which is responsible for the design and construction of the project for the client. Within the D & B approach there are many variations but the two most widely used include Turnkey and pure D & B. In the former approach the contractor may find the site for the client, carry out all design work, construct the project and fit out the building, whilst with the latter approach the client will often involve an independent A?E firm to carry out the concept design and the contractor will be required to complete the design work and construct the building. There are many forms of CM which are used in the USA and the most widely used are the PURE and Independent contractor. The latter approach is used by less experienced clients who wish to achieve fast tract construction but also want to minimise their risk in terms of cost certainty. The former approach is generally used ny sophisticated client who wish to build fast, high quality structures. The CM approach is used frequently in the USA and is supported by the large amount of trade contractors and specialist contractors which operate ion the market.

3	Dominant procurement systems include lump sum (GMP, negotiated, and incentive type). This system is used in the public (due to controls and accountability: it must be the best buy and that means the cheapest price) and private sector (particularly by unsophisticated client as they are given time and cost certainty by the general contractor). More sophisticated clients in the private sector would tend to use other project delivery systems including D&B and CM; they tend to look for a better match between the critical construction issues and the system used. D & B is increasingly fraught with liability problems in terms of design ie who takes responsibility for the designs. The contractor has tended to charge the most of the least amount of design and the client takes the risk. The designers faults are placed primarily with the contractor (as they procure the design work). The D & B system has only been popular in the USA during the last 20 years. Within this system there are a variety of approaches; turnkey where the contractor does everything and D & B where the client produces concept design and the contractor does the rest. Increasingly the philosophy of partnering (developing long term working relationships) has been used with this procurement system to try and reduce some of the adversarialism. Construction Management is also used in the USA and there are various forms of this system in use. The most widely used include Pure CM and CM/Independent contractor form. In the former system the CM is an advisor to the client in much the same way as the design consultants. The CM is involved in coordinating the project (including design and constriction) tendering, selection of contractors and programming of the works on site. The client will enter into contracts directly with the various trade contractors to carry out various packages of work on site. The primary risks of time and cost lie with the client under this approach. In the latter system the Cm is appointed at the design stage to be involved with the coordination and planning of the project, but when designs are 50% complete and specifications are 80% complete the CM takes on the role of a contractor and proposes a GMP for the completion of the works. The CM/Independent contractor takes the risk of the costs and time of the project and will directly appoint trade contractors to execute the various packages of work and does not carry out construction work himself. This second CM approach is particularly used by clients which want a fast delivered building but do not want to be heavily involved in the project and also wish to reduce their risk exposure. The US is a very large country and clients will tend to develop in different states and will used various consultants and contractors in the respective states.
4	Dominant procuremen systems in the public sector include the traditional lump sum system and in the private sector traditional lump sum system, D & B and Construction Management. A/E firms particularly began to be used in the late 1960,s early 70,s when the industry was faced with high interest rates and inflation resulting in clients demanding a faster delivered building. Both CM and D & B are increasingly being used because clients still demand fast track buildings, not particularly because of high interest rates or inflation but because of business imperatives as commercial and retail clients want to continually bring new products on line. Clients are increasingly demanding design, on budget and on time so A/E/Constructor firms have emerged. The benefit of these firms is that they offer a single point of responsibility for all the design and construction duties for the client. The CM approach is also widely used particularly by clients who recognise speed of construction as being an important criteria.

5	Dominant procurement systems in the USA include the lump sum system, design and build, and the CM approaches. In the lump sum approach designs are produced before a contractor is appointed to carry out the construction work. Variations on this system including negotiated contracts are only used in the private sector. The risk for design lies with the designers, whist the risk for cost, time and quality of workmanship lies with the contractor. This is both used in the public and private sector. In the design and build approach the contractor is involved in the design and construction of the work and take the associated risks. There are many forms of CM in the USA but the two mostly used include Pure CM and CM/Independent contractor approach. In the first approach the CM is an advisor the client. Under this procurement system the client will enter into contracts with various trade contractors and therefore takes the majority of risk in terms of time and cost, whilst design quality is with the designers and quality of workmanship is with the individual package contractors. In the second system the CM/Independent contractor takes the role of the CM at the start of the project, but then takes the role of a main contractor and contracts directly with the various trade contractors to construct work packages. The risk of cost lies with the CM/Independent contractor because the CM provides the client with a GMP. the time risk and quality of workmanship risks are also with the CM/Independent contractor. These systems are used predominantly in the private sector although the latter CM approach is used in the public sector on specific projects.
6	The dominant procurement system in the USA is the Traditional Lump sum system which is used by both the public and private sector, with the majority of public sector projects using this system due to accountability reasons. The client will appoint a design team to carry out the design work and once this is completed contractors are asked to tender to carry out the construction work of the whole project. The cheapest and the most suitable contractor is selected, who enters into a contract with the client to complete the project to the designs within an agreed cost and to a certain date. This arrangement is well known and understood in the industry and gives the majority of clients what they want. There are various forms of design and build in the USA which vary on the amount of design input by the contractor. The basis of this arrangement is that a client appoints a single organisation or contractor to carry out both the design and construction of the project for a lump sum price, within a certain time period. This arrangement creates a single point of responsibility for the design and construction of the project and it allows fast tracking. The primary risk assumed by the client under this approach is that of design quality. The contractors will tend to design the least specifications and charge the client the most for it. Increasingly clients are appointing independent design consultants to either carry out the concept design of the project before the contractor is appointed or to evaluate tenders for the client with regards to design. The CM approach offers client speed of construction and high quality buildings. The USA is made up of many small trade based and specialist contractors which are highly sophisticated in their own areas of construction. The use of standardised design details, prefabrication and standard units in construction projects results in fast construction in the USA. The two forms of CM are pure where the client appoints a CM as a consultant to assist with the programming, coordination and planning of the project and as such enters into contracts with various package contractors and CM/Independent contractor where the CM is a general contractor who offers the services of a CM until the designs and specifications are almost complete and then takes the role of a general contractor by giving the client a guaranteed maximum price for the construction of the works. The contractor then appoint individual package contractors to carry out the various packages of work. Under the latter arrangement the client is give a degree of const and time certainty ny the contractor.

Table A2 (i): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE LUMP SUM DESIGN, TENDER, CONSTRUCTION PROCUREMENT SYSTEM IN JAPAN

JAPAN.1																				
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	1	1	1	1	1	2	3	1	3	4	2	1	2	4	3	6	1	*	1
2	2	8	9	1	1	2	3	1	1	1	2	1	2	4	3	12	2	*	1
3	2	7	9	1	1	1	3	1	1	1	2	1	2	4	3	6	2	*	1
4	2	7	1	1	1	2	3	1	1	6	2	1	2	4	3	1	2	*	1
5	4	7	10	1	1	2	3	1	1	6	2	1	2	4	3	6	2	*	1
6	4	7	9	1	1	2	3	1	1	6	2	1	2	4	3	6	2	*	1
7	4	7	9	1	1	2	3	1	1	6	2	1	2	4	3	6	2	*	1
8	4	2	3	1	1	2	3	1	1	6	2	1	2	4	3	6	2	*	1
9	5	7	1	1	1	2	3	1	1	6	2	1	2	4	3	8	2	*	1
10	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11	5	7	9	1	1	2	3	1	1	1	2	1	2	4	3	6	2	*	1
12	5	7	14	1	1	4	3	1	1	1	2	1	2	4	3	6	2	*	1
13	5	7	14	1	1	4	3	1	1	1	2	1	2	4	3	6	2	*	1
14	5	7	14	1	3	2	3	1	1	1	2	1	2	4	3	11	2	*	1
15	5	7	1	1	1	4	3	3	3	1	2	1	2	4	3	12	2	*	1
16		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17	5	1	1	1	1	2	3	1	1	6	2	1	2	4	3	8	2	*	1
18	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19	5	7	7	1	1	2	3	1	1	1	2	1	2	4	3	8	2	*	1
20	5	1	1	1	1	2	3	1	1	6	2	1	2	4	1	6	2	*	1
21	5	1	1	1	1	2	3	1	1	6	2	1	2	4	3	6	2	*	1
22	5	1	1	1	1	2	3	1	1	6	2	1	2	4	1	6	2	*	1
23	5	1	1	1	1	2	3	1	1	6	2	1	2	4	3	6	2	*	1
24	5	1	1	1	1	2	3	1	1	6	2	1	2	4	1	6	2	*	1
summary of predominant responses		7		1	1	2	3	1	1	1/6	2	1	2	4	3	6	2		1

Table A2 (ii): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE DESIGN AND BUILD PROCUREMENT SYSTEM IN JAPAN

JAPAN 2																			
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	1	3	2	2	2	2	4	6	6	6	1	1	2	4	3	6	2	*	1
2	2	2	12	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
3	2	9	9	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
4	2	9	10	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
5	4	4	3	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
6	4	3	12	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
7	4	3	12	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
8	4	3	2	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
9	5	9	10	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
10	5	2	3	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
11	5	2	10	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
12	5	2	15	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
13	5	2	15	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
14	5	2	15	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
15	5	2	15	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
16	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19	5	9	7	2	2	2	4	6	6	6	1	1	2	4	3	6	2	*	1
20	5	2	3	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
21	5	2	3	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
22	5	2	3	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
23	5	2	3	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
24	5	2	3	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
Summary of predominant responses		2		2	2	2	4	6	6	6	2	1	2	4	3	6	2		1

Table A2(iii): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE JOINT VENTURE LUMP SUM DESIGN, TENDER CONSTRUCTION PROCUREMENT SYSTEM IN JAPAN

JAPAN 3																			
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	1	1	1	1	1	1	3	1	1	4	2	1	2	4	3	8	2	*	8
2	2	7	9	1	1	2	3	1	1	6	2	1	2	4	3	8	2	*	8
3	2	7	9	1	1	2	3	1	1	6	2	1	2	4	3	8	2	*	8
4	2	7	9	1	3	2	3	1	1	6	2	1	2	4	3	8	2	*	8
5	4	1	1	1	1	2	3	1	1	6	2	1	2	4	3	8	2	*	8
6	4	7	9	1	1	1	3	1	1	6	2	1	2	4	3	8	2	*	8
7	4	7	9	1	1	1	3	1	1	6	2	1	2	4	3	8	2	*	8
8	4	1	1	1	1	2	3	1	1	3	2	1	2	4	3	8	2	*	8
9	5	1	1	1	1	2	3	1	1	3	2	1	2	4	3	8	2	*	1
10	5	7	9	1	2	2	3	1	6	6	2	1	2	4	3	12	2	*	8
11	5	7	9	1	2	2	3	1	6	6	2	1	2	4	3	12	2	*	1
12	5	7	14	1	1	3	3	1	1	6	2	1	2	4	3	8	2	*	8
13	5	7	14	1	1	3	3	1	1	6	2	1	2	4	3	8	2	*	8
14	5	7	8	1	1	3	3	1	1	1	2	1	2	4	3	8	2	*	8
15	5	7	7	1	1	1	3	1	1	1	2	1	2	4	3	4	2	*	1
16	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19	5	7	7	1	1	1	3	1	1	1	2	1	2	4	3	8	2	*	8
20	5	1	1	1	1	2	3	1	1	6	2	1	2	4	3	8	2	*	8
21	5	1	1	1	1	2	3	1	1	6	2	1	2	4	3	8	2	*	8
22	5	1	1	1	1	2	3	1	1	6	2	1	2	4	1	8	2	*	8
23	5	1	1	1	1	2	3	1	1	6	2	1	2	4	3	8	2	*	8
24	5	1	1	1	1	2	3	1	1	6	2	1	2	4	1	6	2	*	8
Summary of Predominant responses		7		1	1	2	3	1	1	6	2	1	2	4	3	8	2		1

Table A2(iv): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE JOINT VENTURE DESIGN AND BUILD PROCUREMENT SYSTEM IN JAPAN

JAPAN 4																			
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTIO	QUALITY	SM CONTRACT	C CONTRACT
1	1	3	2	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	8
2	2	2	2	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	8
3	2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
4	2	2	9	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	8
5	4	2	12	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	8
6	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
7	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
8	4	2	12	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	8
9	5	2	2	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	8
10	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11	5	2	12	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	8
12	5	2	12	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	8
13	5	2	12	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	8
14	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
15	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
20	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
22	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
23	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
24	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Summary of Predominant responses		2	12	2	2	2	4	6	6	6	2	1	2	4	3	6	2		8

Interview Number	Japan Interviews Name and Company
1	Mr Shigeru Taki Director, Shimizu Corporation Inc. London.
2	Mr Kevin P Tyler, Shimizu Corporation Inc. London.
3	Professor Roger Flanagon, University of Reading.
4	Kumagi Gumi Inc, London.
5	Mr Masafumi Anami (Director), Taisie Europe Ltd. London.
6	Mr Tatsuya Sugawara (Marketing Manager), Taisie Europe Ltd. London.
7	Mr Nagai: Regional Manager, Takenaka UK Ltd, Birmingham.
8	Mr Steve McWigg, Senior Specialism Purchaser, Toyota Motor Corporation, Burnaston.
9	Mr Yamamoto, Kajima UK. London.
10	Ass Professor Yashiro, University of Reading.

Interview	Table A2: Japan Verification of Procurement Systems Models
1	Design and Build is the traditional system which is used in the Private sector in Japan. Additionally the design, tender, construction lump sum approach is used, predominantly in the public sector (for accountability reasons). Both of these arrangements are also incorporated into the Joint venture system in Japan. Construction Management is not popular as it is a system in which the majority of the risk passes to the client, rather staying with the contractor, (which is what is preferred by Japanese clients).
2	Design and Build is the traditional system which is used in Japan followed by the lump sum design, tender, construct approach. Construction management is not popular in Japan as it passes the majority of the risks to the client, and little risk stays with the contractor.
3	In terms of procurement system in Japan there are basically 2; the pre tender independent design system, and the D&B arrangement. These arrangements are further divided into either a joint venture agreement or a single general contractor under taking the works. The project is either let be negotiation or designated competitive bidding systems. The D&B arrangement is not the same as in the UK. In Japan under this system, the client will often got to an architectural firm to acquire the schematic designs for a project, and will then approach a general contractor to 'engineer the design' (similar to the way the bureau de etudes operates in France). The procurement systems used are geared to meet the requirement of their culture. Mr Yo Hasitimi from Shimizu has carried out some research into CM, and concluded that its usage in Japan would be limited as it does not fit with the characteristics of the business environment. There are generally very few restrictions on the type of procurement system which can be implemented in Japan, it the attitude of the clients which dictates their usage. As risk avoiders, they only use systems which place risk on other parties. Although in structure the traditional arrangement of procuring a building in Japan resembles management contracting, in terms of risk transfer and distribution it is very different indeed. The cultural differences and influence it has on the construction industry are immense. Lump sum independent design system is used in both but is predominantly used in the Public Sector. Design and build is used in both but predominantly in the Private sector. In Japan there are a variety of D&B procurement systems available. At one extreme there is the turnkey approach where the clint goes to a contractor to get the whole design and construction work, or there is a system whereby the client uses an independent design consultant to produce schematic designs, and the contractor produces detailed designs and working drawings. The most widely used system is the turnkey approach as there is a single point of responsibility. Joint venture systems are very common and can be either independent design or D&B systems depending on public or private sector, type of client, type of project, which contractors are involved. This system is predominantly used in the private sector.
4	Lump Sum design, tender, construct arrangement is predominantly used by the public sector (90%), but also used by the private sector(10%). Used In the private sector when clients want a particularly designed building/prestigious building. When the design of the building is of particular importance, then this system is used. Design and Build used 90% of the time by the private sector. Joint Venture are generally used for civil engineering work, or in large projects where there is lots of different building to build. The reason for these types of projects is because in very specialist projects, company A may not have the technology to carry out the work, but company B does, so the are invited to carry out some work on the same project. Traditionally they were introduced by the government into Japan to allow small companies to work alongside large companies, facilitating technology transfer, and to stop potential monopolies being formed. Now JV's are only for job sharing, maintaining employment. The most used type of JV is the sperate design, tender construct system, use in both sectors. The companies that enter in to the project, will for a JV 'body' with representatives from all parties. The company with the highest share in the JV project is known as the 'Sponsorer' and will tend to adopt their own company practices.

5	Lump Sum design, tender, construction contracts are predominantly used by the public sector, but is also used by the private sector. Design and Build is most widely used by the private sector, rather than the public although the Japanese government are also attempting to introduce D&B into the public sector. This system is dominant in the private sector because it is an 'easy' system. There is only one contractor, how is responsible for the design and construction of a project. The traditional sequential process also takes longer than this system, so we save time. Joint Venture projects can operate as a traditional sequential lump sum basis (most widely used) or on a D&B basis. The system is used on large projects predominantly in the Public sector. The intention behind this system in the public sector was for smaller companies to work alongside bigger ones, enhancing their ability and technology transfer, as well as trying to control the size of the large construction companies in Japan. This system is attempting to introduce new contractors to clients, thus increasing competition within the industry. There are many types of JV's; Consolidated (most popular), Unconsolidated (used for large complex projects with easily separated sections), Paper JV's etc. The sponsoring company in the JV is the one which does the most work and will lead the project, in terms of management style etc. In order for the construction management system to be adopted in Japan regulations (construction Law) and attitudes must change.
6	Lump Sum design, tender, construction contracts are predominantly used by the public sector, but is also used by the private sector. The traditional system in Japan was the sequential process, as construction companies only had the capability to provide manpower, and materials, not design. It was up to the client to coordinate the project and produce designs, by using consultants. As the capability of construction companies developed they began to offer D&B services. Design and Build is mostly used by the private sector, rather than the public. The Japanese government are also attempting to introduce D&B into the public sector. The Design and Build system is dominant in the private sector because it is an 'easy' system. There is only one contractor, how is responsible for the design and construction of a project. The traditional sequential process also takes longer than this system, so we save time. Joint Venture projects can operate as a traditional sequential lump sum basis (most widely used) or on a D&B basis. The system is used on large projects predominantly in the Public sector. The intention behind this system in the public sector was for smaller companies to work alongside bigger ones, enhancing their ability and technology transfer, as well as trying to control the size of the large construction companies in Japan. This system is attempting to introduce new contractors to clients, thus increasing competition. There are many types of JV's; Consolidated (most popular), Unconsolidated (used for large complex projects with easily separated sections), Paper JV's etc. The sponsoring company in the JV is the one which does the most work and will lead the project, in terms of management style etc. Regulations (construction Law) and attitudes must change in order for the construction management system to be adopted in Japan. Bill of Quantities contracts are used in situations were there is few drawings or specifications of the work prepared. The quantity of the work is unknown. The client produces a B of Q detailing the type of work to be done, and the contractor then prices the work in accordance with the bill descriptions. Once the work is completed, the project is remeasured so that a final cost can be reached. This system is used by both sectors, in specific situations, for emergency or repair works.
7	Lump Sum system is predominantly used by the Public sector. In this case, a particular public body will want the building, and it will be designed by the Public design offices, then goes to tender. This is used approximately 90 % in the Public sector (but also includes the Joint Venture system), and about 20% in the private sector. Design and Build is used predominantly by the private sector, with the majority of finance coming from Banks and personal saving predominantly. Joint Ventures can either form a lump sum or the design and build structure. It is predominantly used by the public sector. Predominantly it is the lump sum form that is used for large projects. Technically under this system, independent designers will be used to produce detailed designs, but often the contractors will produce working drawings for the project. In this arrangement, theoretically all parties can have an equal share in the project, but in practice there is always one company which has slightly higher shares in the project and will be the lead in the JV project: the main contractor of the JV. This company will take most of the responsibility for the project, and the main source of contact for the client. Construction Management is not used in Japan.

8	Dominant Japanese procurement systems include the lump sum design, tender, construct system and the Design and Build system. Management contracting and Construction Management not used in Japan because we have a standard design so there is no benefit. We know how long and how much future projects will cost. In future projects we let our contractors know that we will want the project delivered in X time, and it must not cost more than X yen. Each new project has been built quicker and cheaper, until a point is reached when an optimum combination is reached.
9	Lump sum contracts are used by both the public and private sector, predominantly the public, due to its accountability, and competitiveness. Design and Build is mostly used by the private sector; Commercial. Its traditionally used for building works in this sector. The Joint Venture system of procurement in Japan can be either on a Lump sum basis or on a Design and Build basis. In the public sector it is usually on a Lump sum basis and in the private its on a D&B basis. This system is used most in the public sector by local authorities, were the lump sum approach is taken. It is used in the private sector for large complete projects. The project can be i) consolidated; where each contractor takes equal risk, and profits and ii) Unconsolidated, where the project is divided up and each contractor is responsible for their own part. The sponsor company, the contractor with the largest % share of the project, will form a joint venture company who enter into a formal relationship with the client. The company with the largest share usually adopts its own companies style of management and working practices for the JV project. Its generally uncommon to have a 50-50% joint venture project. Bill of Quantities contract is generally unknown in the private sector, and rarely used in the public sector. It may be used in situation where a natural disaster has occurred and the extent and nature of work is unknown, or emergency works. Contractors agree with the local authority the rate for each item of work, and then measure the works when carried out. One of the greatest problems with these contracts is that a budget for the works cannot be established at the onset of the project. This is one of the important issues for both private and public clients. Time is taken in detailed pre planning of projects, and this usually involves setting up a detailed and fixed budget for a project. This process itself takes a long time due to the amount of committees which must agree to it. Once it has been set, it should be maintained. Generally there is little refurbishment work in Japan (known as Renewal work). Buildings are relatively new in Japan, and clients tend to want new buildings. This system places far more risk on the client in terms of both time and cost than any other system being used. At present there are no 'Management' procurement systems in Japan, but there is pressure from the Americans to introduce CM and MC, but the systems are not developed yet. Construction Management does not operate in Japan due to; i) regulation issues ii) the clients don't like this approach as they will be taking more risk on the project costs and time. Consequently they cannot properly define the project budget which is of importance to them at the start of a project. Unless clients change their minds, or improve their cost management systems this system will not really operate in Japan. iii) dealing directly with sub contractors can be a problem as they have not really learnt/established to work by themselves, unless they are well established and large. Generally sub contractors tend to work under a main contractors management and coordination. They rely on the main contractor to provide many facilities, like attendances etc. They tend to rely heavily on their parent companies.

10	In lump sum contracts, great importance is given to completing to budget and to a completion date. In the initial stage of a project when a contractor submits a tender for a project, the lump sum final costs of the building are roughly indicated. Cost indicators are used to establish these figures base on Yen /Sqm classified for the building type/usage. General contractors have a good in house database of construction cost information for project tendering. At this stage of the project there is no use made of the Bill of Quantities. Once a tender has been accepted, then a Bill of Quantities is produced on the basis of the contract drawings, which are usually not detailed enough to produce the Bill of Quantities, so in house QS's or estimators will make the necessary assumptions to fully price the project. The drawings are not detailed enough to produce detailed estimates. In the progress of the project, site managers in charge of cost control, estimate the expected costs of the works. At this point, details are determined so accurate costs may be established. This is often determined by the mode of subcontracting used, as there is no need for a general contractor to quantify all items in a subcontractors package, if the subcontractor gives a lump sum price. If the contractor is executing the works then he is required to produce a pricing breakdown. If the subcontractor is providing labour only, then the general contractor is required to quantify the materials required, and also the payment that must be paid to the subcontractors.

Table A3(i): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE LOTS SEPARES PROCUREMENT SYSTEM IN FRANCE

FRANCE 1																			
Relationship to PSM Elements		1'	2,5,6,12	3(i), 11 (i)	3(ii), 11(ii)	3(iii), 11(iii)	11 (i, ii, iii)	7(i)	7(ii)	7(iii)	4(ii)	5'	4(i)	9	10	13	14'	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
2	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
3	1	2	3	1	1	2	1	1	1	1	2	2	1	8	5	8	2	1	1
4	4	2	12	1	4	4	3	1	1	1	2	2	1	4	3	12	2	1	1
5	1	7	7	1	4	4	3	1	1	3	2	2	1	8	5	8	2	1	1
6	4	7	7	1	1	4	3	1	3	6	2	2	1	8	5	8	2	1	1
7	4	7	7	1	4	4	3	1	1	3	2	2	1	8	5	12	2	1	1
8	5	2	15	1	4	4	3	1	1	6	2	2	1	8	5	8	2	1	1
9	5	2	15	1	1	4	3	1	1	3	2	2	1	4	5	6	2	1	1
10	5	2	3	1	1	4	3	1	1	1	2	2	1	8	1	8	2	1	1
11	5	2	5	1	1	2	3	1	3	1	2	2	1	8	1	8	2	1	1
12	2	7	7	1	1	4	3	1	3	1	2	2	1	8	5	12	2	1	1
13	2	7	7	1	1	4	3	1	1	3	2	2	1	8	5	8	2	1	1
14	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
15	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18	4	7	7	1	1	1	3	1	3	3	2	2	1	8	1	8	2	1	1
19	4	7	7	1	1	1	3	1	3	3	2	2	1	8	1	8	2	1	1
20	4	7	7	1	1	1	3	1	3	3	2	2	1	8	1	8	2	1	1
21	4	7	7	1	1	4	3	1	3	3	2	2	1	8	1	8	2	1	1
22	5	7	7	1	1	4	3	1	3	3	2	2	1	8	1	8	2	1	1
23	4	7	7	1	1	4	3	1	3	3	2	2	1	8	1	8	2	1	1
Summary of Predominant responses		**7**	**7**	**1**	**1**	**4**	**3**	**1**	**1/3**	**3**	**2**	**2**	**1**	**8**	**1/5**	**8**	**2**	**1**	**1**

Table A3(ii): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE ENTERPRISE GENERAL PROCUREMENT SYSTEM IN FRANCE

FRANCE 2																				
Relationship to PSM Elements		1'	2,5,6,12	3(i), 11(i)	3(ii), 11(ii)	3 (iii), 11(iii)	11(i, ii, iii)	7(i)	7(ii)	7(iii)	4(ii)	5'	4(i)	9	10	13	14'	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
2	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	3	6	2	*	1
4	4	7	7	1	2	2	4	1	6	6	2	1	2	4	3	6	2	*	1
5	1	7	7	1	4	4	7	1	1	3	2	1	2	4	5	8	2	*	1
6	4	7	7	1	4	4	3	1	1	3	2	1	2	4	5	8	2	*	1
7	4	7	7	1	4	4	7	1	1	3	2	1	2	4	5	8	2	*	1
8	5	2	15	1	4	4	3	1	1	3	2	1	2	4	6	8	2	*	1
9	5	2	15	1	4	4	7	1	1	3	2	1	2	4	6	8	2	*	1
10	5	1	1	1	1	4	3	1	1	3	2	1	2	4	3	8	2	*	1
11	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12	2	2	15	1	2	2	3	1	1	3	2	1	2	4	3	8	2	*	1
13	2	2	15	1	1	2	3	1	1	1	2	1	2	4	3	8	2	*	1
14	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
15	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18	4	9	10	1	1	4	3	1	1	3	2	1	2	4	3	8	2	*	1
19	4	9	10	1	1	4	3	1	1	3	2	1	2	4	3	8	2	*	1
20	4	9	10	1	1	4	3	1	1	3	2	1	2	4	3	8	2	*	1
21	4	9	10	1	1	4	3	1	1	3	2	1	2	4	3	8	2	*	1
22	5	9	10	1	1	4	3	1	1	1	2	1	2	4	3	8	2	*	1
23	4	9	10	1	1	4	3	1	1	1	2	1	2	4	3	8	2	*	1
summary of predominant responses		7/9	10	1	1	4	3	1	1	3	2	1	2	4	3	8	2		1

Table A3(iii): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE GROUPEMENT SOLIDAIRES PROCUREMENT SYSTEM IN FRANCE

FRANCE 3																			
Relationaship to PSM Elements		1	2,5,6,12	3(i), 11(i)	3(ii), 11(ii)	(iii), 11(iii)	11(i, ii, iii)'	7(i)	7(ii)	7(iii)	4(ii)	5'	4(i)	9	10	13	14'	8(i)'	8(ii)
Question		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
2	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
3	1	1	1	1	1	4	3	1	1	1	2	1	1	4	3	6	2	1	8
4	4	7	7	1	2	2	4	1	1	1	2	1	2	4	3	8	2		1
5	1	2	15	1	1	4	3	1	1	1	2	1	1	4	3	8	2	1	8
6	4	2	15	1	1	4	3	1	3	3	2	1	1	4	3	8	2	1	8
7	4	2	15	1	1	4	3	1	1	1	2	1	1	4	3	6	2	1	8
8	5	7	7	1	1	4	7	1	1	1	2	1	2	4	3	12	2	*	8
9	5	7	7	1	1	4	7	1	3	3	2	1	2	4	5	12	2	*	1
10	5	2	3	1	1	4	3	1	1	3	2	1	1	4	5	12	2	1	8
11	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12	2	7	7	1	1	2	3	1	3	3	2	1	2	4	5	8	2	*	8
13	2	7	7	1	4	2	3	1	1	1	2	1	1	4	3	8	2	1	8
14	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
15	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18	4	7	7	1	1	4	3	1	3	3	2	1	1	4	5	8	2	1	8
19	4	7	7	1	1	4	3	1	3	3	2	1	1	4	5	8	2	1	8
20	4	7	7	1	1	4	3	1	3	3	2	1	1	4	5	8	2	1	8
21	4	7	7	1	1	4	3	1	3	3	2	1	1	4	3	8	2	1	8
22	5	7	7	1	1	4	3	1	3	3	2	1	1	4	3	12	2	1	8
23	4	7	7	1	1	4	3	1	3	3	2	1	1	4	3	12	2	1	8
Summary of predominant responses		7	7	1	1	4	3	1	1/3	3/1	2	1	1	4	5/3	8/12	2	1	8

Table A3(iv): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE GROUPEMENT CONJOINTS PROCUREMENT SYSTEM IN FRANCE

FRANCE 4																			
Relationship to PSM Elements		1	2,5,6,12	3(i), 11(i)	3(ii), 11(ii)	3(iii), 11(iii)	11(i, ii, iii)	7(i)	7(ii)	7(iii)	4(ii)	5'	4(i)	9	10	13	14'	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
2	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
3	1	1	1	1	1	4	1	1	1	1	2	1	2	6	5	8	2	*	1
4	4	7	7	1	2	2	4	1	1	1	2	1	1	6	1	8	2	1	1
5	1	2	15	1	1	4	3	1	1	1	2	1	1	6	1	8	2	1	1
6	4	2	15	1	1	4	3	1	1	6	2	1	2	9	1	8	2	*	1
7	4	2	7	1	2	4	4	1	1	6	2	1	1	9	1	3	2	1	1
8	5	7	7	1	1	4	3	1	3	3	2	1	1	6	1	12	2	1	1
9	5	7	7	1	1	4	3	1	3	3	2	1	1	6	3	12	2	1	1
10	5	2	3	1	1	4	3	1	1	1	2	1	2	6	1	8	2	*	1
11	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12	2	2	7	1	1	2	3	1	1	1	2	1	1	6	1	8	2	1	1
13	2	7	7	1	1	2	3	1	3	1	2	1	1	6	3	9	2	1	1
14	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
15	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18	4	7	10	1	1	4	3	1	3	3	2	1	1	6	1	8	2	1	1
19	4	7	10	1	1	4	3	1	3	3	2	1	1	6	1	8	2	1	1
20	4	7	10	1	1	4	3	1	3	3	2	1	1	6	1	8	2	1	1
21	4	7	10	1	1	1	3	1	3	3	2	1	1	6	1	8	2	1	1
22	5	7	10	1	1	4	3	1	3	3	2	1	1	6	1	8	2	1	1
23	4	7	10	1	1	4	3	1	3	3	2	1	1	6	1	8	2	1	1
Summary of Predominant responses		**7**	**10**	**1**	**1**	**4**	**3**	**1**	**3**	**3**	**2**	**1**	**1**	**6**	**1**	**8**	**2**	**1**	**1**

Interview Number	France Interviews Name and Company
1	Mr Stephen Pearson, South Bank University
2	Mr L Willmott, Willmott Lewis Architects France
3	Ms Helene Chavet, CSTB Research Institute
4	Mr Phil Corbett, Gleeds, Paris
5	Ms Rebeca Newman, Architect Richard & Newman, Paris
6	Mr Jean-Luc Salagnac (Project Manager), CSTB Research Institute
7	Mr J P Pajon, Gleeds, Paris
8	Mr P J Braithwaite, Cyril Sweet, Economiste

Interview	Table A3: France Verification of Procurement Systems Models
1	In the **lots separes** system, the client takes on risk in terms of no fixed final project cost, and also the risk of default by individual contractors and covering the cost of replacement contractors, however the contractor gives the client a fixed price for his package.
2	Lots Separes system is the most widely used system in France. Its used both in the public and private sector, and is the most traditional system used. However different systems are preferred in different regions around France, by different categories of clients, and on different projects. It is considered to be similar to the construction management system in the UK in terms of its overall structure, but when a closer analysis is made the system has various unique features. The detailed design of the proposed building is most usually done before the trade contractors are asked to tender for individual work packages. The contractors may be asked to produce some working drawings, but the majority of the work is done before tender stage. The new public work contract (1994) indicates that the role of the architect under this system is to create detailed and concept design, but the contractors will be involved in producing working drawings. The contract goes on to suggest that the detailed design work for the project must be done before the project is sent out to tender. Although this system has the ability to be a fast track system, it not often used in this way. The generai way the system operates is to have the majority of detailed design work done before tender, with contractors just modifying designs, to produce working drawings. The major reason why this system is the most used in both the public and private sector is because it is consider to offer the client "best value for money". The ideology behind this system is that if the client is letting packages out to trade contractors he is benefitting from their price competition, and he is able to select the most suitable for the job. Also because working drawings are produced by the contractor there is an element of buildability in the system.
3	Our systems have been evolved through tradition and through our cultural differences from other nations. The most widely used system is The Lots Separes approach - and this is more to do with our culture and organisational structure of the industry than anything else. I do believe that things will change in our industry. Although The Lots Separes system may resemble construction management in its overall organisational structure, when considered in more detail it does not. There are various unique characteristics of this system. The Enterprise General and Groupement systems are also widely used. In Enterprise General the contractor can also be involved in the production of detailed designs along with the BET, although they will usually more involved in producing working drawings on site. This system provides a single point of responsibility for the whole project - ie. construction. The risk of time and cost and quality of workmanship are passed to the general contractor. Groupement des Entreprises Solidaires (Jointly Liable) is used for predominantly large projects. This system is considered to have greater risks attached to it for the client than other arrangements. Under this arrangement there is one contract between the group and the client. However if one of the members of the groupement fails or defaults on their work package, the group will agree to take on this liability and complete that package for the same cost and within the same time frame. There are therefore some form of linkage between the members of the groupement to accept the liability, should one of its members fail. One contractor will take on the role of the mandataire, and will be the spokesperson for the remainder of the group. Groupement des Entreprises Conjoints where a group of contractors come together to carry out a project - The structure is very similar to the Lots Separes system, in that each of the contractors in the groupement do not accept liability for one another, even though they are working together for this project.

4	The predominant system of procurement is the Lots Separes; which are broadly categorised as architectural packages and technical packages. Lots Separes systems has been suggested to be similar to construction management, which does not offer clients cost certainty before the projects start on site. However, the key difference with the Lots system is that at tender stage the majority of the package s are let at a fixed lump sum price before construction has commenced. If however speed is of crucial importance, then the packages are let at stages throughout the construction period, so cost certainty for the client is reduced. The Lots Separes system has evolved and works in French industry. It has to answered to the needs of clients who use the system. If it did not offer clients what they want it would not be used. In the traditional method of French procurement the time risk is built into the contract, the contractors know of the construction programme (planne) and are aware that they must complete their work in a certain time, and iff they don't there are penalties attached. If the pilote has a good programme, and the works are being delayed, he can see who's fault it is, and take appropriate action. The pilote will be engaged for certain period, within which the project must be completed, so he also takes some of the risk, if the delay is within his control. There is no contract between the lots on the project , so if one contractor defaults, no other contractor will bear responsibility for that contractors work. However, on all projects there is a document which defines areas of "interface", between the separate packages, so all parties are aware of what other parties are carrying out. If one of the contractors does default, it is the responsibility of the pilote or architect to replace that package. However what often occurs, is that an existing contractor who has the skill for the package will take on the lot, but upon new terms and conditions. Enterprise Generate is also a well used system in France . This tends to be used on either small projects or complex, specialist projects. The key issues are single point of responsibility, and firm price, and an experienced contractor in this particular field of construction. On large commercial projects you tend to use the lots separes system, as its more competitive and is generally a quicker method of construction.
5	The majority of construction projects we have been involved with use The Lots Separes system. Clients tend to prefer this system. It is the traditional french method of building procurement and has evolved within the industry. This system is particularly beneficial for architects because it allows great flexibility in terms of design for projects which are design/quality led, this system works very well. It is beneficial for clients as they get the best trade contractor for each package of work, maintaining quality. Additionally, it allows the designer to produce a building which meets the requirements set down by clients, and allows more flexibility for designers. Architects tend to be more comfortable with this system, because they are allowed the freedom to design, more so than in The Enterprise General system. Under this arrangement the architect is given greater control through the design and construction process. Approximately 90% (including nearly all of the most expensive packages) will be let before any construction starts on site and by letting these packages at this stage, the client is given a relatively high degree of overall cost certainty. Each package is let on a fixed price. This process effectively reduces the risk the client is placed under - the risk is calculated - and attempt to be minimised. This arrangement allows quality and design issues to effectively be maximised. Enterprise Generate is also extensively used in France, and has been for sometime. This system is commonly used by developers and clients who want a simple/or relatively standard designed building. Where design of the project is a very key consideration, this system is not preferred.

6	The most widely used system is The Lots Separes approach - and this is more to do with our culture and organisational structure of the industry than anything else. Other dominant systems include Enterprise General and Groupement systems. The Enterprise General is often involved in the production of detailed designs along with the BET, although they will usually more involved in producing working drawings on site. This system provides a single point of responsibility for the whole project - ie. construction. The risk of time and cost and quality of workmanship are passed to the general contractor. Groupement des Entreprises Solidaires (Jointly Liable) is predominantly used for large projects. Under this system if one of the members of the groupement fails or defaults on their work package, the group will agree to take on this liability and complete that package for the same cost and within the same time frame. There are therefore some form of linkage between the members of the groupement to accept the liability, should one of its members fail. One contractor will take on the role of the mandataire, and will be the spokesperson for the remainder of the group. Groupement des Entreprises Conjoints where a group of contractors come together to carry out a project - The structure is very similar to the Lots Separes system, in that each of the contractors in the groupement do not accept liability for one another, even though they are working together for this project.
7	The Lots system is widely used in the public sector and certainty of cost is provided by the majority of works packages being evaluated and let on a lump sum basis before you start work on site. This is the case for 90% of projects - however where a "fast track" project is requested - then such certainty cannot be delivered - but this applies to smaller or medium sized projects. However what is provided is a "reference budget" which sets cost limits for the project -this will be global figure, rather than an amount for individual trade packages. Once Lots contractors are selected, each contractor agrees a firm lump sum price for their work. This system therefore does not always operate on a fast track basis. Indeed, where cost certainly is required its only when all/majority of tender packages are let that work begins on site. However, this system can be fast track, at the expense of providing cost certainty. The main philosophy behind the system is to get the best contractors for each separate package, maintaining a high quality project. Also you involve the person who will build the project in the design process.In the Groupement arrangements the solidaires system is the most widely variety of this system to be used; under this arrangement the contractors are liable for one another's work, should on of the contractors default. The remaining contractors have certain responsibilities vis a vis the client;guaranteeing the original price and time the package was to be completed within. The solidaries system will have contractors between themselves:- The terms and conditions of this contract denote that if one of the contractors defaults, the remaining would guarantee the price and contract period. This is for the benefit of the client, providing greater security. As a consequence each contractor will have to price for this additional risk. This system is predominantly used on large projects, which no single contractor can perform. Its particularly used in the public sector.

8	The dominant procurement system in France is the Lots Separes system. The Lots system provides high quality construction projects. In the majority of projects using this system the lots are all sent out to tender at the same time, before construction starts on site, so giving the client cost certainty. It is only a few projects that the fast track characteristics of this system are used; resulting in reduced cost certainty. In the Entreprise Generale system the client has a single point of responsibility for the whole construction of the project. The risk of time and cost are firmly placed with the contractor. This is also a very popular procurement system in France along with the Lots system. With the increased amount of foreign investors in France, they are usually familiar with this general contracting approach and are more likely to use this system than the lots approach, which gives them a better quality project. Groupement des Enterprises Solidaires (jointly and severally liable) is frequently used and is where the contactors will have a agreement with one another which states that if one contractor defaults, the rest of the groupement will carry out and complete the project to the original cost and original time frame. The groupement acts as a single uniform body so will give relative certainty for cost timing of the project. Although the groupement contractors will have a formal arrangement between themselves to delegate responsibility the client will only enter into one contract with the groupement itself - rather than with individual contractors. This type of procurement route is particularly used for major building and civil engineering projects, which no single contractor could carry out, for financial or logistic reasons. Groupement des Enterprises Conjoints (jointly with) is very similar to the lots separes system, without the same amount of administration work. The conjoints system will group the trades and a contractor is taken in the groupement to carry out a category of work, which may involve several trades. Each individual contractor becomes responsible for their own section of work only - the typical structure will be one contractor for the structural works, another for the M & E works, and another for the finishing trades etc. There is generally no/little conferring between the contractors of the groupement to agree to a project cost and time programme. They effectively get on with their own works. There are far fewer contractors operating within the groupement, than compared with the lots system. The general distribution of risk under this system are similar to the lots system, but it cuts down on the number of contractors, administration and also increases programming between the works. The client is attempting to get the best of both worlds under this structure - ie having a single point of responsibility, but maintaining high quality workmanship. The client enters into individual contracts with the members of the groupement.

Table A4 (i): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE ITEM RATE CONTRACT IN INDIA

INDIA 1																			
Relationship to PSM Elements		1	2,5,6,12	3(i), 11(i)	3(ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	1	1	1	1	1	2	3	1	1	6	2	1	2	6	5	8	2	*	1
2	1	1	1	1	1	2	3	1	1	6	2	1	2	6	5	8	2	*	1
3	1	1	1	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
4	1	1	1	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
5	1	1	1	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
6	1	1	1	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
7	2	1	1	1	1	4	6	1	1	1	2	1	2	1	1	8	2	*	1
8	2	1	1	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
9	2	1	1	1	1	2	3	1	1	1	2	1	2	4	5	8	2	*	1
10	3	1	1	1	1	2	3	1	1	1	2	1	2	8	5	8	2	*	1
11	3	1	1	1	1	2	3	1	1	1	2	1	2	8	5	8	2	*	1
12	4	1	1	1	1	2	3	1	1	1	2	1	2	8	5	8	2	*	1
13	4	1	1	1	1	2	3	1	1	1	2	1	2	8	5	8	2	*	1
14	4	1	1	1	1	2	3	1	1	6	2	1	2	8	5	8	2	*	1
15	4	1	1	1	1	2	3	1	1	1	2	1	2	4	1	8	2	*	1
16	4	1	1	1	1	2	3	1	1	1	2	1	2	8	5	8	2	*	1
17	4	1	1	1	1	2	6	1	1	1	2	1	2	8	5	8	2	*	1
18	3	1	1	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
19	3	1	1	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
20	5	1	1	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
21	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
22	5	1	1	1	1	2	3	1	1	1	2	1	2	6	5	9	2	*	1
23	5	1	1	1	1	2	3	1	1	1	2	1	2	8	5	8	2	*	1
24	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
25	5	1	1	1	1	2	3	1	1	1	2	1	2	6	1	8	2	*	1
26	5	1	1	1	1	2	6	1	1	1	2	1	2	4	5	8	2	*	1
27	5	1	1	1	1	2	3	1	1	3	2	1	2	6	3	8	2	*	1
Summary of Predominant responses		1	1	1	1	2	3	1	1	1	2	1	2	6/8	,5	8	2		1

Table A4(ii): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE ITEM RATE (COST PLUS) PROCUREMENT SYSTEM IN INDIA

INDIA 2																			
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	1	2	8	1	1	2	3	1	1	6	2	1	2	6	5	8	2	*	1
2	1	2	8	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
3	1	2	8	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
4	1	2	8	1	1	2	3	1	1	1	2	1	2	6	5	10	2	*	1
5	1	2	8	1	1	2	3	1	1	1	2	1	2	6	5	10	2	*	1
6	1	2	8	1	1	2	3	1	1	1	2	1	2	6	5	10	2	*	1
7	2	2	8	1	1	2	3	1	1	1	2	1	2	1	1	8	2	*	1
8	2	2	8	1	1	2	3	1	1	1	2	1	2	1	1	8	2	*	1
9	2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10	3	2	8	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
11	3	2	8	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
12	4	2	8	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
13	4	2	8	1	1	2	3	1	1	6	2	1	2	6	5	8	2	*	1
14	4	2	8	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
15	4	2	8	1	1	2	3	1	1	1	2	1	2	4	3	8	2	*	1
16	4	2	8	1	1	2	3	1	1	1	2	1	2	4	3	8	2	*	1
17	4	1	1	1	1	2	3	1	1	1	2	1	2	4	3	8	2	*	1
18	3	2	8	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
19	3	2	8	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
20	5	2	8	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
21	5	2	8	1	1	2	3	1	1	1	2	1	2	6	5	8	2	*	1
22	5	1	1	1	1	2	3	1	1	1	2	1	2	4	3	8	2	*	1
23	5	1	1	1	1	2	3	1	1	1	2	1	2	4	3	8	2	*	1
24	5	2	8	1	1	2	3	1	1	1	2	1	2	4	1	8	2	*	1
25	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
26	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
27	5	2	8	1	1	2	3	1	1	6	2	1	2	4	3	8	2	*	1
Summary of Predominant responses		**1/2**	**8**	**1**	**1**	**2**	**3**	**1**	**1**	**1**	**2**	**1**	**2**	**4/6**	**3/5**	**8**	**2**		**1**

Table A4(iii): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE DESIGN AND BUILD PROCUREMENT SYSTEM IN INDIA

INDIA 3																			
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	1	2	8	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
2	1	2	8	2	2	2	4	6	6	6	2	1	2	4	3	1	2	*	1
3	1	2	8	2	2	2	4	6	6	6	2	1	2	4	3	1	2	*	1
4	1	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
5	1	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
6	1	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
7	2	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
8	2	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
9	2	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
10	3	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
11	3	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
12	4	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
13	4	2	8	2	2	2	4	6	6	6	2	1	2	4	3	6	2	*	1
14	4	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
15	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16	4	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
17	4	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
18	3	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
19	3	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
20	5	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
21	5	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
22	5	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
23	5	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
24	5	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
25	5	1	1	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
26	5	2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
27	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Summary of Predominant responces		2	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2		1

Table A4(iv): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE PRICE WORK PROCUREMENT SYSTEM IN INDIA

INDIA 4																				
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
2	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
3	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
4	1	3	8	1	1	2	3	1	1	1	2	2	1	1	1	9	2	*	1
5	1	3	8	1	1	2	3	1	1	1	2	2	1	1	1	9	2	*	1
6	1	3	8	1	1	2	3	1	1	1	2	2	1	1	1	9	2	*	1
7	2	3	8	1	1	2	3	1	1	1	2	2	1	1	1	9	2	*	1
8	2	3	8	1	1	2	3	1	1	1	2	2	1	1	1	9	2	*	1
9	2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10	3	3	8	1	1	2	6	1	1	1	2	2	1	1	1	9	2	*	1
11	3	3	8	1	1	2	6	1	1	1	2	2	1	1	1	9	2	*	1
12	4	3	8	1	1	2	6	1	1	1	2	2	1	1	1	9	2	*	1
13	4	3	8	1	1	2	6	1	1	1	2	2	1	1	1	9	2	*	1
14	4	3	8	1	1	2	6	1	1	1	2	2	1	1	1	9	2	*	1
15	4	3	8	1	1	2	6	1	1	1	2	2	1	1	1	9	2	*	1
16	4	3	8	1	1	2	6	1	1	1	2	2	1	1	1	9	2	*	1
17	4	2	8	1	1	2	6	1	1	1	2	2	1	1	1	9	2	*	1
18	3	3	8	1	1	2	6	1	1	1	2	2	1	1	1	9	2	*	1
19	3	3	8	1	1	2	6	1	1	1	2	2	1	1	1	9	2	*	1
20	5	3	8	1	1	2	6	1	1	1	2	2	1	1	1	9	2	*	1
21	5	3	8	1	1	2	3	1	1	1	2	2	1	1	1	9	2	*	1
22	5	3	8	1	1	2	3	1	1	1	2	2	1	1	1	9	2	*	1
23	5	3	8	1	1	2	3	1	1	1	2	2	1	1	1	9	2	*	1
24	5	3	8	1	1	2	3	1	1	1	2	2	1	1	1	9	2	*	1
25	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
26	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
27	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Summary of Predominant responces		3	8	1	1	2	6	1	1	1	2	2	1	1	1	9	2		1

Interview Number	India Interviews Name and Company
1	Mr Arun Singh (Masons Solicitors), London
2	Mr Rao (Nicmar), Bombay.
3	Mr T S Kashyap (Management Consultant) Bangalore
4	Mr T Srikanth Bhagarat (Financier) Bangalore
5	Mr Shimms Jagislam (Management Consultant), Bangalore
6	Mr M Romonias (Client), Bangalore
7	Mr Nainesh Jaisingh (ANZ Bank), Bangalore
8	Mr R Vishwanathan (Client), Bombay
9	Mr A Nagabushana Rau (Nicmar), Bangalore
10	Mr K V Harsha Babu (Architect), Bangalore
11	Mr M S Ramaswany (Engineer), Bangalore
12	Mr M K Vishwanath (Nicmar), Bombay
13	Mr Kulkami (Nicmar and MBAI), Bombay
14	Mr Choudhury (Contractor) and MBAI), Bombay
15	Mr Abhjit Tanna (Contractor & MBAI), Bombay
16	Mr Beji E Billimoria (Contractor & MBAI), Bombay

Interview	Table A4: India Verification of Procurement Systems Models
1	Lump Sum (Design, Construct, Tender) D & B, BOT, BOO, - used for infrastructure projects
2	Dominant Procurement Systems include; 1. The Lump Sum Sequential (as in UK) is known in India and is used for specific projects such as bridges, cooling towers and other such small projects. It is not often used on building work as other systems are more traditional (used approximately 0-5% - specialist projects). 2.Item Rate Contract: the client produces the drawings, specifications and tender documents (through the architect) which the tendering contractors will price. Each contractor will fill in the 'rates' column in the bill; the rates which they enter into the bill are fixed. The final bill total is not fixed. The cheapest tender is often chosen to carry out the works. Once the project is completed, the job is remeasured and priced in accordance to the bill rates and the final account is reached.This system is often used in the private sector and is predominantly used in the public sector because the contractor expressly presents all the rates for items of work in the tender documents. 3. Design and Build: Turnkey Contracting: where a client produces a brief or performance specification and the contractor will produce all designs and construct the project for a fixed price. This system is predominantly used in civil's and infrastructure projects, but is also being used in the building sector. 4. Cost Plus Contracts; used in the public sector. The government will produce a bill of costs for a project based on standard designs and the contractor is asked to price. These rate with a percentage above or below these rates. 5. The piece work contract This is the most traditional system known in India - for primarily residential work and for small building projects. The client will select and coordinate labour only specialist subcontractors to carry out the works. In this system the client will appoint a designer to design the building in detail. The client will provide all/most of the materials and will employ sub-contractors to carry out the works. The client appoints various contractors at stages throughout the project to carry out specific work items:- foundations, groundworks, drainage, brickwork, blockwork, carpentry, roofing, plastering etc. The client also takes the coordinating and planning work, often with advice from the designer. This system predominates as it allows great flexibility in the projects allowing late design changes. Additionally, as the client supplies all materials and deals directly with sub-contractors, it is considered that he is getting a 'cheaper' project as no main contractors profits are involved. (This system is used 90% of the time in the private sector for residential and small building projects eg hotels, shops, offices).
3	Item Rate, piecework and Design and Build.
4	Item Rate and Design and Build.
5	-
6	-
7	Item Rate, piece work and Design and Build.
8	-

9	Item Rate, Cost Plus % and Lump Sum (Public). The private sector systems include i) The Item Rate Contract - similar to the public sector. ii) Lump sum contracts are beginning to be used but what is a very common problem here is late design changes. This is a very common problem. If you don't like what the architect has designed, once you get on site you change it. It's a very common problem. iii) Design and Build - This tends to be used for residential complexes/apartment buildings and some commercial buildings. Generally the system works under a turnkey approach ie designs are all done by the contractor or by architects who are employed by the contractor. In the private sector these types of development are done by Estate developers or land owners who see a demand for a particular form of building and then attempt to fulfil that demand. iv) Piece Work Contract - This is the traditional way to obtain your own home in rural areas - you will employ individual trade contractors and the client takes the co-ordination role with the housewife taking a primary role. Generally there is little co-ordination between the various parties; the client, the architect, the engineer, the contractor. They don't tend to come together to discuss project aims and objectives. Each individual tends to have his own idea of what is wanted!
10	Dominant Procurement Systems in the Public Sector include i)The Item Rate Contract:- contractor required to fill in each item rate which is then fixed. ii) Cost plus percentage contracts (on a pre-priced Bill) contractor will put a +/- percentage against each pre-priced rate in the bill which are then fixed. The rates are established from government departments. Private Sector Procurement Systems include i) Item Rate contract: most widely used system and is used between 60-70% of the time. ii) Design and Build (Turnkey): The client appoints a contractor who will usually employ an architect to carry out all the design work and then the contractor will build the works. Larger more sophisticated contractors do have their own in-house departments. This system is still picking up in the private sector. iii) Piece work contracts: This is the most traditional arrangement for residential and small building works and is still predominantly used in rural areas. The client provides materials and will coordinate all of the various labour only sub-contractors on the project. This system is operated within a very loose structure - usually there are no formal contracts with work being carried out on mutual trust basis and verbal arrangements. If defective work is done; either the client will reduce the rate for the work or he will simply not pay the contractor and ask him to re-do the work; or he will reappoint a new contractor. That's the way the system works! The concept of the client who uses this form of system is that consultants and main contractors are expensive so instead of appointing numerous consultants and a main contractor. The client effectively takes on the role and gets the job done himself. It is considered to be a cheap method of acquiring buildings.
11	Lump sum, Item Rate, Cost Plus % in Public Sector. Item Rate, D & B Piecework in Private Sector.
12	The Private Sector Procurement Systems include (i) The Item Rate Contract - similar to the public sector. (ii) Lump sum contracts are beginning to be used but what is a very common problem here is late design changes. This is a very common problem. If you can't like what the architect has designed, once you get on site you change it. It's a very common problem. - The item rate contract tends to accommodate late design changes. The general problems of the industry are about adequate planning and co-ordination of the works. Contractors often demand increases in item rates due to inflation of material costs and clients tend to pay due to the threat of the contractor walking off site or suspending the works. This is the mentality/culture here. At present demand for exceeds supply in construction so the contract has quite a lot of power but they also realise that there would be no work without the clients! (iii) Design and Build - This tends to be used for residential complexes/apartment buildings and some commercial buildings. Generally the system works under a turnkey approach ie designs are all done by the contractor or by architects who are employed by the contractor. In the private sector these types of development are done by Estate developers or land owners who see a demand for a particular form of building and then attempt to fulfil that demand. (iv) Piece Work Contract - This is the traditional way to obtain your own home in rural areas - you will employ individual trade contractors and the client takes the co-ordination role with the housewife taking a primary role.

13	The public sector systems include 1.**Item Rate Contract** A Bill of Quantities is produced by the appropriate works department with all of the items of work described. The quantities of each item are only approximates and are not fixed. Tendering contractors are required to give a fixed rate for each item of work in the Bill of Quantities. The total value/cost of the Bill of Quantities is not fixed as the quantities are only approximates and not certain. 2.**Cost plus Percentage Contracts** A Bill of Quantities is produced by the government department which contains both quantities and prices for each item of work. The rates are established by the government department as the prevailing rates for each item of work. Again the quantity is not fixed. Each tendering contractor is now required to give a percentage above or below each of the item rates in the pre-priced Bill of Quantities. This allows rates to be compared between competing contractors. Once a contractor is selected, the percentage quoted are fixed throughout the duration of the contract. The private sector systems include 1. Item Rate Contractor 2. Design and Build (Turnkey Projects). These are generally for infrastructure projects and some building projects such as housing complexes. 3. Piece work contract/labour contract. The client will supply all materials, designs are carried out by an independent design consultant and labour only subcontractors are employed to carry out various sections of the works; concreting, shuttering, excavations, masonry, carpentry, reinforcements, etc This system is generally used for housing projects and is a traditional system.
14	In the public sector the main procurement system is the Lump Sum & Item Rate Contract, but this has two forms: B_1 and B_2. **Item Rate Contract** B_1 Tender documents are produced including a Bill of Quantities (Approximate) the contractor then enter into the bill fixed rates for each item of work, at the end of the project the work is remeasured and the contractor is paid according to each rate he has quoted in his tender. **Pre-priced Item Rate Percentage Contract** B_2 The government department will produce a full Bill of Quantities for the works, including quantities (approximately) and rates. The tendering contractors then will put a percentage below or above each item rate in the bill. These percentages are then fixed and the best (cheapest contractors gets the job). At the end of the project the work is remeasured in accordance with the % above or below the government quoted rates for each item of work. Lump Sum contracts are only given when the detailed final designs are completed before tender stage and the client is guaranteed not to make any changes. There are very few instances where this is the situation, so it is not often used. The item rate system is more flexible and suitable to our industry. Additionally contractors are not competent and technically experienced enough to quote on lump sum contracts - the item rate contract is easier for them. They have less risk and this system is faster. Private Sector Procurement Options include 1. Item Rate Contracts. 2. Design and Build (Package Deal/Turnkey/Contractors own design). In this system the contractor will produce concept, detailed and often specialist designs and be involved with building the structure. An architect or engineer will be appointed by the client to take on the overall coordination role and also to assist the client in tender document preparation and tender evaluation as well as post contract administration. Theoretically this system seems ideal to clients as risks are predominantly shifted to the contractor. However the major problem facing Indian clients is the evaluation of tenders both designs and costs. Emphasis is placed on the clients technical and financial capability to judge the merits/downfalls of each tender submitted so a relatively "sophisticated" client is required to chose the best suited tender. Experienced clients will appoint consultants (architect/engineer) to assist with this process. 3. Piece Work Contract This is predominantly used for residential developments. It is considered to be the most 'traditional' way of acquiring a 'house' in India. Additionally this system is used for both maintenance and repair works. Generally the client will appoint an architect or more often a less qualified design consultant to design the structure from concept to detailed design. Once all detailed design work is carried out, the client will appoint individual trade contractors (piece works - labour only subcontractors) to provide the specialist skills required for each work item (eg groundworks, foundations, brickwork, carpentry etc). It is very often that no formal contractual documents are used between the subcontractors and the client. Verbal agreements are usually made and are often binding. The client will usually provide all materials on site and will pay each subcontractor for the amount of labour supplied. Either the client or the consultant appointed will supervise the works as they proceed and make payments to each subcontractor. Under this system, the overall coordination management and planing roles lie with the client. This system has been traditionally used as it is considered to be cheaper than other routes as the client deals with each subcontractor directly benefitting from their prices and also being able to programme their works.

15	Dominant Procurement Systems in the Public Sector include 1.Item Rate Contract - where the contractor is asked to fill in a Bill of Quantities and each rate is fixed in the contract. Once the project is under construction, each item is remeasured and the contractor is paid in accordance with the-measured amount and the tender rate in the Bill of Quantities. The final bill total is not fixed, only the item rates of the contract are fixed. The risk of increased costs is firmly placed with the client under this system. There are provisions in all contracts for escalation clauses which uses a formula to calculate percentage escalations in costs. 2.The Cost Plus Percentage Contract - This is similar to the item rate contract but in this case at tender stage each contractor is given a pre-priced Bill of Quantities prepared by the associated government department (PWD). The contractor will go through each rate in the bill and add a plus (+) or minus (-) percentage for each rate over or below the pre-priced rate, he can execute the work for. The successful tender will be accepted and the % rate quoted on each item will be fixed irrespective of the quantity of each item or the material cost of each item. In the Private Sector they include; 1.Item Rate Contracts 2.Design & Build - Turnkey Systems What is important to understand is that 3.The piece work contract 4. Cost reimbursement contracts. The contractor will keep records of all material costs and labour costs involved in the project and the client will pay these costs plus as additional percentage for overheads and profit to the contractor.
16	Item Rate, Cost Plus %, lump sum contracts in the public, Item Rate, Design and Build, Piecework contracts and lump sum contracts in the private sector. Management contracts have been introduced. Increasingly we have seen the emergence of independent management consultants in the industry. This is the new trend in the industry to employ a 'so called Construction Manager' but these construction managers are not developed enough to work as such professional assess there is little adequate formal training of management, planning and co-ordination. What is occurring is that failed contractors are now setting themselves up as construction managers.

Table A5 (i): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE LUMP SUM PROCUREMENT SYSTEM IN MALAYSIA

MALAYSIA 1																				
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	5	1	1	1	1	2	3	1	1	6	2	1	2	4	3	8	2	*	1
2	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
3	5	7	8	1	1	2	3	1	1	6	2	1	2	4	3	3	2	*	1
4	5	1	1	1	1	1	3	1	1	6	2	1	2	4	3	9	2	*	1
5	5	7	8	1	1	2	3	1	1	6	2	1	2	4	3	8	2	*	1
6	5	7	8	1	1	2	3	1	1	6	2	1	2	4	3	3	2	*	1
7	5	7	8	1	1	2	3	1	1	1	2	1	2	4	3	12	2	*	1
8	5	7	8	1	1	1	3	1	1	1	2	1	2	4	3	3	2	*	1
9	4	7	10	1	1	1	3	1	1	1	2	1	2	4	3	8	2	*	1
10	2	7	10	1	1	1	3	1	1	1	2	1	2	4	3	8	2	*	1
11	1	7	9	1	1	1	3	1	1	1	2	1	2	4	3	8	2	*	1
12	1	7	9	1	1	1	3	1	1	1	2	1	2	4	3	8	2	*	1
13	1	7	8	1	1	4	3	1	1	1	2	1	2	4	3	8	2	*	1
14	1	7	8	1	1	4	3	1	1	1	2	1	2	4	3	8	2	*	1
15	4	7	8	1	1	4	3	1	1	1	2	1	2	4	3	9	2	*	1
16	4	7	8	1	1	4	3	1	1	1	2	1	2	4	3	9	2	*	1
17	4	7	8	1	1	1	3	1	1	1	2	1	2	4	3	8	2	*	1
18	4	7	8	1	1	1	3	1	1	1	2	1	2	4	3	8	2	*	1
19	4	7	9	1	1	1	3	1	1	1	2	1	2	6	3	8	2	*	1
20	4	7	9	1	1	1	3	1	1	1	2	1	2	6	3	8	2	*	1
21	4	7	9	1	1	1	3	1	1	1	2	1	2	6	3	8	2	*	1
22		7	9	1	1	1	3	1	1	1	2	1	2	4	3	8	2	*	1
23	5	7	9	1	1	1	3	1	1	1	2	1	2	4	3	8	2	*	1
24	4	7	11	1	1	1	3	1	1	3	2	1	2	4	3	8	2	*	1
25	5	7	7	1	1	1	3	1	1	1	2	1	2	4	3	8	2	*	1
26	4	7	9	1	1	1	3	1	1	1	2	1	2	6	3	8	2	*	1
27	2	7	10	1	1	1	3	1	1	1	2	1	2	4	5	8	2	*	1
28	2	7	10	1	1	1	3	1	1	1	2	1	2	4	5	8	2	*	1
Summary of Predominant responses		7	8/10	1	1	1	3	1	1	1	2	1	2	4	3	8	2		1

Table A5(ii): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE DESIGN AND BUILD PROCUREMENT SYSTEM IN MALAYSIA

MALAYSIA 2																				
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	8(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	5	2	3	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
2	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
3	5	7	8	1	2	2	3	1	6	6	2	1	2	4	3	10	2	*	1
4	5	7	8	2	2	2	4	6	6	6	2	1	2	4	3	1	2	*	1
5	5	7	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
6	5	2	3	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
7	5	7	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
8	5	1	1	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
9	4	7	9	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
10	2	9	8	2	2	2	4	6	6	6	2	1	2	4	3	10	2	*	1
11	1	7	9	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
12	1	7	9	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
13	1	7	8	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
14	1	7	8	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
15	4	7	11	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
16	4	7	11	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
17	4	7	8	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
18	4	7	8	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
19	4	7	8	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
20	4	7	8	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
21	4	7	8	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
22	4	7	10	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
23	4	7	10	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
24	4	9	8	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
25	5	2	8	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
26	4	7	14	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
27	2	7	8	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
28	2	7	8	1	2	2	4	1	6	6	2	1	2	4	3	10	2	*	1
Summary of Predominant responses		**7**	**8/10**	**1**	**2**	**2**	**4**	**1**	**6**	**6**	**2**	**1**	**2**	**4**	**3**	**10**	**2**		**1**

Table A5(iii): SUMMARY OF QUESTIONNAIRE RESULTS FOR THE MANAGEMENT CONTRACTING PROCUREMENT SYSTEM IN MALAYSIA

MALAYSIA 3																			
Relationship to PSM Elements		1	2,6,12	3(i), 11(i)	3 (ii), 11(ii)	3(iii), 11(iii)	11(i,ii,iii)	7(i)	7(ii)	7(iii)	4(ii)	5	4(i)	9	10	13	14	3(i)	8(ii)
Question Number		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RESPONDENT	CATEGORY	CLIENT	FINANCE	C DESIGN	D DESIGN	S DESIGN	D STANDARD	CD CONTRACT	DD CONTRACT	SD CONTRACT	N PRODUCER	PRODUCER	S MANAGER	R COMPLETE	R PRICE	R FUNCTION	QUALITY	SM CONTRACT	C CONTRACT
1	5	2	3	1	1	2	3	5	5	5	2	1	1	9	3	5	4	1	5
2	5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
3	5	2	3	1	1	2	3	1	1	1	2	1	2	3	3	8	4	7	5
4	5	2	3	1	1	2	3	1	1	5	2	1	1	3	2	8	2	7	5
5	5	2	3	1	1	2	3	1	1	1	2	1	2	3	1	8	1	7	5
6	5	2	3	1	1	2	3	1	1	1	2	1	2	3	1	9	4	7	5
7	5	2	3	1	1	1	3	1	1	1	2	1	1	1	9	3	4	7	5
8	5	2	3	1	1	1	3	1	1	1	2	1	1	3	2	8	4	7	5
9	4	2	3	1	1	1	3	1	1	1	2	1	1	3	2	8	4	7	5
10	2	2	12	1	1	1	3	1	1	1	2	1	1	3	2	5	4	7	5
11	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
14	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
15	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17	4	2	12	1	1	1	3	1	1	1	2	1	1	3	2	8	4	7	5
18	4	2	12	1	1	1	3	1	1	1	2	1	1	3	2	8	4	7	5
19	4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
20	4	2	12	1	1	1	3	1	1	1	2	1	1	10	2	8	4	7	5
21	4	2	12	1	1	1	3	1	1	1	2	1	1	10	2	8	4	7	5
Summary of Predominant responses		2	12	1	1	1	3	1	1	1	2	1	1	3	2	8	4	7	5

Interview Number	Malaysia Interviews Name and Company
1	Ms Mizon Rung, QS Senior Lecturer, University of Technology Malaysia, Johar Baru.
2	Mr Mohameddin, QS Lecturer, Johar Baru.
3	Mr Mike M^{c}Iver, Director, Plus 3 Consultants, Kuala Lumpur.
4	Dr George Ofori, National University of Singapore.
5	Mr Lenard Kok, Executive Director, J R Knowles Malaysia, Kuala Lumpur.
6	Mr M Milford, John Laing International, Commercial Director, Malaysia, Kuala Lumpur.
7	Ms I Khatjah BT Mohd Al Piah, Public Works Department, Senior Architect, Kuala Lumpur
8	Mr Abdullah Bin Che Mat, Public Works Department, Quantity Surveying Department & Board of Surveyors, Kuala Lumpur.
9	Mr Bruce Schlautzer, Project Manager for Bovis International, K L Towers, Kuala Lumpur.
10	Mr Abdullah Bin Che Mat, Chartered Quantity Surveyors & Institute of Surveyors, Kuala Lumpur.
11	Mr Abd Shahar Abd Karim and Mr Khairuddin Bin Abdul Rashid, Construction Industry Development Board, Kuala Lumpur.
12	Mr Shar Ipuddin Muis and Lawrence Hokhai Toon, Master Builders Association Malaysia, Executive Officers, Kuala Lumpur.
13	Mr Abdul Rohman, Promot Consultants, Architect, Kuala Lumpur
14	Mr Tay Toong Soong, Baharuddin Ali and low Sdn, Kuala Lumpur
15	Mr Lai (Director), Davis Langdon & Seah, Kuala Lumpur.
16	Mr Rosden, Head of Department (Surveying) University Technology Malaysia, Principle Lecturer/QS, Kuala Lumpur

Interview	Table A5: Malaysia Verification Of Procurement Systems Models
1	The traditional procurement systems in Malaysia include the conventional lump sum contracts (with or without a B of Q) and more recently D & B is being used. Approximately 60-70% of projects are executed on the traditional lump sum basis - 30% is D & B and a few projects are using Management Contracting. Projects which use the D & B arrangement are usually of a specific nature (eg hospitals, schools, budget hotels). This system is actually being supported by the public sector, most of the time, its used on public sector projects. Its usage tends to be limited in the private sector, unless the client specifically requests for such an arrangement to be used. Design and Build was introduced into Malaysia in the mid 1980's, whilst management orientated systems have only been used within the last 2 - 3 years.
2	The dominant Building Procurement system in Malaysia is the conventional lump sum system, with or without quantities (drawings and specifications). The B of Q is used most of the time. Design and Build is used, particularly within the public sector. It has been used in Malaysia for the development of hospitals around the country. It is a growing form of procurement. The disadvantages which are associated with this arrangement in the UK are not really know here, however, as its usage becomes more extensive the problems may become more apparent.
3	The dominant procurement systems in Malaysia include the conventional lump sum system (with and without quantities) and the D & B system. The conventional approach is used most of the time, by all types of clients within the industry. Management contracting has begun to be introduced into Malaysia, but only a few projects have been procured on this basis. There is still a lot of traditional thinking within the industry which largely resists change and encourages the use of the conventional approach. Indeed many of the professionals and their respective institutes are reluctant to change as their positions are safeguarded with the use of conventional approaches.
4	Building procurement systems include the lump sum traditional system being the most widely used with both a B of Q or Drawings and Specifications and Design and Build.
5	The traditional procurement system is the lump sum conventional system. It tends to be used by both the public and private sector - particularly developed within the private sector. Design and Build is primarily used in the Public sector and indeed has been promoted by the government. The private sector is very traditional and as such relies on the lump sum conventional method of project acquisition, although it is still used within the private sector. Management contracting has been introduced into Malaysia in the last 3/4 years - although it only has limited usage, being offered by only a few firms within the industry. It is still in a very early stage of usage. The traditional approach is entrenched in the history of Malaysia. Clients generally feel that the system is workable, its well known, tested and within limits gives clients what they want. Indeed, clients and the industry are reluctant to change.
6	The two dominant building procurement systems in Malaysia include the lump sum traditional route, and the Design and Build route. Within the D & B option there is also the Turnkey system - (which implies taking a green field site to produce a fully operational building for the client). Additionally Build Operate Transfer (BOT) and other various forms of similar schemes are being used more in the Building Sector in Malaysia: particularly it applies to commercial developments in K L (through the medium of land swap).
7	The conventional lump sum approach is widely used within the public and private sector. The use of Bill of Quantities has been endorsed in the public sector and standardised buildings and projects over 1 million Malaysian ring it should use a Bill of Quantities. Drawings and specifications can be used on lower valued projects and within the private sector. Design and Build is used within both the public and private sector with the PWD having their own "turnkey" department which specifically deals with turnkey building projects. Management Contracting has also been introduced.

8	Lump sum conventional system may be with or without a B o Q, and is used widely both in the public and private sector. On large jobs, with a high value a B of Q is usually incorporated. D & B and Turnkey contracting are used. Management contracting has been used on a few occasions within the private sector and is one of the new procurement systems in Malaysia.
9	The lump sum traditional method of procurement is something that the Malaysian industry has grown with, rather than adapted. However, D & B seems to be imported from other countries. I believe that clients are still unfamiliar and also uncomfortable with this approach. The use of this arrangement backs up my comments - the lump sum system is the most widely used. On the K L Towers project the majority of packages have been let on a lump sum basis - with only a few on the D & B arrangement (which is a consequence of resource limitations). The key factor when looking at procurement systems is the level of satisfaction of the client, how well are they prepared and able to participate in projects. The most widely used procurement system is the conventional approach, with D&B only being used on a relatively few number of projects. I believe as the client becomes more sophisticated, and the industry becomes more organised, than there will ultimately be changes in procurement routes. Also as the economy strengthens and as time becomes more associated with money and lost rental, new fast-track orientated systems will emerge. Restrictions on time and money causes the industry to become more inventive and develop new approaches to the acquisition of buildings.
10	The two procurement systems in operation in Malaysia are the conventional lump sum system and D&B. Most projects exceeding 1 million ring it in the private sector will tend to go on a lump sum using a B of Q. For housing schemes private developers prefer the lump sum (drawings and specifications) system as it is easier for post contract cost control, as a B of Q is potentially open to a lot of claims from contractors. Contractors are becoming smarter and smarter:- on the same project a contractor will prefer a lump sum contract on the basis of a B of Q, as it is fair to them because they will be paid for all of their measured work. On a drawing and spec. project they will take the higher risk. Within the public sector most projects will be carried out with a B of Q - for accountability purposes. There is a trend now towards using the B of Q more - (the split would be approximately 60% - 40% (B of Q to Spec.)). D&B is still not that popular except for special government jobs - where time is very important, to deliver the project within a certain time frame (eg hospitals). D&B was primarily introduced in the 1970's (late) and costs went up by 30% because the contractor was taking all of the risk and wanted to cover himself due to finance and delays in payment. The use of D&B is now more selective in the type of projects it is used on. The private sector has become interested in this approach especially developers who wish to reduce their risks and wish to pass it to the contractor. Management orientated procurement systems are gaining more attention in the private sector but these systems have not caught on. The skills are not in place:- subcontractors are not experienced enough - and the management within the industry is not adequate. The most recent trend is to appoint a project manager on projects.
11	The conventional approach of lump sum contracting may be with or without a Bill of Quantities and in the public sector both systems are used. For projects costing more than 1 million Ringgit a Bill of Quantities must be used. If the project is of a standard nature, and is less than 1 million ring it, it is still let on the basis of a Bill of Quantities. Design & Build (Turnkey) projects are generally used in both sectors of the economy although they have been promoted heavily in the public sector. Approximately 10% of all construction projects are let on this basis. Of those 10%, 60% of the projects are within the public sector. The Public Works Department in Kuala Lumpur have their own turnkey unit which specifically deals with such projects. The value of such projects is usually high - such as hospital projects and power projects. The predominance of the traditional procurement system and more recently D&B is a reflection of what the market has got to offer clients, along with the fact that the industry is still maturing. As clients and projects become increasingly more sophisticated new procurement options will emerge.

12	The major procurement systems in Malaysia is still the conventional lump sum system, with or without a B of Q (depending on the size of the project). D & B is not really a big trend in Malaysia yet, its use is being encouraged. The majority of projects are let on the traditional lump sum basis to family based contractors, through personal contracts and negotiations/business connections.
13	The types of procurement systems in Malaysia include lump sum traditional and D&B (turnkey). More recently, management contracting and BOT schemes have been introduced. With the Government liberalisation and privatisation policies a lot of work is done as BOT schemes, but the majority of these projects are infrastructure related. Most projects are still based on the lump sum traditional system, with a B of Q.
14	The most widely used system of procurement is the lump sum traditional system with a B Of Q rather than with drawings and specifications. The latter approach gives the contractor a higher level of risk - and so is usually only used for smaller specialised projects - and generally projects with a value of less than half a million Ringgit. Most projects in the public sector will be based on the B Of Q, whilst in the private sector it depends on the type of project, although the majority will be on this basis. Housing projects will be on drawings and specifications. Design and build is increasingly being used. Management Contracting has also been introduced.
15	The major procurement systems are: lump sum traditional (with or without quantities) and D&B:- both of these systems are relatively risk adverse for the client, placing risk onto the contractor. This is quite an important characteristic of clients' culture. Even as clients become more sophisticated and experienced there is no guarantee that they will use more management orientated procurement systems. Management contracting is beginning to be used in the industry - but only on certain projects - by particular categories of clients (less than 5%).
16	The most widely used procurement system in Malaysia is the lump sum system (with B Of Q, followed by drawings and specifications) and is used in both sectors of the economy public and private. The B of Q method is widely used in both sectors, particularly in the pubic sector due to accountability, whilst the use of drawings and specifications tends to be higher in the private sector. D & B arrangement is used on projects which are required quickly (fast track) or complicated projects, and is used by both sectors. The use of this arrangement is approximately 20%. Management contracting has also began to be used in Malaysia - with a few companies now offering this service to clients in the industry. The contractor provides the management input to plan and co-ordinate the building of the structure by an army of subcontractors.

APPENDIX B

Results of the interviews for the Validation of Key Competencies Models

USA	Table B1 (i, ii, iii, iv, v, vi, vii and viii)
Japan	Table B2 (i, ii, iii, iv, v, vi, vii and viii)
France	Table B3 (i, ii, iii, iv, v, vi, vii and viii)
India	Table B4 (i, ii, iii, iv, v, vi, vii and viii)
Malaysia	Table B5 (i, ii, iii, iv, v, vi, vii and viii)

Interview Number	USA Interviews Name and Company
1	Mr Nicholas Renny, President Chesterton International, New York
2	Mr Denis Higston, Executive Vice President, Tillyards, New York
3	Mr Wilson C Barns, Principle Lecturer, Department of construction Management, College of Engineering and Design, Florida International University.
4	Mr John Robbins Architects, Cost Engineers, Florida
5	Mr Karl Marriot, Project Manager, Abacus Project Management, Arizona
6	Mr Alister Roberts, President, Ackroyd Cost Control Consultants, Seatle

Interview	Table B1(i): USA Verification of Competencies: Initiator/Promoter
1	Available in both the public and private sector.
2	Competencies available.
3	Competencies available in both the private and public sector. In the private sector there are sophisticated or experience and inexperienced clients who have different priorities and will use various procurement systems.
4	Competencies available in the public and private sector.
5	Competencies available in the public and private sector.
6	Competencies available

Interview	Table B1(ii): USA Verification of Competencies: Funder
1	Competencies available.
2	Competencies available.
3	Competencies available.
4	Competencies available. There are numerous sources available to obtain finance for construction.
5	Competencies available.
6	Competencies available.

Interview	Table B1(iii) USA Verification of Competencies: Schematic/Concept Design
1	Competencies available predominantly by the architect and by Architect/Engineering firms.
2	Competencies available.
3	Competencies available largely through the architect and increasingly through A/E firms. The architect traditionally took control of the design process and the construction process but they have lost control to other consultants and in a desire to not assume too much risk. The architect has traditionally been involved in defining costs but have not done a good job. The contractor is better qualified to provide cost advice which is the cost of the work plus the contractors profit. Increasingly the cost engineer is taking a more active role in providing cost advice for the client and architects and is part of the design team.
4	Competencies available.
5	Competencies available. Architect will be involved in producing concept designs. The use of A/E firms in the USA means that the architects and engineers will be involved in all stages of design and frequently the tender process.
6	Competencies available through Architect/Engineering firms and architects.

Interview	Table B1(iv): USA Verification of Competency: Detailed Design
1	Competencies available through the engineer and the A/E firms
2	Competencies available.
3	Competencies available.
4	Competencies available through the A/E firms and the various engineers which practice in the industry.
5	Competencies available; the engineers will predominantly be involved in the detailed design. It is important to recognise that the contractor is involved in the production of working drawings.
6	Competencies available through the engineers and A/E firms.

Interview	Table B1(v): USA Verification of Competency: Specialist Design
1	Competencies available. Many specialist designers and contractors are involved.
2	Competencies available.
3	Competencies available. Specialist design is either done by a specialist engineer or by specialist contractors in the industry.
4	Competencies available.
5	Competencies available. Either specialist engineers or specialist contractors are frequently involved in M 7 E design, H & V design and lifts within the building. The contractors will do the whole package of work being involved in the design process, the construction process and frequently the manufacturing process. The consequence of the various participants involved in the design process results in problems in the coordination of drawings. The architects drawings are not often coordinated with the specialist designers drawings etc. The level of integration of design needs to be higher.
6	Competencies available.

Interview	Table B1(vi): USA Verification of Competency: Management of Construction
1	Competencies available.
2	Competencies available.
3	Competencies available.
4	Competencies available.
5	Competencies available.
6	Competencies available.

Interview	Table B1(vii): USA Verification of Competency: Construction Production
1	Competencies available; far fewer wet trades are used on construction sites and there is more use of off site prefabrication than in the UK.
2	Competencies available; great use is made of simple construction techniques, few wet trades on sites and more use of prefabrication.
3	Competencies available. Many trade based and specialist contractors are involved in the industry.
4	Competencies available.
5	Competencies available: great use is made of off site fabrication, simple construction techniques, standard components and few wet trades on site.
6	Competencies available.

Interview	Table B1(viii): USA Verification of Competency: Allocation of Risk
1	Competencies available; standard contracts are used.
2	Competencies available standard contracts are used.
3	Competencies available standard contracts exist for both the public and private sector. Due to the various building regulations and codes which apply to each state these contracts usually have slight modifications to take account of these differences. Public contracts may be broken down from State contracts, to federal contracts and then down to city contracts, finally to project contracts. In the private sector it is not uncommon for clients to take advice from lawyers and amend standard contracts to suite their needs and shift risks in the project to the contractor.
4	Competencies available.
5	Competencies available.
6	Competencies available. Standard contracts are produced in the public and private sector. Private contracts are produced by the American Institute of Architects.

Interview Number	Japan Interviews Name and Company
1	Mr Shigeru Taki Director, Shimizu Corporation Inc. London.
2	Mr Kevin P Tyler, Shimizu Corporation Inc. London.
3	Professor Roger Flanagon, University of Reading.
4	Kumagi Gumi Inc, London.
5	Mr Masafumi Anami (Director), Taisie Europe Ltd. London.
6	Mr Tatsuya Sugawara (Marketing Manager), Taisie Europe Ltd. London.
7	Mr Nagai: Regional Manager, Takenaka UK Ltd, Birmingham.
8	Mr Steve McWigg, Senior Specialism Purchaser, Toyota Motor Corporation, Burnaston.
9	Mr Yamamoto, Kajima UK. London.
10	Ass Professor Yashiro, University of Reading.

Interview	Table B2(i): Japan Verification of Competency: Initiation/Promotion
1	Competencies available. Japanese clients build on a lump sum basis; be it the traditional sequential process or the D&B approach. The client will spend time with his organisation setting up a budget for a project; which is a detailed complex process. Once set the client does not want to change the budget. If amendments are required to be made to the budget this usually requires many board meetings with the organisation to discuss the next course of action, which is not liked. There is a great deal of preplanning and estimating before a budget is set for a project, and once set the budget should be the same as the final project costs. Once the budget has been established changes should be minimised during the course of construction. Japanese clients are risk adverse. Long term trusting relationships are important to Japanese clients.
2	Competencies available. Japanese clients build on a lump sum basis; traditional sequential process or the D&B approach and want the certainty of a fixed price before they start the project. The client will spend time with his organisation setting up a budget for a project which is a detailed complex process. Once set the client does not want to change the budget and this is why obtaining a fixed price at the start of the project is so important. Japanese clients are risk adverse. Japanese clients only tend to work on a long term trusting arrangement.
3	Competencies available. When looking at the Japanese market it is important to recognise that civil engineering projects in the UK they account for about 14% of the work, while in Japan it accounts for 34%. This invariably affects the structure of the industry. Japan has a fairly big public sector. Japanese clients are generally risk adverse and want to pass risk to the contractor, having a single point of liability. This affects the make-up and attitude of Japanese contractors. If we take a project such as a large office building in Tokyo worth say £20 million to be built for Hitachi by Shimizu, there is a 90% chance of project costs being negotiated between the client and contractor, a 90% chance that the project will be a Design and Build project, and a 90% chance that it will be a joint venture project also. 'Nining Kenky' means long term relationship which is very important in the Japanese system and heavily influences business practice. The long term attitude and the complex wed of associations between companies has a ponderous influence on business. By considering the Japanese procurement systems it is apparent that the client possesses minimal risk, whilst the contractor carries the majority of the risks involved. Client don't carry risk, the contractors do in Japan. This is a major reason why systems such as Construction Management and Management Contracting are not used as they pass substantial risk to the Client. This is not what Japanese Clients want. Mr Yo Hasitimi from Shimizu has carried out some research into CM, and concluded that its usage in Japan would be limited as it does not fit with the characteristics of the business environment, clients don't want the risk and so will not use such systems. Clients tend to dictate the usage of various procurement systems because as risk avoiders, they only use systems which place risk on other parties. Cost is important to Japanese clients as it is to all clients, but they are far more interested in quality. If we rank clients criteria they would be; Quality, Time, Cost: "get the quality right and the cost will follow".
4	Competencies available. Business relationships are based on long term alliances in Japan. If a contractor fails to perform in a contract, and the client is not satisfied, the contractor will not be used again. If a project increases in value from the tender figure, it is general practice for the contractor to absorb such losses. If the project scope changes substantially, then adequate remunerations are given to the contractor. The most important issue in Japan is achieving client satisfaction. Clients are concerned with the overall impression of the building, rather than top specifications for all items. The client primarily has a fixed budget, which limits design, so the most suitable body to design the building is the contractor. Clients in Japan think they are getting the best options, they consider that they are already getting fast track approaches with the systems they have. Long term relationships and trust between the client and the contractor are still very important issues in Japan. the Japanese process of negotiation is very difficult for Western companies to understand. The language and cultural barriers still affect the use of foreign contractors in Japan. Its easier to use contractors that are familiar to you.

5	The completion date for the client is considered to be of key importance. There is usually unreasonable pressure from the client to the contractor to complete. Even if the delay is beyond the control of the contractor, he will be required to complete to the date stated. The clients organisation may have its own design consultants in-house, who can be involved in producing outline designs. Traditionally, there has been very close relationships with specific clients and specific contractors. The accounting and budgeting procedures in Japan are very important, once a budget is set by the client it is maintained.
6	Competencies available. The completion date for the client is considered to be of key importance. Large clients often have their own design consultants in-house, who can be involved in producing outline designs which is done when a design and build approach is undertaken. Traditionally, there has been very close relationships with specific clients and specific contractors. The accounting and budgeting procedures in Japan are very different to the UK, once a budget is set by the client it is maintained. The budget is usually fixed before construction. These systems do not allow the budget or a fixed price to be set.
7	Takanaka do little civil engineering works, and generally little work for the public sector. Our private clients account for 60-70 % of our work predominantly on the basis of D & B. It is expected by our clients that minor changes in costs will be absorbed by the general contractor, but if there are major changes to the works, and substantial increases in costs, the client will pay the extra. Management procurement systems are not used in Japan because of i) attitude of the risk averse clients ii) attitude and expertise of subcontractors who traditionally work under the management and control of the general contractor. The client has no independent construction professional that can act as the construction manager. This is a major reason for the use of Design and Build in the private sector, the client has a single point of responsibility for the whole project, getting one company to do everything. The risk adverse nature of the client is important to recognise. Private sector clients prefer Design and Build as it reduces the problem for the client in terms of who we should involve in obtaining a building. They go to one general contractor who can design and build, the project and who gives the client a single point or responsibility. If you have independent designers and independent contractors, and there is a problem with the final building, it becomes difficult to place the blame on a party. Clients don't like this uncertainty, its easier for the client to deal with one party. If the client can express his needs to one party who is in charge of the whole project, it means that his requirements are uncomplicated, there is less misinterpretation. Because there are long term relationships in Japan, the client and the contractor have a good understanding of what each other want. In Japan the client is King, he is always right. In Japan negotiation is a key process. In Japan trust is very important, and there seems to be little here. In Japan the customer is always right, and this attitude goes into building, the client will get what he wants. Changes are made by the client and we will adhere to them. There is profit built into our tenders, which give us some flexibility to account for these. Major changes will result in increased costs for the client. We have long term relationships with clients; this makes the process more 'negotiable'. We understand each other better, and are willing to accept changes more readily. Ultimately, there is more TRUST. We often do not ask our clients to pay for initial outline design proposals for new buildings, as we are assured that the client will use us to develop the building. The client will spend time negotiating the budget for a project, and once it is set, they are reluctant to change. Their attitude is that once we have set the budget, the project should be completed within this, if it goes over budget there can be problems, as explanations have to be given as to why. It is difficult to persuade superiors to increase the budget once set." **Japanese clients will choose an expensive but fixed price, rather than a cheap and variable one**".

8	The reason for Japanese clients preference for the lump sum system and the Design and Build system in Japan is primarily because we are confident and comfortable with our existing approaches to the procurement of buildings. They have been used for many years and they have been continually refined. We have worked with the same construction company for many years, so we have long stranding relationships, that have developed over time and involve mutual trust and respect.It is against our philosophy to work directly with suppliers (subcontractors) or contractors that we have not had previous dealings with. If we started using new contractors it would show signs of distrust. We have used the same contractors for the last 40 years and we have grown together in business. We have more than 140 almost identical projects worldwide, the designs being continually modified by ourselves and our contractors. After a project has been built, we discuss the possible modifications that can be made with future projects. Additionally, we have a large database of previous project costs, and completion times, so we have relative certainty in house of future project costs.
9	Competencies exist
10	'Amae' refers to a system of tolerance for others, but also can mean being respectful and to be dependent upon others or the need for others. Our society is rooted in the concepts of dependency and collectivity. Often the contractor will agree to certain extra work with no extra cost to the client. Although legally, the contractor does not have to do so, the long term, trusting relationships between the parties will allow this to occur. For the Big firms, their clients are very valuable, the manner of business being on a long term basis, so their aim is to satisfy their clients in any way they can, and performing their contract. The general contractor has to 'compromise' for these irrational client demands to preserve their long standing relationships. The client is considered to be 'KING'. Small contractors, who are usually run by 1 person, are not interested in the client or the contract, and they don't compromise, or accept the clients desires. The Big companies have originated from carpentry firms in the 19 century, although they now consist of sophisticated staff and departments, they still retain the view that the client is of utmost importance. Society also expects this. The client is passing on the risk in construction to the contractors, and they are pricing for it. If these costs of risks are well determined in the contract, and are accepted by the parties involved, then Japanese contractors will prefer to take Fee bases CM systems, rather than the present lump sum system. It is a social and general custom that the general contractor will cover the risks involved in a project. So the Japanese contracting system operates by having greater profit margins to compensate for uncertainties and risk shifts from the client to the contractor. This is a major reason for the high cost of Japanese projects. 20-30% of the total project costs is in the overheads alone (including fees, risk, insurance and profit), so construction costs are 70-80%. This gives the Japanese client the great benefit that the client is given certainty of construction time, cost and quality; this is what they want.In Japan there are differences in culture, ways of thinking and ways of doing business.

Interview	Table B2(ii): Japan Verification of Competency: Fund
1	Competencies available
2	Competencies available. Construction companies offer finance themselves from within their company groupings.
3	Finance is generally very easy to obtain for private sector clients in Japan. All the large companies have a major bank as a shareholder in their company.
4	Banks are usually major shareholders in construction companies, and each of the Big 6 will have a Bank in its group, indicating support for each other in the market. By Banks being major shareholders in companies it stops the threat of being taken over by an unknown body. It thus helps maintain a good relationship, and also provides protection from intervention. It is important to understand that when a budget is formed in Japan is should be kept to. Projects should not go over or be under, and as accurate as possible. A lot of time and attention is paid to building up the budget for a project by a group in a company.
5	Competencies exist
6	Competencies exist
7	Takenaka don't usually provide the funding for a projects, what can occur is to introduce the client to a Bank in our Group, for loans.
8	Construction is a profitable industry, finance is available.
9	Competencies exist
10	Competencies exist

Interview	Table B2(iii): Japan Verification of Competency: Schematic/Concept Design
1	Competency available. Standard designs are frequently used.
2	Competency available
3	Competencies are available. The number of architecturai firms in Japan is far fewer than in the UK. Instead design tends to be either carried out by the clients in house design department or by the contractor. Subsequently, the contractors have a lot of power in the industry.
4	In the public sector, government design departments are used to create the concept/scheme designs, in the private sector, design consultants are engaged. The architect is less of an artist and more of an expert technician. Compered to UK cost control, the Japanese are more accurate because at tender stage the designs are more than 95% complete. Budget estimates are generated by individual engineers and architect building up rates and costs for their designed items of work. All the items are priced and brought together and a price is built up. The clients database of costs is extremely huge compared to UK clients, and have information of the cost of various element per sq meter in similar type projects. Prices are then negotiated by the clients team and a budget is finally reached. Under the D & B arrangement in the private sector concept designs are produced by the contractor rather than the client or his independent consultants. If a client wants a building of spectacular design, then they will often employ famous architects to design it, and they will also have to pay for it. If a client wants a building to carry out a function in then they don't really want an amazing building, yes they want quality, but the don't want to pay extra for it. Standardisation in design and component manufacturing leads to cheaper costs. The whole development process in Japan is far more integrated in Japan. There is less separation. Designs are generally produced by the contractor who also build the project.
5	The public sector generally use their own in house design departments. Architects predominantly design building work, and engineers design civil engineering work. Architects and engineers role in the design process will depend on the type of project.
6	Architects predominantly design building work
7	Takenaka are architectural specialists, and our clients come to us for this reason. Concept designs are often produced by Takenaka's design department due to its excellent reputation so we offer a complete service from start to finish, but an independent designer may be used at this stage.
8	Competency available
9	In the tender, design, construction system designs are produced by external consultants (Architects, Engineers) or by public design organisations and once designs are completed they are sent out to tender. In the private sector, large companies usually have their own in house maintenance and design consultants, who develop the outline designs. They have the option to appoint consultant; architects, engineers to carry out full design, or to call in contractors and go down the D&B route. Under the design and build route particularly in the private sector concept design are usually produced by the contractor, who have large in house design companies. It is uncommon to use external consultants to produce the clients concept designs, the D&B contractor does it all.
10	Architectural practices are not so concerned with procurement issues. They are primarily concerned with designing the building rather than project management.

Interview	Table B2(iv): Japan Verification of Competency: Detailed Design
1	Competency available through engineers. The contractor is frequently involved in the design stages of a project, particularly if a design and build approach is taken.
2	Competencies available. The engineer and contractor are frequently involved in detailed design stages.
3	Competency exists through engineers but design tends to be either carried out by the large clients in house design department or by the contractor. Subsequently, the contractors have a lot of power in the industry. Once a contractor is selected for the works, they are also involved in some design work, sitting down with design consultants trying to solve possible design problems. For example the contractor may suggest a better material or construction technique, which will be at no extra cost to the client, and will discuss this proposition with the design consultants.The maximum fee level that consultant architects and engineers can charge is about 8.5%, for all design work, with such low fees, the contractor is often involved in some aspects of design.
4	In the private sector design offices there are different departments which deal with specialist work such as M&E, H&V, Fire proofing, glazing. Engineers and architects are taught the principles of costing and estimating, giving them greater financial awareness, so the possible fluctuations on their estimates is small.
5	Competencies are available. The contractor is considered to be more 'capable' to design a building than a pure architectural practice in Japan. This form of procurement places the risk with one, party the contractor.
6	Competencies are available. The contractor is considered to be more 'capable' to design a building than a pure architectural practice in Japan. This form of procurement places the risk with one, party the contractor.
7	Under the design and build approach detailed design is always done by the general contractor. Therefore, specifications of the building are often left up to the contractor, as many private companies do not have a design department and are unsure about construction and design, so they ask us to produce design details, so we produce a range of options and the client chooses. The contractor is considered to have full responsibility for the project, he is the clients single point of contact. It is easier for contractors to do these drawings as i) the architect does not visit the site when modifications are required, or arrives too late, and ii) we know construction methods better, so we assist with design. This is only the case for minor adjustments to the designs, major changes are carried out by the architect.
8	Competency Available. Research and Development is very important in Japan.
9	External architects/engineers do not prepare as much detailed design drawings as their UK counterparts. They prepare standard designs, clarifying the most detailed areas of the design. These drawings **can not** generally be directly used by the contractor to construct the building, the main contractor has to re draw, or produce working design drawings based on the consultants detailed design drawings. The contractor has the additional duty to develop the designs to the working drawing stage.

10	There is a problem of liability of design drawings in Japan, as design is done by the architect, engineers, and also contractors. The architect has to sign or stamp all drawings but this does not give approval, but merely indicates that it has been viewed by the architect. Architects want to escape from the final liability of the project. In large projects formal meetings are held with the contractor, specialists and the architects to discuss final design details and get approval for the works. If a specialist designs work, their liability on the works is considered to be ambiguous, in practice the general contractor will compensate for some defects in design, but legally it is the architects responsibility. In general the contractor will assume liability for the project. General contractors are not happy with this situation and are trying to transfer risk to architects more explicitly than before. In most cases Japanese design firms have two contracts with the client; 1) design work, 2) supervision of the construction works (the resident or visiting architect is expected to check whether the building has been constructed according to drawings. He is the agent for the client. As such he is considered to be the most important person on the site.

Interview	Table B2(v): Japan Verification of Competency: Specialist Design
1	Competencies are available through specialist engineers and specialist contractors.
2	Competencies are available through specialist engineers and specialist contractors.
3	Contractor often involved.
4	The contractor is still required to produce some working drawings, even when designs have been prepared prior to tender. This is because contractors are the people of the industry that know about the most advanced technology and new methods of construction, so they are the ones who produce working drawings.
5	Contractor are required to produce some working drawings, even when designs have been prepared prior to tender. This is because contractors are the people of the industry that know about the most advanced technology and new methods of construction, so they are the ones who produce working drawings.
6	Competency exists
7	Often working drawings are produced at the site office by the contractor. Construction details should be discussed with site construction staff, subcontractors and suppliers. If a subcontractor is involved in the design of a particular element of the building, the general contractor is considered to be responsible for this design by the client. If the element fails, the client will approach the contractor to make it good as they have final responsibility, and the contractor will expect the subcontractor to rectify the damage at his costs if it is their fault.
8	Competency available
9	Competency available
10	Subcontractors are involved in the design construction interface (production design) is also of importance. The process of determining what to build and how to build is very ambiguous in Japan, even though they are closely related. In general Japanese design firms or departments, do not produce working drawings, but only produce schematic drawings. They will also produce a limited amount of shop drawings, in order to exemplify the methods and techniques of construction. The drawings produced are not enough for construction purposes and so additional drawings will be produced by the contractor to compensate the gap between insufficient design drawings. Construction drawings are produced by the general contractors at the site office or regional branch offices. This process is referred to as "Seko (Construction) Zumen"(drawings) are produced by the contractor. The general contractor before producing the construction drawings will first produce co-ordination drawings known as "Sugo (coordinate, synthesis, intermediate) Zumen". This is generally because there is usually no consistency between architectural, structural engineers, and service drawings; the 3 general sections of the design department or office. There is no coordination between the drawings between these 3 sections of the design office, so drawings can slightly vary. To confirm consistency and coordination between the drawings of the various departments, the general contractor will produce coordination drawings. This is considered to be a required or standard procedure for general contractors, in order for them to initiate construction. This process has traditionally been carried out by the contractors as part of their works, but now there are calls for charging a fee for such services. The general contractor will usually price for this service in their overheads/profit. In order for contractors to gain a position in the 'Upper Stream Orientated Approach' to construction, they wish to separate this function and charge a fee for it, which is being instigated by the Building Contractors Society (BCS) a unique society, comprising of members of the top 86 contracting firms in Japan.

Interview	Table B2(vi): Japan Verification of Competency: Management of Construction
1	The general contractor takes on the role of manager of the construction process. This is not seen as a separate function but a part of the contractors duties under a lump sum arrangement. The contractor is responsible for the management and coordination of his subcontractors on site. The general contractor will carry out little construction work himself, subcontracting the majority of the work.
2	The management of construction is undertaken by the general contractor who carries this duty out as part of a lump sum arrangement, it is not considered as an independent function. The general contractor will carry out little construction work himself, subcontracting the majority of the work and being responsible for the coordination and management of the subcontractors.
3	General contractors tend take the role of the managers of construction for their subcontractors. Although in structure the traditional arrangement of procuring a building in Japan resembles management contracting, in terms of risk transfer and distribution it is very different indeed. Contractors in Japan don't pass on the risk to their subcontractors as they do in the UK. The General contractor carries the risk. For example the general contractor will often tell the subcontractor what the package of work will cost, before the subcontractor has priced the work. The two will then negotiate the package cost. If once the project has started the sub contractor falls into difficulty and realises that he will make substantial losses or no profit on the works, he informs the general contractor and they negotiate to either take remedial action on this project, or for a future project to increase the profit margin for the subcontractor. There is a different mentality in Japan.
4	Greater attention is also given to the method statement. The contractor spends a long time deciding on the position of scaffolding, hoists, tower cranes and temporary works for a project, as they are usually owned by the contractor. Often 2-300 drawings are produced to show the exact location of the temporary works. This is done because Japanese clients believe that the Preliminaries in a project are the most susceptible to problems (high risk areas), so with planning, this is minimised, and costs are saved. In the UK this seem to be a big area of cost escalations in projects.
5	The role of the general contractor in Japan is to supervise and co ordinate the work of the subcontractors. They carry out little construction work themselves. The management of the construction is done by the general contractor. Independent management companies do not exist in Japan because the major construction companies have performed this role in their general duties as contractors. They consider that it is not necessary to introduce other new systems to the way that the big six operate originally. They traditionally do little construction work themselves, and instead tend to supervise and coordinate the work of their subcontractors. We do not call this 'Management Contracting' but general contracting.
6	The role of the general contractor in Japan is to supervise and co ordinate the work of the subcontractors. They carry out little construction work themselves. The management of the construction is done by the general contractor. Independent management companies do not exist in Japan because the major construction companies have performed this role in their general duties as contractors.
7	The general contractor who is responsible to the client for the completion of the works will undertake the role of manager of the construction process as they rarely carry out construction work themselves. Instead the majority of work is subcontracted to the specific subcontractors who work for the general contractor. There is no independent management professional in the Japanese industry that can offer the construction managers service at present.
8	Competency available through the general contractor and project managers.

9	Competency available.
10	Building professionals and construction companies in the industry climb up to the managerial /higher levels of a project; ie planning, procurement. Large contractors and architectural firm are trying to enter into such specialist areas. This is known as 'Upper stream Oriented Approach'. In Japan construction drawings are easy to change. They do need approval by the architect or design office, and they are usually flexible to agree to such changes. This gives the contractor great flexibility. In the case when the construction completion date is very tight, the contractor can make modifications to the designs, to allow quicker construction, and thus meet the completion date. What occurs is some form of 'Trade-Off' negotiation between the parties. For example is unexpected situations occur in the building fabric, and it leads to more expensive construction costs, the contractor will negotiate with the client to make a cost saving elsewhere in the building to off set costs, such as internal finishes. It is essential that the contractor maintains the performance specification of the building, but he can make changes in order to complete on time and cost. The Big contractors don't do any construction work themselves, they have their own subcontractors to carry out the work. They effectively coordinate the subcontractors on the project to get the job done. The issue of Risk is very important here. In terms of the distribution of risk the system is very different from Management Contracting. When the general contractor enters into a MC with a client, it is on a fee basis, whilst when the Japanese lump sum system is based on costs, overheads and profit. This is the difference. The price given by the general contractor involves a fee for their service as coordinators but also but also a wider range of insurance costs, so the general contractors will complete the works, even in the case of unexpected costs being required in the project, they will carry out the works without additional demands to the client for money. Even though the architect has insurance to cover liability, the general contractor will usually compensate this, if there are defects in the design of the building, in order to preserve their relationship with the client, and because they are involved heavily in the construction design drawings. They take out insurance to cover their design liability, but the overheads included in the project are usually large enough to cover these costs and also to make a good level of profit. The general contractors understand the risk they are placing themselves under in this system and therefore price for it. General contractors take a substantial risk in Japan, and this is the fundamental difference between the UK MC system. If Japan develops a legal and social system which regulates the fees that can be charged, and risk in construction, then management forms of contract could be used. In Japan the general contractor also compensates for possible problems after the completion of the building, whether they have the legal liability or not. Under the fee systems (CM) contractors will not accept this liability. So our system covers a very wide range of risks.

Interview	Table B2(vii): Japan Verification of Competency: Constructor Producer
1	The relationships with subcontractors in Japan is better than in the UK, a more long term attitude is taken to working relationships. The systems are less adversarial. The long term relationships and the trust that is involved in the construction process are the key differences between business in the UK, and business in Japan. The Japanese negotiation system is also very different; being lengthy and in great detail. Large general contractor carry out little construction work themselves with the majority of work being conducted by subcontractors. General contractor will usually have an army of subcontractors which will exclusively work for them. There is a greater amount of 'aftercare' provided by Japanese builders, we consider ourselves to be morally responsible to the client.
2	There is a long term trusting relationships with subcontractors and general contractors in Japan. The Japanese builders give a life long guarantee on their buildings, we never walk away from a problem. If after the defects liability period has ended there is a problem with a building, we will go a fix it if we can; its all about long term relationships. Competencies are available. General contractors often carry out little construction work themselves, with the majority of work being subcontracted. The subcontractors will generally work exclusively for contractors. There is a greater amount of 'aftercare' provided by Japanese builders, we consider ourselves to be morally responsible to the client.
3	Contracting organisations in Japan are not however like UK contracting organisations, they are very Japanese in terms of their organisation, their behaviour and their practice in the industry. All the big six, employ many architectural engineers in their design departments. Also much use is made of subcontracting in the industry. Each large company has its own collection of subcontractors who work exclusively for the general contractors. The subcontracting system is on an allegiance basis, contractors do not shop around for subcontractors as occurs in the UK. The long term attitude and the complex wed of associations between companies has a ponderous influence on business. Due to long term relationships and the importance this has on future business, the contractor will see it as his role to take all the risk from the client and build the job to the best quality, best price, and in the fastest possible time, and if there are problems during the project the contractor will take the best endeavours to reduce them. Even if problems occur 10 years after the project is built, it is common practice for the original contractor to come back and rectify the problem for the client. It should be recognised that with smaller projects and with small contractors there are as many problems as there are in the UK. With the small companies in the industry the systems is as 'cut throat' as the UK, but there are still cultural differences. It is difficult not to generalise.
4	All contractors staff are taught the principles of costing and estimating, giving them greater financial awareness, so the possible fluctuations on their estimates is small. The reason why D&B is favoured by contractors is because outside consultants are not employed, instead everything is done in-house. This makes it much easier for the contractor to control the costs of the project. External consultants would insist on particular types of material and construction techniques, which may not be achievable by the contractor. Large Japanese general contractors have always been supported by many good specialist subcontractors.
5	Competencies available. There are many skilled companies in the industry which are labour only, trade contractors and vendor contractors (manufacturers and installers).
6	Competencies available.

7	Management procurement systems are not used in Japan because of i) attitude of the risk averse clients ii) attitude and expertise of subcontractors who traditionally work under the management and control of the general contractor. Sub contractors generally do not have the skills to coordinate themselves, and also do not have the ability to accept the responsibility of a whole project. This is why they work with the parent contractor. The relationship Takanaka has with British subcontractors is very different to that with our Japanese subcontractors. The British subcontractors will often not accept slight modifications to their tenders, without large increases in costs. The attitude is different, it seems as if their tender price is the lowest price possible, and if there are any changes, this is the contractors profits, so they are all charged for. Our relationship with Japanese subcontractors is very strong. We have several hundred that work exclusively for us, and they are referred to as 'Takenaka's Friends Association'. It is prestigious to join this organisation. We have very high expectations of quality, and if we request something, the subcontractors will do their best to achieve it.
8	Competencies available, many small contractors and subcontracting exist in the industry.
9	Generally the main contractor is responsible for the work and designs of the specialist sub contractors used on the project.
10	The large general contractors in Japan are very sophisticated and understand the concept of procurement. General contractors are now involved in producing construction/working drawings (Sekeu Zumen) or the building fabric. The role of specialist or trade contractors is very rapidly changing in Japan (see Furasaka). The role of building services subcontractors is a very specialised one. In General, they provide a "Black Box" package, ie they are involved in the design, fabrication, and installation of services into buildings. The work is examined and stamped by the general contractor but all the work involved id executed by the subcontractor. These specialist are becoming stronger, more powerful and more specialised in the Industry, due to their high technological potential. The work done by most other subcontractors involves the building fabric, and so such contractors only supply labour, or supply limited drawings for their own area of work. They do not have the capability to make comprehensive or adequate design drawings, so their work is generally labour intensive. In this case the general contractor will be involved in the construction drawings and the general coordination. Depending on the level of specialisation of a contractor, and the power of the subcontractor will dictate their role in the design process. In this case such sophisticated subcontractors are given a performance specification for their work package along with basic schematic designs, and they will do the rest. "Seino (performance) Haichu (requesting/ offering the work)" is the term used for this type of contracting, with specialists. This type of system is specifically used in Public Housing Projects by the Housing Urban Development Corporation (HUDC) in the public sector. It is used on the construction of flats, and high rise housing. Each general contractor have their own efficient construction methods, and the HUDC produce specifications and schematic planning, which implies that only 1 contractor can do the work as he is the specialist in this type of construction. The general contractor thus has a free hand in determining the construction method to be employed although the type of material will be defined (reinforced concrete). It is up to the general contractor to design and build the project for a lump sum fixed price. This is a special case for public buildings and the arrangement is more used in the private sector.

Interview	Table B2(viii): Japan Verification of Competency: Allocation of Risk
1	Competency available
2	Competency available
3	The key to the Japanese system is the placing of risk. The Japanese are risk averse, and consequently, clients want to pass risk to the contractor, having a single point of liability. This affects the make-up and attitude of Japanese contractors. Japanese contract documents are more formal agreements rather than documents which detail consequences if problems occur like JCT. Problems are solved in amicable ways, rather resorting to litigation or claims. Negotiation is the key to business practice in Japan, issues are negotiated rather than turning problems into litigation. The client will enter into a contract with the contractor, who will carry out the construction in accordance with the clients requirements. If there is a problem with a package of works, the subcontractor will re do the work, or will get no work in the future. In all the Japanese systems it is very clear where all the risks reside in each system, whilst in the UK system there are a lot of fuzzy areas.
4	Competencies available. Standard forms of contract exist. Trust and long term relations are important.
5	If a specialist contractor is used to design an element of the project, there is no formal relationship between the client and sub contactor, just the main contract exists between the client and the general contractor. Provisions can be made for design liability in contracts. In the public sector, there are inflation clauses which will cover increases in costs for long term projects. In the private sector the contractor takes on this responsibility.
6	Formal relationship between the client and the main contract exists between the client and the general contractor. Provisions can be made for design liability in contracts.
7	Japanese clients are far less contractual, and litigious and negotiation is an issue here.
8	Competencies exist and standard documents are used.
9	Competencies exist but long term trusting relationships are more important.
10	Competencies exist.

Interview Number	France Interviews Name and Company
1	Mr Stephen Pearson, South Bank University
2	Mr L Willmott, Willmott Lewis Architects France
3	Ms Helene Chavet, CSTB Research Institute
4	Mr Phil Corbett, Gleeds, Paris
5	Ms Rebeca Newman, Architect Richard & Newman, Paris
6	Mr Jean-Luc Salagnac (Project Manager), CSTB Research Institute
7	Mr J P Pajon, Gleeds, Paris
8	Mr P J Braithwaite, Cyril Sweet, Economiste

Interview	Table B3(i): France Verification of Competencies: Initiator/Promoter
1	Competency exists.
2	Competencies exist. Clients in France don't necessarily go for the cheapest price, the idea is that the go for "the one who makes the best overall offer". The clients perception of risks is different. French clients are influenced by their attitude and culture. The client is more certain about what and when he is getting his building.
3	Competency exists. Characteristics of the type of client will affect what procurement system is adopted. Our insurance systems - the 10 Year policy in France we design buildings to last much longer than 10 years. This is a minimum period, that the building should be without fault for. This decennial policy is not considered by all the industry as a good concept, indeed there are practitioners who want to reduce or get rid of such a system. The darker side to this insurance system is that because all the parties know they have to be insured for damage, some are becoming complacent with the fact that if their part is defective, the defective work will be corrected by their insurance. This is a very complex system which can be open to abuse. It must be regulated very clearly - which is a difficult process. Clients are not too aware of the various procurement systems as compared with the UK. Generally clients will adopt The Lots separes approach or the enterprise general system for their projects.
4	Competencies exist. A great difference between French and UK clients is the expectations of clients, they tend to except less stringent cost certainty, so this Lots system is used often. This difference is attitude is based on culture and the way the French Industry is organised. French clients are becoming more aware of the benefit of cost control, as the economiste is emerging as a valued consultant in the industry. French clients prefer to use separate specialists to carry out the works as it is considered that the result is that you get a better quality building
5	Competencies exist. The perception of French clients is a little different from UK or US clients. It must be remembered that at tender stage, almost all of the packages will be let - and they will be all based on a fixed lump sum basis. A greater degree of "teamwork" is incorporated into projects. The client, architect and contractors work far more closely together. If there are any problems, they are quickly dealt with by the architect and the client. The aim is to get the best project for the client as soon as possible. The general working mentality in France is based on "good faith" and teamwork, rather than individualism. The construction and design team are here to serve clients.
6	Competency exists. The characteristics of the client will affect what system is adopted for example a private developer who wants a commercial complex, will want this type of project built quickly, with a life expectancy of say 15 years, with profit and money being a key factor. A public client who is building residential complexes will have different criteria/requirements, and wants a building for a longer time period. This decennial policy is not considered by all the industry as a good concept, indeed there are practitioners who want to reduce or get rid of such a system.
7	Competencies exist. The clients is important in France, at the end of the day we do what the client wants. The whole basis of acquiring a building in France is based around teamwork - "a building is like making a film - with various people who have not worked together before - but must follow a script (design) to achieve a finished product." There is a strong belief in lasting relationships in France, if there is a problem on a project it's sorted out by all the parties and discussed rather than one party making demands upon the other. The power base in France seems to lie firmly with the clients and his consultants, who if are not happy with the services provided by the contractor will not use that contractor for future projects. There is a far less adversarial attitude when it comes to construction in France. However, this system does however break down, but on the whole clients and practitioners are happy with the arrangement. Indeed, contractor and management sometimes takes second priority in achieving client satisfaction.

8	More sophisticated/experienced contractors will tend to appoint individual consultants to carry out concept, detailed specialist design and the role of the economiste. Less experienced clients, requiring a single point of responsibility, will appoint an architect, who will appoint other consultants. French clients are not so concerned with the financial aspects of construction - they are generally less preoccupied with cost certainty than their UK counterparts. They are generally happy with being given a budget - or limit on costs, rather than a detailed initial cost estimate - which is what clients in the UK are used to. French clients are obviously concerned with projects going over budget - but there is not a definite amount which is given to them before the project starts. In many ways it's the UK QS which has manifested and encouraged such concern with costs. There has traditionally been no profession in France, which has offered such stringent cost advice.

Interview	Table B3(ii): France Verification of Competency: Fund
1	competency exist.
2	competencies exist.
3	Depending on the size of the client, his track record and the level of security which may be provided will dictate the ease of obtaining finance for construction. Competencies are available, with strong links between finance institutions and the construction industry. Financial institutions are a little more cautious about lending to construction since the recession. The market is now flooded with commercial and office space in Paris, and developers have declined. Prior to the recession banks and developers due to the buoyant market invested huge amounts of finance into such developments which are now still unoccupied. Financial institutions are generally interested in the construction sector as it is a large part of the market, and is a good method of investment.
4	competency exist.
5	competency exist.
6	Competency available. There are good links between the finance sector and the construction industry in France. The size of the client, his track record and the level of security which may be provided will dictate the ease of obtaining finance for construction. Financial institutions are generally interested in the construction sector as it is a large part of the market, and is a good method of investment however they are a little more cautious about lending to construction since the recession. The market is now flooded with commercial and office space in Paris, and developers have declined. Prior to the recession banks and developers due to the buoyant market invested huge amounts of finance into such developments which are now still unoccupied.
7	competency exist.
8	The links between finance and construction are indirectly involved in construction. As part of their group many banks will have a 'developer' or some form of construction company or team of project mangers who will manage their own construction projects. The majority of Banks in France are still owned by the public sector. The links in France are like a "spiders web"; with a large number of diverse companies being linked together.

Interview	Table B3(iii): France Verification of Competency: Concept Design
1	competencies exist.
2	competencies exist.
3	It is often the case that concept and detailed or structural designs are completed by the architect and BET. It is often the case that the client will enter into a contract with the architect. The services of the maitre d'oeuvre is usually provided by the architect, who subcontracts to a BET and economist. The architect will then engage a known BET and Economiste, so they are subcontractors to the architect, to carry out the complete functions of the maitre d'oeuvre. This is the most predominant arrangement, as architects are often used to working with a certain BET and economiste. For secondary clients this will be the most widely used arrangement as they have a single point of responsibility. However with primary experienced clients, who have a good extensive knowledge of the industry. they can enter into separate contracts with the architect BET and economist, but it is not often the case. The architect the main purpose is to design rather than manage, the engineer is to provide technical details, the economiste is to provide cost advice. Traditionally by default the architect has managed, but there is also the pilote who is considered to be qualified in taking on this role.
4	Concept designs are done by the architects. Traditionally the architect would be predominantly involved in concept design work, and the BET, engineers and contractor would be responsible for technical and working drawings. This effectively placed more liability on the contractor and BET. Nowadays, the architect tends to be involved to a greater extent, following designs through to a detailed stage. The economiste, a recent development in France is only just taking off, and is becoming more involved in the design process to provide cost advice. France has traditionally been architect led, with then producing designs, and controlling the building process. This is however changing, as clients are becoming more aware of the benefit of cost control, and the economiste is emerging as a professional in the industry. The function of the maitre d'oeuvre was traditionally carried out by the architect, who then appointed a BET, and economist. This is beginning to change as the BET and economist may now be directly appointed by clients. The split is about 50-50. Gleeds personally prefer to work for the client, rather than the contractor. Depending on the method of appointment will also affect liability, if the architect appoints, then he is liable for their work, but they are also liable to him - (the decennial insurance system).
5	The role of the architect can however vary in the Public and Private sector. They are required to be appointed by client to obtain a building permit, their role then may be involved in just concept design, or the whole design process and also could be involved in design and supervision of the whole project. The role of the architect in the public sector is codified and depends on the missions selected for the project. In the private sector their role is less regulated, and are often involved in the design process. In the public sector, the role of the architect, and their missions is influenced by the size and nature of the project. On small/medium sized projects, the architect will be involved in both design and supervision. However on large complex projects, where many trades are involved, and the co-ordination and supervision role is complex, then the architect tends to be limited to the design process. The architect predominantly will be involved with concept, rather than detailed/structural design. The architect can be involved in this area of design, as many architects will work with the BET's, but its generally carried out by structural engineers. For the majority of our private clients will carry out concept/detailed designs, but also take on the role of the pilotage. There are two ways of engaging the maitre d'oeuvre;(i) either the client enters into a contract with an architect for the full services, so the architect must then appoint an BET and economiste, or (ii) The client enters into separate contracts with an architect, BET and economiste. The former arrangement will be more attractive for clients as they have a single point of responsibility for the services of the maitre d'oeuvre, however the former arrangement is preferred more by architects, as their liability is limited to their designs only. Architectural practices tend to be small, practices usually only consist of 2/3 architect, and the largest of such practices will be so. Instead, there is also a lot of freelance work for architects in France.

6	Concept designs are completed by the architect. Client may enter into a contract with the architect for the whole design function. The services of the maitre d'oeuvre is usually provided by the architect, who subcontracts to a BET and economist. The architect will then engage a known BET and Economiste, so they are subcontractors to the architect, to carry out the complete functions of the maitre d'oeuvre. This is the most predominant arrangement, as architects are often used to working with a certain BET and economiste. Foe secondary clients this will be the most widely used arrangement as they have a single point of responsibility. However with primary experienced clients, who have a good extensive knowledge of the industry. they can enter into separate contracts with the architect BET and economist, but it is not often the case. The architect the main purpose is to design rather than manage, the engineer is to provide technical details, the economiste is to provide cost advice. Traditionally by default the architect has managed, but there is also the pilote who is considered to be qualified in taking on this role.
7	In France you have within the public sector different types of services offered by the maitre d'oeuvre; which will include the Architects, BET and Economiste, ranging from M1 to M12. However what tends to be the case is that architects will produce concept designs and will be involved in detailed (technical) designs along with the BET, but working/shop drawings will be left up to the contractor to produce. The client will decide what he wants each consultant to do. In France the industry contains less consultants, who have not been segregated as much as they are in the UK from one another and consequently there also seems to be less involvement by the UK clients in their own projects - primarily because consultants have indicated that they can do it better than their clients. The economiste is required to produce quantities from the designers details. These quantities are not contractually binding. This is why there has not been a real tradition of the clients team producing their own separate qualities. This role has been performed by contractors who agree a lump sum price for their works. However, with the increased requirement for pre-contract price certainty, this is now becoming a necessity for the economist to conduct. Also by doing so, each contractor will be providing the same document. The down side to this is that designs must be completed before tender stage, and it precludes contractors involvement. Architectural design in France is very important - the architect traditionally has taken a key role throughout the design and to some extent in the construction process. The budget is usually formulated upon the clients requirements and the architects designs; and if when detailed and specialists designs are completed we go over budget, then we ask the architect to modify his design without loosing the architectural integrity of the project.
8	Architect traditionally carries out concept design. Each architect tends to use a known BET, who produces detailed designs. The architect does little structural design work. The architect may employ a BET, and economiste himself, or the client may appoint then directly - its about a 50/50 split. Its the clients decision to select which method of appointment is selected. The French have historically left the role of cost control to the architect; he is thought to be the "main man" on projects; and in some ways french clients are less sophisticated, or concerned with cost control then their UK clients. This is predominantly due to the organisational structure in France, and the way building projects are conducted in France. The architect, who has had limited expertise in cost control, has traditionally taken the key role in project organisations, and so costs are not monitored as closely and accurately as in the UK.

Interview	Table B3(iv): France Verification of Competency: Detailed Design
1	competencies exist.
2	competencies exist.
3	It is often the case that concept and detailed or structural designs are completed by the architect and BET. The architect can also be involved with detailed design along with the BET. Detailed design tends to be shared between the architect and the BET.
4	All of the technical detailing (approximately 70-75%) will however be done by the BET, and the engineers (structural, mechanical, electrical) (approximately 25-30%).
5	The architect predominantly will be involved with concept, rather than detailed/structural design which is carried out by the BET. The architect can be involved in this area of design, as many architects will work with the BET's, but its generally carried out by structural engineers. For the majority of our private clients will carry out concept/detailed designs, but also take on the role of the pilotage.
6	Detailed or structural designs are completed by the BET. The architect can also be involved with detailed design along with the BET.
7	Detailed design tends to be shared between the architect and the BET.
8	competencies exist.

Interview	Table B3(v): France Verification of Competency: Specialist Design.
1	competencies exist.
2	competencies exist.
3	Specialist engineers in the BET are involved in specialist design. Working drawings are most often left up to the contractors to complete. This allows much greater interaction between the architect and the contractors (Buildability) for example on a recent site. Working drawings are predominantly left up to the contractor to prepare, as he will be carrying out the work, and has expert advice on how this element of the structure should be designed and constructed. However it must be maintained that it is difficult to make generalisations. On some projects, the contractors involved in working drawings/design is minimal, however on other projects it is greater. Specialist design is often carried out by the contractors and a specialist engineer or design consultant.
4	Specialist engineers and contractor would be responsible for technical and working drawings.
5	Competency available.
6	Engineers and contractors are involved in specialist design. Working drawings are predominantly left up to the contractor to prepare, as he will be carrying out the work, and has expert advice on how this element of the structure should be designed and constructed. Specialist design is often carried out by the contractors and a specialist engineer or design consultant.
7	Under the Lots system with complex projects, the design team will meet regularly with the specialist engineers to sort out design issues, allowing liaison between different trades. This process is done before you go-out to tender.
8	competencies exist.

Interview	Table B3(vi): France Verification of Competencies: Management of Construction
1	competencies available.
2	competencies exist.
3	Competency available, usually carried out by the Pilote. The function of the pilotage may be carried out by several individuals. Under lots systems on large projects you will usually have an independent body who will manage and co-ordinate the project for the client. On smaller and medium sized projects, it may often be the case that the role of the pilote will be executed by the architect, and can be done by the gros oeuvre. In such a case, the party will be paid a fee for their service. On ordinary projects - it is generally the architect who will take on this role. As projects become larger and more specialist. The role may be passed to a gros oeuvre or pilote. It is generally less common for a gros oeuvre contractor to take on this role - its predominantly the architect or the pilote. Management has generally played as small a part in the education of construction professionals.
4	The role of the pilotage can also be executed by the pilot, the architect or a gros oeuvre (masonry contractor). The consultant/practitioners who takes on this role depends on the size, nature and complicity of the project; then a pilote will be appointed, whilst on relatively simple projects, the function will be carried out by the architect or gros oeuvre. Management; is generally less important in France, consultants having relatively little formal education in this area. However management seems to be more reactive on sites - as problems arise on site they are dealt with.
5	In many ways, the role of the pilotage is similar to the role of the construction manager, involved in the co-ordination, supervision and management of the construction process. The function of the pilotage is often carried out by the architect, but it is considered to be a separate role, and thus we are paid an additional fee for this service. When we are dealing with small/simple projects, this role os relatively easy. With projects becoming more complex, this function requires more specialist skills, and greater direct involvement, and architects often find this a difficult process. The general contractor under the Entreprise general system will take the role of the pilote (manager) and will take the risk for time and cost delays.
6	Pilote carries out the competency. The function of the pilotage may be carried out by several individuals. Under lots systems on large projects you will usually have an independent body who will manage and co-ordinate the project for the client; known as the pilote. This body will enter into a direct contract with the client for this function, however on smaller and medium sized projects, it may often be the case that the role of the pilote will be executed by the architect, and can be done by the gros oeuvre. In such a case, the party will be paid a fee for their service. On ordinary projects - it is generally the architect who will take on this role. As projects become larger and more specialist. The role may be passed to a gros oeuvre or pilote. It is generally less common for a gros oeuvre contractor to take on this role - its predominantly the architect or the pilote. The details of the site management is not taught to our graduates. This role is left up to the graduates employees, when they are first employed.
7	What has to be improved in France is the management and cost control involved in the building process.
8	The function of the pilotage can be done by an independent pilote, which is usually on large complex natured projects; whilst on simple, small and medium sized projects the architect of the contractor would perform this function. Increasingly contractors responsible for the gros oeuvre will also carry out the role of the pilote.

Interview	Table B3(vii): France Verification of Competencies: Construction Production
1	competencies exist.
2	competencies exist.
3	The contractor will often subcontract a substantial amount of their work to other contracts, but he retains overall responsibility for the construction of the works they are contracted to perform.
4	Competencies exist. There are many small specialist contractors. The general mentality in building is quite different from the UK, for example if there is a slight change to the design, often the contractors will absorb such changes at no extra cost to the client. On large changes, the client will claim for variations - but the whole system seems to be far less adversarial. (Generalisation) Contractors seem to be well aware that when work start on site there are going to be changes, which could only be seen once you start work. There seems to be a more team orientated approach and "good faith" and generally less involvement with lawyers. Specialist trade based contractors are extensively used to carry out the works as it is considered that the result is that you get a better quality building. Extensive use is made of subcontracting. The majority of contractors in France are small trade/craft based so this system has been perpetuates by the structure of the industry. Most of the medium sized contractors are large specialists, or subcontractors of large companies.
5	The general contractor will take the risk of both time and cost certainty, but it is usually to the determent of the project design. This system incorporates many subcontractors.
6	Contractors will often subcontract a substantial amount of their work, but they retains overall responsibility for the construction of their works.
7	It is common for the contractor who will build the (or part of the) project to be involved in the design process. In France at tender stage, it is the contractors responsibility to make sure that the drawings, specifications and quantities provided by the client all match up. This responsibility lies clearly with the contractor. The quantities which are produced by the economiste are not contractually binding. This is why there has not been a real tradition of the clients team producing their own separate qualities. This role has been performed by contractors who agree a lump sum price for their works. However, with the increased requirement for pre-contract price certainty, this is now becoming a necessity for the economist to conduct. Also by doing so, each contractor will be providing the same document. The down side to this is that designs must be completed before tender stage, and it precludes contractors involvement. Traditionally, tender analysis is a long process in France, as each individual tender must be evaluated on design and price. The contractor in France is not allowed to modify the tender documents, but is however allowed to provide options - which is a strong feature of the French industry. The contractor is considered to be the expert when it comes to construction. Once the tender analysis has been carried out, the appropriate contractor is selected, and a process of negotiation will commence. This is also important in France; you will negotiate the price with the most suitable contractor; (As a principle we tell our clients not to go with the lowest contractor, however the client will often go to the cheapest - depending it they have the extra money) In the private sector however clients usually have to select the lowest bidder due to accountability. this involves asking the contractor to quote a price on which he is not interested in doing the work. This is the contractors "best" (lowest possible) price - once negotiation has been started the contractor is also requested to check the quantities, and on their last offer they will also inform the client that you are accepting the quantities so they become the contractors firm quantities. This stops the contractor from claiming extras once they have been appointed. Many of the major contractors are also manufacturers - this means that they have two distinctive roles and methods of working within the industry.

8	competencies exist.

Interview	Table B3(viii): France Verification of Competencies: Allocation of Risk
1	competencies exist.
2	competencies exist.
3	There are various forms of contract for the public and private sector. The private sector are recommended to follow forms. In the public sector there are various forms; and there are various codes which must be followed the public sector effectively is a model of what occurs in the private sector.
4	competencies exist.
5	competencies exist.
6	Various contract are available for public and private sector work. The private sector are recommended to follow forms. In the public sector there are various forms; and there are various codes which must be followed the public sector effectively is a model of what occurs in the private sector.
7	competencies exist.
8	Standard forms of contract exist in France but they are not like their Uk counterparts. In France there is a general contract which is similar to JCT 80, and there is a standardised document known as the CCAG which covers all aspects of all projects; so it can only be used as a very general document. This document will be superseded by the CCAP - which details the particulars of the specific building project in question. There is a mixture of contractual matters including start and completion dates, penalty clauses and prelims (site huting, drainage, storage etc.). These documents are very straight forward and easy to understand, with a limited amount of legal and technical terminology.

Interview Number	India Interviews Name and Company
1	Mr Arun Singh (Masons Solicitors), London
2	Mr Rao (Nicmar), Bombay.
3	Mr T S Kashyap (Management Consultant) Bangalore
4	Mr T Srikanth Bhagarat (Financier) Bangalore
5	Mr Shimms Jagislam (Management Consultant), Bangalore
6	Mr M Romonias (Client), Bangalore
7	Mr Nainesh Jaisingh (ANZ Bank), Bangalore
8	Mr R Vishwanathan (Client), Bombay
9	Mr A Nagabushana Rau (Nicmar), Bangalore
10	Mr K V Harsha Babu (Architect), Bangalore
11	Mr M S Ramaswany (Engineer), Bangalore
12	Mr M K Vishwanath (Nicmar), Bombay
13	Mr Kulkami (Nicmar and MBAI), Bombay
14	Mr Choudhury (Contractor) and MBAI), Bombay
15	Mr Abhjit Tanna (Contractor & MBAI), Bombay
16	Mr Beji E Billimoria (Contractor & MBAI), Bombay

Interview	Table B4(i): India Verification of Competencies: Initiator/Promoter
1	Government Public Clients, Central, State, Local Government, Private Clients, Commercial, Retail, Industrial, Residential.
2	Public and Private Clients; Limited availability of France. Late design changes by clients, poor supply of materials, transportation and Mobilisation problems, labour unions - all affect the clients ability to start the job. Major client is public sector - but now changing due to privatisation policies of (1991).
3	-
4	Land Acquisition is a key issue and landowners in major cities are in a very powerful position and can make or break a development.
5	-
6	Acquisition or ownership of land is crucially important:- land is usually the most expensive and important part of the development process.
7	-
8	Competency available.
9	Competency available: limited finance - but Housing Development Finance Corporation (HDFC) helping to secure finance for public and private housing. Late site acquisition/handover of site by clients is a problem. Late design changes by clients. Many public sector projects are started without adequate analysis and assessment of the cash flows required. No one tends to analyse the long-term financial commitment required for projects and so they tend to run out of money (particularly in the public sector). With India's continual social/economic and political problems finance is often diverted from construction to other areas in the economy.
10	Competencies generally available: majority of work in the public sector, but the private sector is increasing. There are often financial problems particularly in the public sector in terms of availability, getting finance on time, late payments and running out of funds for construction.
11	Competencies are available - majority of work is in the public sector - but privatisation policies has led to the private sector playing a more influential role in the construction industry. Finance is however a problem - there is often large cost and time delays on projects. Government departments all have their own in house QS's, Architects and Engineering departments who have traditional done all the work. Increasingly private consultants are being appointed. Clients are often reluctant to pay the full fees charged by consultants - and this has the effect of consultants passing extra liabilities back to the client.
12	Competencies of clients are available with the public sector being traditionally the major client in the industry, although the private sector is becoming more influential. The lack of finance is a major "bottleneck" in the industry. The paying capacity of clients is law. Clients don't have much finance so construction systems which are affordable to clients must be introduced. The supply of materials (particularly cement and steel) which have been controlled by the government were always in demand and were the cause of delays. Transportation problems across India have also affected the supply of materials and the delays on projects. Late changes by clients and poor planning result in delays on projects.
13	Competencies available. Predominantly work is executed by the public sector. The private sector has been increasingly involved in the construction of infrastructure for large projects foreign finance is provided to assist developments (particularly on BOT projects).

14	Most of the building work is carried out by the private sector, with the public sector concentrating on infrastructure. The availability and flow of finance is a major problem in the building process. Construction is not considered as an industry which results in problems obtaining finance for projects. Land acquisition is the key to obtaining or getting building work started in this country. It is also difficult to obtain skilled qualified labour,as a result of this shortage the quality of our buildings suffers.
15	Competencies available, but lack of finance, management skills and skilled labour is a problem within the industry. Government finance frequently runs out during construction, whilst private finance is usually charged at high interest rates. Land acquisition is of major importance as this is often the most expensive part of the development process. Finally late design changes by the client are a major problem.
16	Competency available in the private and public sector. It is difficult to acquire and maintain a flow of finance in both public and private projects. Management and coordination skills are limited within the industry.

Interview	Table B4(ii): India Verification of Competency: Fund
1	Government Finance - 8 year National Plans, International aid - World Bank, United Nations. Private Finance - Banks, Private Money lenders, Personal Savings.
2	Lack of Government Finance for infrastructure projects and building work. Generally finance is provided at either high interest rates - or its supply will be unpredictable - difficult to guarantee in our economy. Consider construction as a "risky" business therefore reluctant to provide finance.
3	Finance is difficult to secure and equitable rates.
4	Key problem in the industry is availability of finance and to lend it at equitable rates. Banks lend at high interest rates.
5	Securing finance is a major problem; private clients are faced with limited avenues to require finance - which is at high interest rates. In the public sector there is the problem of raising and maintaining the flow of finance for projects. If there are any economic problems or other sectors of the economy requiring finance; it is usually taken from the governments construction budget. This is a major reason for time and cost problems in India.
6	Lack of finance for projects is a major problem. In the public sector there is no adequate budgeting support to maintain a continual flow of finance on projects. We need to ensure a steady flow of finance to a project once it has commenced. In the private sector the problem is acquisition of finance. High interest rates are charged along with strict lending arrangements.
7	Finance and its acquisition is a problem. Our financial institutions are still developing and are cautious about lending for construction; its considered to be a risky business so the arrangements on loans are stringent with high interest rates.
8	Lack of adequate construction finance; insufficient availability of finance; and unguaranteed supply. If there are any political or national problems finance is out to construction and projects are abandoned or delayed. In the private sector there is the problem of securing finance at reasonable rates.
9	Finance is a very big problem, public departments do not have adequate flows of finance. Down payments are often obtained from tenants before construction of buildings in the private sector are commenced, with periodic payments being made during the construction of the project. This provides a key source of finance for developers/constructors.
10	Availability and flow of finance is a problem. Banks and private money lenders charge high interest rates on loans. Further development is required in this sector.
11	There has recently been the emergence of new finance institutions for construction. Traditionally finance has been difficult to secure from Banks. New finance institutions are however in an embryonic stage of development.
12	Sources of finance include Government, Banks and Private money lenders. Pension Funds and insurance companies don't provide finance for construction. Banks charge high rates on loans and are reluctant to provide finance for construction, particularly as consultancy is not regarded as an "industry". The lack of finance causes major bottlenecks within the industry. Down payments schemes have been introduced by property developers to provide finance for projects. Tenants are required to make down payments for properties before they are constructed. Private sector finance is predominantly provided by Banks, Private Money lenders or in house finance. If this issue is not addressed, the industry will stay in the same state of development.

13	Finance is available but at high interest rates in the private sector. Financial systems are generally rigid resulting in being difficult to obtain funding for construction. Foreign finance is obtained for major projects - particularly for infrastructure works. The supply and availability of finance is limited because construction is considered to be a risky business. The acquisition and ownership of land is vital in any development. It is the most expensive part of the development process.
14	Majority of finance for public sector comes from the government raised through taxation and fiscal policy. A major reason for delays in projects in the public sector is due to "financial bottlenecks". The Indian government are faced with numerous national problems which require finance so money is shifted from construction work to such emergency areas. Finance in the private sector is difficult to obtain because construction is not considered as an industry. Obviously finance as well as getting at rates which are affordable to the industry are key issues which must be considered. Legislation should be used to facilitate the allocation of finance to construction on a continual, long term basis.
15	Lack of finance is a substantial issue affecting the operation of the construction industry. Banks do provide finance for building work, but it is limited and not openly available and is charged at high rates of interest. Black money is often used in the industry. In government financial projects the supply of funds are often cut due to the governments priorities frequently changing. Access and availability of short and long term finance is a problem.
16	Finance is available from Government sources and Banks. Private finance is difficult to secure and is only provided at high rates of interest. The supply of finance for public projects is often diverted to more important or emergency projects/circumstances. The Housing Development Finance Corporation provide finance for low cost housing.

Interview	Table B4(iii): India Verification of Competency: Concept Design
1	Architects produced concept/detailed design. Engineers produce structural design/site supervision. QS - price design work.
2	Competency Available - architects.
3	Competencies available.
4	Competencies exist.
5	Competencies exist.
6	Competency available.
7	Competencies exist.
8	Competency available.
9	Competency available: Architect will produce clients brief, concept and save detailed design, obtain necessary approves and meeting design standards. Also involved with tender documentation, evaluation, analysis and certification of payments (usually done with assistance of QS). In rural areas designs are frequently done by unregistered architects/engineers. Designs are often produced in these cases by the client or constructor. Independent consultants are not really appointed unless it is a major/large project.
10	Competencies are available. Technically architects are trained to high standards. Architect has been involved in producing the brief, concept and detailed design, often being the team leader. They are now a team member. Although architects were given good technical education their skills in management, co-ordination, planning and supervision has been limited, which has been a major problem in the industry. Traditionally there were few qualified registered architects, anyone with an interest in architecture calls himself an architect. This is however not the case now. The role of the architect often includes site selection, appointment of consultants, production of brief, concept and detailed design, tender documentation and analysis.
11	Concept design competencies are in place - architects are involved in producing the brief and concept designs. They however lack management and planning skills. There is no definitive structure of the role of professionals in the industry. The architect will often be required to carry out a multitude of tasks which he may not be qualified to do.
12	Competencies are available. Architect is involved with production of the brief, concept and detailed design, contract administration and tendering. The architect appoints a QS to provide cost advice and will be responsible for obtaining permissions and certificates for development.
13	Competencies are available.

14	Competencies exist: Architects and engineers are technically well qualified carrying out the briefing and design, and tendering process. A major shortcoming is the lack of management training for construction consultants. The architect is involved in producing the brief, concept design, getting all necessary statutory approvals, detailed design and tender documentation. Initial cost advice is provided by the QS.
15	Competency available: the Architect is often involved in land acquisition, brief production, concept and detailed design, tender documentation, tender analysis and evaluation and post contract administration including supervision of the works and certification of payments. The architect is responsible for obtaining all the necessary approvals and meeting statutory regulations. The architect will often employ a QS and Engineer to provide cost advice and produce structural designs respectively.
16	Design competencies are available; technical skills are available however managerial and co-ordination skills are limited within the industry.

Interview	Table B4(iv): India Verification of Competency: Detailed Design
1	Architects involved in Detailed with Engineers.
2	Competency available - Architects/Engineers.
3	Competencies available.
4	Competencies available.
5	-
6	Competency available.
7	-
8	Competency available.
9	Competency available. Architect of Engineer involved in detailed design; Engineer involved in structural details translating the architects drawings into detailed designs and working drawings.
10	Competencies in place. Architects usually carry out detailed design assisted by engineers who are involved in structural detailed drawings and working drawings. Engineers also take a supervisory role on site checking that the contractor has followed the design specifications.
11	Engineer will produce all of the structural details and specifications from the architects detailed designs. Architect is often involved in producing detailed designs also.
12	Competencies available. The architect is frequently involved with detailed design with engineers who are responsible for structural design and producing working drawings.
13	Competencies available.
14	Competencies available: provided by the architect and engineer who is extensively involved in producing structural details and working drawings.
15	Competencies available - however the management aid co-ordination skills are not traditionally taught to design consultants.
16	Competencies available.

Interview	Table B4(v): India Verification of Competency: Specialist Design
1	Competency Available: Specialist Engineers/Contractors.
2	Ccompetencies available.
3	Competencies available.
4	Competencies available.
5	-
6	Competency available.
7	Competencies available.
8	Competency available.
9	Competency exists in Specialist Engineers or Vendor Contractors who often manufacture, supply and construct a specialist element of the structure.
10	Specialist Engineers (M & E, & Air Conditioning) will be appointed to design specialist elements of the works.
11	Predominantly M & E of Air Conditioning Engineers are used to design specialist details. Vendor contracts (who design manufacture, supply and install) equipment are also used.
12	Competency available; Specialist Engineers are involved in designing specialist elements of the structure. Vendor contracts also design specialist elements such as air conditioning and lifts.
13	Competency available.
14	Competency is provided by Specialist Engineers and vendor contractors.
15	Competencies available through Vendor Contractors and Specialist Engineers.
16	Competencies available.

Interview	Table B4(vi): India Verification of Competency: Management of Construction
1	General contracts manage and co-ordinate sub-contractors on site. Poor Project Management and Construction Management skills.
2	Greater level of management and overall planning and co-ordination required - competency provided by large Indian contractors. Especially lacking in the public sector.
3	Inadequate management skills exist. There are not enough consultants or experienced contracts who have management skills. The problem is that it is difficult to get clients to understand the importance of management skills and employ management consultants. They just look at us as an additional fee and tend to believe that other consultants like engineers and architects should provide this service -but they are not training to do so.
4	Competency not available.
5	Management is a great problem. Adequate attention is not given to the processes of planning, programming, co-ordination and general project management.
6	Inadequate construction or project management skills and experience. More management skills are need in the industry. There are few professionals who are qualified and experienced to be involved in the planning, co-ordination, programming and are all management of construction projects in India.
7	Competency not available.
8	There is inadequate experienced management staff in the industry. For too long the whole managerial, co-ordinating, programming and planning roles have been neglected. International managers are being used on local large projects, because local staff have not got the skills or expertise.
9	There are few named experienced managers within the construction industry. The problems of the industry are concentrated around the inadequate management, planning and co-ordination of works. We have experienced qualified technical staff, but we lack the techniques and general understanding of the management of construction. Contracts do not plan work adequately and do not have technical experienced management staff 'inhouse'. We should not just adopt American or UK management systems as they are not carved to our environment, what is required is for us to develop our own form of management which is appropriate to our industry. There is limited registration of contracts for public sector works, with each public works department being its own set of licensed contractors for particular types of projects.
10	Adequate skills are not available in the management planning, co-ordination and supervision of construction work in India. This has been a major problem.
11	Major problems in the industry are the planning, co-ordination and management of projects. Management is a problem as no professional is trained adequately to do it. The emergence of Project or Construction Management Consultants has recently trickled into India - however such contractors are only appointed on large complex projects - and in general they are not used.
12	Management and planning skills are poorly distributed in the industry. As projects become more complex the co-ordination, planning and management of such projects becomes more important, however there is a limited supply of these skills in the industry.
13	Management skills are deficient within the industry.

14	There is lack of adequate management planning, organisation and co-ordination skills training for construction practitioners. There is no formal training in this area. Neither the architect nor the engineer has skills in this area, they are technically educated. In India there has never been a professional that has taken on this role - the client passes the management role to the architect, the architect passes it to the engineer, the engineer to the site supervisor, the site supervisor to the contractor and the contractor to their sub-contractors. No one wants, or considers it their duty to assume the responsibility to manage the construction process. Management consultants are emerging in the industry - but they are still not functioning well. This is because clients and management consultants have different priorities. The client wants the building completed as quickly as possible, whilst the management consultants are concerned with planning, co-ordination and management of the construction process. Indian clients don't want to pay fees for these services as they consider that it should be done by existing consultants. Skills are being imported through joint ventures with international companies.
15	Poor management, planning and co-ordination skills within the industry are a major drawback to its development. Consultants are currently not trained in this area during their technical educations. The importance of management in construction is being highlighted as new courses and training programmes are being established. There has recently been the establishment of Project Management Consultants (PMC's) within the industry who are providing these skills - however there are only few trained consultants. It has traditionally been assumed that the general contractor takes on this management role, however contractors have tended to be largely illiterate with only construction experience rather than formal technical or managerial education.
16	Construction management training is required within the industry. There is no real management skills within the industry. The number of skilled professionals within the industry is depleting due to their movement to more lucrative areas of employment. More skilled practitioners are required within the industry which may only be achieved by introducing more training programmes. The whole area of management in construction industry needs to be investigated and developed.

Interview	Table B4(viii): India Verification of Competency: Constructor Producer
1	Small trade based contractors - small firms.
2	Traditional materials of construction techniques, labour intensive, lack of prefabrication (as they are classed as manufactured products therefore liable for taxes), labour only subcontractors working for general contractors, - traditionally a shortage in the supply of materials particularly cement and steel. General contracts, vendors and piecework contracts exist.
3	Competency available but generally limited skilled labour.
4	Competency available.
5	Competency available but poor standards.
6	Competency available but poor standards.
7	-
8	Competency available but in limited supply. There are few skilled workers within the industry.
9	There are many small labour only sub-contractors who work for general contracts pending specialist labour skills. However the level of skills in the industry is neglected and is relatively low. Specialist contracts (vendors) also exist who provide both materials labour and plant for specialist areas of work. The majority of companies have less than four employees - often only with 1 employee. The availability of materials and plant is often restricted (particularly cement and steel). The skills basis for construction workers is limited; traditionally skills were passed down from father to son - the industry is saturated by poorly housed and badly skilled workers. Most of the trained staff have moved to countries which offer better opportunities.
10	Competencies available but there is a shortage of supply of skilled labour: general contracts, vendors and pieceworkers.
11	Quality is a problem primarily due to the lack of skilled labour and materials: general contracts carry out major projects providing materials and plant, employing piece work contracts (labour only sub-contractors) and vendor contracts to carry out the construction work.
12	General contracts, vendors and piecework contractors. Piecework contractors are often trade based, labour only contracts with the general contractor providing plant and materials. Vendors often manufacture, supply and fix specialist elements of a building. A major problem is that construction is not recognised or organised as an industry. There is a need for improved planning, regulation and registration of contracts along with working methods in the industry.
13	General, vendor and piecework contracts exist. Materials are supplied by the general contract with the pieceworkers providing labour. There is a shortage of skilled workers within the industry coupled with a shortage of materials.

14	Contractors and trade contracts have limited or no formal education or training. Their skills have been passed down from father to son, with no organised form of certification or qualification. The lack of skilled labour has resulted in poor quality work, time overruns, many of the 'local practitioners' are passed down from father to son. The construction methods which are used are labour intensive to make use of the excess supply of labour in India. General contracts, pieceworkers and vendor contracts exist in the industry.
15	There has traditionally been poor education of construction workers - with skills being informally learnt on site. Construction work is executed by general contracts, pieceworkers and vendor contracts.
16	Construction is carried out by general contracts, piece works and vendor contractors. There is a lack of skilled workers within the industry. Skills have traditionally passed down from father to son on construction sites - this is no longer the case, and no formal training institutions exist. There is additionally a poor supply of materials and plant. The most traditional arrangement was the existence of piecework contracts, however more recently there has been the development of general contracts in the industry. Contracting organisations are becoming more experienced and competent and they are still developing.

Interview	Table B4(viii): India Verification of Competency: Allocation of Risk
1	Documents originate from RIA 63 - weighted towards the client - imposed/adopted with little modification.
2	Originate from UK RIA 1963: although standard they are often modified on each project, and located to suit the clients interests. Standard contracts are produced by each state authority, but are generally composed of a patchwork of contracts - mixed to suit the local market. Contract documents are not too important as we rely upon personal contracts and relationships. Unethical practices are a vital part of contracting: accountability is not very high.
3	Contracts available but they are adopted from Western countries.
4	-
5	Contracts are designed for each client with little standardisation.
6	-
7	-
8	Contracts are designed to be specific for each client.
9	The contract documents used have often been adopted or imposed from the UK. The tradition of using colonial contracts and FDIC (used by the World Bank) is not appropriate. These documents are not adopted to our working environment. This is a key issue. We are now beginning to develop our own systems, but we are working in an environment which has been following a British structure of working and UK forms of contract. Fair and equitable contracts need to be developed. The old boy-network and political connections in the industry are very important. The more influential your contracts the better your progress. Corruption is a problem in this country, as in other nations. The problem is manifested by the level of bureaucracy and status and the low rewards given to individuals.
10	Contracts used are adopted from RIA 1963 and FDIC. There are no standard forms of contract which are used nationally, but it is in the process of being implemented.
11	Each government department and architectural practice produce their own individual forms of contract which are based on JCT(63) with individual modifications. Clients tend to pick up clauses from the various contracts available and make up their own document to suit their own interests.
12	There is no national accepted standard contract document used in India, although the Master Builders Association of India has established a contract which is currently being reviewed by the Government of India. Currently each government department will produce its own specific contract. Current contracts are based on RIA 1963 and FDIC contracts, recommended to suit individual clients interests. Due to India's colonial history, many of the contracts and aspects of our legal system has been adopted from the UK.
13	No standard contract conditions exist. State and local public works departments have drafted their own documents which are an amalgamation of RIA 63 and FDIC 1, 2 and 3 contracts. In the private sector it is often left up to the architect to draw up contract documents. These are often backed in favour of the client.

14	Different Public Works Departments have their own specific standard contracts. Each Ministry within the government produces standard contracts both at state and central level. These are based on amalgamation of RIA 1963 and FDIC contracts. These are usually pro client rather than contractor. Many contract conditions, standards and working conditions have been inherited from the British during their role in India. Even our legal structure has its roots in British laws.
15	Construction contracts are produced by various government departments and private practices which are an amalgamation of RIA 1963 and FDIC contracts. There are not always written contracts to carry out the works. On large projects there would be but for small/medium sized contracts, written contracts may not be used. It is based on good faith and trust between the parties. Verbal agreements are often used. Litigation in the construction industry in India is not that apparent. Alternative dispute resolution systems like arbitration are made use of rather than litigation.
16	Standard forms of contract are produced by each public works department. The Indian Institute of Architects also produces a standard private sector contract which is similar to RIA 1963. There is no nationally accepted standard form of contract.

Interview Number	Malaysia Interviews Name and Company
1	Ms Mizon Rung, QS Senior Lecturer, University of Technology Malaysia, Johar Baru.
2	Mr Mohameddin, QS Lecturer, Johar Baru.
3	Mr Mike McIver, Director, Plus 3 Consultants, Kuala Lumpur.
4	Dr George Ofori, National University of Singapore.
5	Mr Lenard Kok, Executive Director, J R Knowles Malaysia, Kuala Lumpur.
6	Mr M Milford, John Laing International, Commercial Director, Malaysia, Kuala Lumpur.
7	Ms I Khatjah BT Mohd Al Piah, Public Works Department, Senior Architect, Kuala Lumpur
8	Mr Abdullah Bin Che Mat, Public Works Department, Quantity Surveying Department & Board of Surveyors, Kuala Lumpur.
9	Mr Bruce Schlautzer, Project Manager for Bovis International, K L Towers, Kuala Lumpur.
10	Mr Abdullah Bin Che Mat, Chartered Quantity Surveyors & Institute of Surveyors, Kuala Lumpur.
11	Mr Abd Shahar Abd Karim and Mr Khairuddin Bin Abdul Rashid, Construction Industry Development Board, Kuala Lumpur.
12	Mr Shar Ipuddin Muis and Lawrence Hokhai Toon, Master Builders Association Malaysia, Executive Officers, Kuala Lumpur.
13	Mr Abdul Rohman, Promot Consultants, Architect, Kuala Lumpur
14	Mr Tay Toong Soong, Baharuddin Ali and low Sdn, Kuala Lumpur
15	Mr Lai (Director), Davis Langdon & Seah, Kuala Lumpur.
16	Mr Rosden, Head of Department (Surveying) University Technology Malaysia, Principle Lecturer/QS, Kuala Lumpur

Interview	Table B5(i): Malaysia Verification of Competency: Initiator/Promoter
1	As yet there is no independent body which provides advice for clients on how to obtain buildings however the CIBD may take on this role. Malaysian clients in general are not risk takers, they tend to be risk adverse. Competency Exists.
2	Competency Exists.
3	Major client is the public sector, but the private sector is developing rapidly. The experienced clients should not be underestimated in Malaysia.
4	Competencies exist in the public and private sector.
5	Malaysian clients tend to be risk adverse clients. Clients want contractors to bear the majority of risks within projects. Its a growing economy and at present the newest or the largest client type are the 'developers' - who are new and inexperienced clients. Competencies exist.
6	There are few expert clients within the industry , with the majority of clients being inexperienced developers. There tends to be a lot of diversification of business activities by clients so they may be in the car sales industry one day, and by the next, they may have also decided to venture into property development. The construction/property market is very attractive at present so its an industry that many clients want to enter into. Everyone wants to be on The Malaysian Stock Exchange at present, and one of the criteria for doing so is to have a large turnover. Having a property development arm to a company is considered to be the quickest and most effective way of doing this. This in effect creates business groups as a company begins to diversify into many activities, and keeps all the services required within its own business groupings. There is no independent group providing clients with information on how to procure buildings. Personal contracts and your connections are very important within the industry. In general long term, trusting business relationships are important, and this is a common characteristic of South-East Asia. The risk averse nature of the people does influence the historical development or prominence of a particular system. The greater sophistication and experience of clients will also result in the development of new procurement techniques as they become dissatisfied with the conventional approach. Competencies exist.
7	Competencies exist. The private sector in Malaysia is more experimental than the public sector. In the PWD we have to stick closely to set procedures and ways of implementing projects. Such stringent procedures are not set out in the private sector. As client profiles become more sophisticated, along with the economic activity, new procurement systems will develop, allowing more involvement of the client, quicker total building delivery periods and variations in risk allocation.
8	Clients within our industry are generally risk averse and are inexperienced, although the number of experienced clients is continually growing. The use of D & B/Turnkey contractors within the industry has been promoted because it is potentially faster then the conventional approach - and passes all the risks of the project to the 'other party' (the contractor). Where speed is a factor - D & B is used, whereas lump sum conventional approach is usually far more design orientated projects. Clients are not technologically minded and are relatively inexperienced

9	The level of experience of Malaysian clients varies from a few who are highly experienced to many who are inexperienced. The majority of clients are inexperienced. Clients here are only inexperienced technically; in terms of negotiation, business sense they are highly developed. Even though the client on this project is relatively inexperienced, they are willing and prepared to take an active role in the running of the project. Understanding the characteristics of the market is vital for success here. At present the market is buoyant, but this is won't be the case forever. As clients begin to analyse how to carry risk and the best way to distribute it, new procurement approaches will emerge within the industry. Time/cost trade offs are considered here - but they are not as important as in the UK - but this is a function of the economy and the level of economic activity. As the level of client sophistication and their requirements increase, engineers and architects are more openly challenged by the industry to provide services that are wanted, rather than providing what they perceive clients want. The designers still feel that they are the kings of the industry and should be obeyed at all costs. They have been traditionally involved in making the decisions for the client.
10	The majority of construction clients have been inexperienced but the profile has changed since the last recession in the mid 1980's. The property sector is a good form of investment and so has attracted a whole range of new clients. In the late 70's there was mass development, lots of lending by banks and then there was the big collapse of the economy. After this period a lot of companies went bust and the remainder became more aware of the industry and its character. The majority of clients within the industry are inexperienced. However as the industry becomes more active, and projects are becoming more complex, clients are gaining experience and sophistication. The Malaysian Industry has been developing very fast, becoming more sophisticated, clients are becoming more knowledgable, are appointing more professional consultants and there has been a surge in information technology into the industry.
11	The nature of our clients are essentially risk-adverse so I believe that management contacting and construction management will not take off as they do not adequately place risk with a single party in the contract (ie not the client). Additionally the organisational framework of the contracting and subcontracting sector needs to be further developed in order to use management orientated systems. Subcontractors and contractors do not know how to manage, co-ordinate and plan adequately well enough to use such procurement options. The client does not have much protection within the industry and this is especially true for house owners. Large commercial clients are relatively safe as they are large clients and have power within the industry. The client is currently the single party within the industry which is suffering the most and getting the worst deal. The setting up of the CIDB is a primary step to assist and safeguard clients from further problems within the industry. The National Consumers Association is also beginning to assist clients. Competencies exist.
12	The profile of clients is that they are relatively inexperienced, and risk averse, and tend to want to pass risk to the contractors. The trend is however changing the size of projects or becoming bigger and more complex, which will require foreign capital, technology and expertise. This is how we will learn new methods of procurement. The employment of foreign consultants, joint venture and working with foreign companies is helping with the process of technology transfer. The client basis in Malaysia is continually growing and becoming more sophisticated but at present the majority of clients are inexperienced. The country is moving towards developed status and the majority of "urban" clients are well educated and know what they want, and how to get it.
13	The majority of clients are inexperienced - however the large clients from big corporations are experienced and have their own consultancy/design departments. The majority of clients are small and therefore inexperienced and rely on the advice provided to them by their appointed consultants. Private clients tend to approach architects first to produce their briefs and concept design, as well as advice on procurement.

14	Most of the clients are inexperienced, however more sophisticated clients which build regularly are experienced within the industry (such as develops/Corporate Clients). Large clients tend to have their own consultants in house - however the majority who are inexperienced clients rely upon appointed consultants to provide advice (usually an Architect). As projects become more sophisticated, and clients experience becomes wider, more risk orientated, and better and more sophisticated procurement systems will be observed within the industry. Our company is receptive to these changes, but on the whole the industry is still resistant to change. They have to stick to systems that they are used to.
15	Competencies exist. There are limited clients who are sophisticated and experienced enough to implement such procurement options, accepting the associated risks.
16	Competencies exist.

Interview	Table B5(ii): Malaysia Verification of Competency: Fund
1	Competencies exist but the finance sector has traditionally been quite reluctant to provide capital for the construction industry as it is considered to be a risky industry.
2	Public and private sector finance is available.
3	Finance institutions, at present, due to the perceived buoyancy of the market look favourably upon the construction industry and are willing to provide finance for construction. If its a reasonable project, and a reasonable feasibility study is done, then banks are quite receptive to building proposals.
4	Competencies exist.
5	Competency available. With the recent privatisation policy more private sector sources have come forward to support construction, however it is still mostly banks which assist the industry.
6	The financial organisations in Malaysia are well developed, and quite aggressive and there has been a track record of sustained growth within the economy with construction being one of the key areas and consequently finance houses are prepared to lend money for construction. There is presently a "Boom Boom" scenario here - but this may change in a few years, leaving the country in problems.
7	Competencies exist.
8	Competencies exist.
9	Competencies exist.
10	The trend in Malaysia is that the government is promoting a privatisation policy and the new concept which is being advocated is BOT or BOO or BLT. Competencies exist.
11	Public sector traditionally provided finance, but the private sector is playing an important role. Competencies exist.
12	Competencies exist.
13	Competencies exist.
14	Finance institutions tend to look favourably towards the construction industry; especially banks who are the major funders of projects. Financiers look at the potential of the development, and if its a sound proposal they are willing to give finance. During the recession there were many construction projects which were abandoned around Malaysia due to the contractors/clients going into financial difficulty. Banks and governments were providing low interest loans to try and attract clients and contractors back to these projects to complete them. (The National Bank was involved in this instance).
15	Public and private sector competencies exist.

16	The relationship between the financial institutions and the industry is purely a commercial one - there is no real incentive to assist the industry. The government have imposed a low interest rate for public housing, and have special projects which will be exempt from taxes and levies eg hotel projects build before 1998 (which is done to boost tourism).

Interview	Table B5(iii): Malaysia Verification of Competency: Concept Design
1	Competency available.
2	Competencies exist, and are imported thorough the use of foreign architects.
3	Competencies exist.
4	Competencies exist or if a particular design is required then foreign architects are used with local architects.
5	Competencies exist.
6	If several designers are appointed such as a concept, detailed and specialist designer, it is often the case that they will all be individually required to enter into contracts with the client. Clients are generally reluctant to have 1 lead designer. For large complex buildings or for prestigious structures it is now quite common for foreign architects to be appointed to produce concept design and local design teams to produce detailed designs and associated specifications. The major building collapse in 1992 - The Highland Towers has resulted in a noticeable increase in the amount of attention being paid to equality and workmanship. This disaster resulted in the introduction of a certification system: bring about a greater regulation and policing of design control (in terms of initial design approval and completion in accordance to design details). There is now a certificate of fitness which all buildings are required to have at the point of handover. Prior to this disaster the situation was quite low. A professional engineer is now required to sign off the building, approving that the building has been built in accordance with the approved designs. The engineer by doing so takes the liability for the completed project.
7	The PWD design department under the conventional approach will be involved in producing the public client's (the particular ministry/departments) brief and then translating this into concept and detailed designs. The role of the architect has been important within the industry and particularly in the private sector, where they are the "supervisory officer" in the contract -in effect they are the leaders of the industry and are given a degree of power within the industry. In the public sector however the supervisor may be an architect/engineer or other consultant -the primary role of the architect is therefore to design.
8	In the public sector all design work is usually carried out by the PWD design departments who are employed by the respective public body (client) to design the structure. These design departments will be involved in producing the clients brief, concept and detailed design. In the case of D & B the PWD design department will be involved in the production of the clients brief and concept design, whilst the contractor will be involved in the production of detailed designs. With regards specialist designs, if the design department cannot provide the information, a contractor may be asked to design the element, (with a performance specification) or an external design consultant will be appointed . The majority of projects undertaken by the PWD are based on standardised designs.
9	Many have been educated abroad. When designing in developing countries, architects and designers tend to over design the work as they know that it will be compensated by the contractor on site. Therefore to maintain safety requirements, buildings tend to be over designed. This indicates that the profession has adapted itself to its market place; and consequently it is not pushing itself to grow in terms of the leading edge of technology or concentrating an international construction/design methods, such as sophisticated construction technology methods. There is a strong attitude towards learning of foreign consultants and this is reflected in the keen interest and support provided by indigenous clients and staff.

10	The architect will produce the client's brief, concept designs and provide information on procurement.
11	Competencies are available. The architect is predominantly responsible for concept design and will also be involved in detailed design with the assistance of engineers - mechanical, electrical, structural, etc. The architect can often recommend the appointment of a QS and/or engineers or the client himself may appoint all consultants independently. There are many regulations which dictate the quality and standard of workmanship within the industry but the biggest problem is the enforcement of such regulations. There are many administrative procedures, guidelines and regulations but they are not fully or adequately enforced. Indeed the problem is further compounded by each local authority having its own specific notes and regulations - resulting in further confusion and fragmentation of the industry. There is no uniformity of the industry; for example if you are building in the city centre then you must go to the City Council to get the required approvals. If you are building in the suburbs then you must go to the local authority within that suburb who may have different requirements/regulations from the City Council.
12	Competencies exist.
13	Competencies exist.
14	Competencies exist but are also imported when required.
15	Competencies exist.
16	Competencies exist.

Interview	Table B5(iv): Malaysia Verification of Competency: Detailed Design
1	Competency available.
2	Competencies available.
3	Competencies exist.
4	Competencies exist but can be imported by the appointment of foreign architects.
5	Competencies exist.
6	The level of competency of the professionals who are involved in large projects, at the cutting edge of the industry are invariably trained overseas, (The UK, US, Canada and Australia etc) and have the necessary competencies.
7	Competency available.
8	Competency available.
9	Competencies exist but are also imported if required.
10	Competencies exist.
11	Competencies exist.
12	Competencies exist.
13	Competencies exist.
14	Competencies exist, but can also be imported if required.
15	Competencies exist.
16	Competencies exist.

Interview	Table B5(v): Malaysia Verification of Competency: Specialist Design
1	Competencies available.
2	Competency available.
3	Specialist contractors will often design foundations such as pile foundations, retaining walls and will enter into a collateral warranty for their designs with the client.
4	-
5	There are also a group of specialist subcontractors such as M & E contractors and lift installers - who are involved in design, construction and often manufacture of their components. These subcontractors are still in the minority.
6	Specialise contractors are often involved in design of H & V installations, and M & E work.
7	If a specific specialist design potion is required either the PWD will employ an outside design consultant, or the specialist contractor will be given a performance specification and required to carry out the associated design work.
8	Competencies available.
9	Specialist contractors who manufacture and install work are used.
10	Competency exists.
11	M & E and Air conditioning specialist contractors exist who are frequently involved in design.
12	Competency exists.
13	Competency exists.
14	An increasing trend in the industry is to use a contractors design portion supplement in the contract
15	Competency exists.
16	Competency exists.

Interview	Table B5(vi): Malaysia Verification of Competency: Management of Construction
1	Management skills for contractors has tended to be neglected in formal education - it just comes with experience. Most contractors are established and just learn how they manage - with little formal training. A lot of the large companies are still family owned businesses and skills are passed from father to son. Subcontractors generally have poor management skills. Management is a major limitation within the industry. This lack of competence in management extends up to many of the main contractors also.
2	Traditionally there has been poor management skills within the construction industry, however it is changing. There are a lot of JV's being carried out, with Malaysians taking part in the management of construction projects. We are still growing and learning.
3	There is generally a shortage of experienced technical people and graduates within the industry and this invariably results in problems regarding management. There is a constant movement of staff as a small experienced team is usually running a large number of projects.
4	Particular skills in management and coordination is required as there is a distinct lack of such skills within the industry
5	In terms of specialist subcontractors this is not the case - as they have developed their management/planning skills in parallel with their specialist trades. The majority of subcontractors are still trade based, and are not so sophisticated in terms of management. The large contractors are competent in management skills - and carry out some construction work themselves, but tend to subcontract the majority of work out to trade contractors. There is a general difficulty of getting trained skilled tradesmen and keeping them within a company - so it is easier to employ specialists. A major problem remains the coordination and management of the various specialist and trade contractors on site; its often the case that contractors are working over each other which results in delays.
6	The bulk of the industry, at the smaller level is deficient of certain skills, such as management and planning. A new and fashionable consultant to have on a project now is a Project Manager who works for the client: who is responsible for the management and coordination of all aspects of the project including design and the clients consultants. However, in many cases this is more a cosmetic appointment rather than anything else.
7	The level of sophistication in terms of planning, management and co-ordination is quite low - except for the large multi-national companies who are very experienced.
8	The trade based contractors - the smaller companies in the industry and the largest sector of the contractor market generally lack a level of sophistication in management, financial resource and planning. They are trade/craft based organisations. These companies have a knowledge of construction skills and how to physically build, but the implementation process is often unorganised and poorly administered/managed. The lack of management and planning skills has affected the overall running of the construction industry. Companies have been unable to plan their work efficiently, and have relied upon personal relationships to guarantee work. This has resulted in project cost overruns, time delays and poor quality projects, keeping contractors at an inefficient level of growth (this problem is especially true for the Malay contractors rather than the Chinese contractors. The Chinese contractors usually have a good level of training and tend to be skilled construction workers, whilst the Malays tend to have less formal training, more father to son approach. Generally Malay contractors have little formal training, although some training institutes exist nationally to assist in the development of skills. The level of skills within the industry is reflected by the quality of building work). We need to develop the associated skills for that system eg more sophisticated clients, better Management of contracts, increased skills of trade contractors, greater organised and independence of subcontractors within the industry.

9	The current trend is for Project Managers - however if skills were not imported - Malaysian companies would have great difficulty in offering such a service. The markets are "overheated" in Malaysia at present, and design consultants have a lot of work on. Although many of the design consultants have been trained overseas many of them are not comparable, in terms of management expertise, when compared with their foreign counterparts. The art of scheduling, and co-ordination and good management is still yet to be discovered, along with its cost and time saving benefits.
10	Management is not formally taught to the contractors within the industry - they tend to pick it up as they go along. The CIDB is going to introduce a more structured approach to the training of contractors.
11	Competencies are not available.
12	The majority of companies who operate within the industry are family based companies so they incorporate more traditional methods of project management. The more modern companies are using a more sophisticated approach to management. There are no reliable statistics which indicate the size and number of contracting firms which operate within the market. This will be one of the roles of the CIDB.
13	The current trend in the market is to have a Project Manager involved in projects.
14	The industry in Malaysia is set to face a lot of foreign competition, and we must try and keep pace with them. The capability of local contractors is continually improving, as the experience and management skills expand:- they are becoming better organised and soon will be able to undertake large scale projects.
15	The traditional deficiency/problem of contractors in Malaysia has been regarding quality control, safety on site and poor management. The use of management orientated procurement systems is limited by the availability of good management contracting/CM companies - there are only a few firms in the industry with this expertise.
16	The traditional problem with contractors has been poor understanding of management planning and co-ordination and poor financial resources. Quality is a problem - but particularly for public projects due to the inexperience of small contractors (class f) who are encouraged to work on public projects and more importantly, the lack of skilled workers within the industry. The large companies have developed their skills in management and organisation as they have the resources to attract the most skilled and best labour into their organisations.

Interview	Table B5(vii): Malaysia Verification of Competency: Constructor Producer
1	Most of the construction work is carried out by subcontractors, with the main contractors carrying out the structural works. Our construction industry is faced with two constant problems - materials and labour shortage which affects the coordination and running of construction projects. There is a labour shortage as generally the industry has a poor image and people are reluctant to work in construction. As a result many of construction works are foreign.
2	There is a big labour shortage in Malaysia as we have 93% employment. We are lacking between 20-30% of labour and skilled craftsmen we are employing many foreign works as we don't have enough employees in our own country. The biggest problem is the lack of labour. The total number of foreign workers in the country is currently 1.2 million, and we still need more. The chinese have traditionally taken a role in the management of the construction industry, with the Malays being involved in the actual construction work. Subcontractors tend to work through main contractors under their control and management. Consequently they have not developed these skills within their own organisations. Management expertise is lacking, but as projects become more diverse and complex in nature, and more international work is carried out, it is being built up.
3	The main contractors take on the role of planning, coordination and management of the projects and will tend to use sub-contractors to execute the works. The main contracts do not employ any direct labour staff themselves - all work is generally subcontracted. The architect being is the head of the team whilst contractors are at the bottom, being told what to do by the architects and other consultants. Its gradually changing as architects are being increasingly employed by contractors; and so contractors professionalism is rising and their management skills are beginning to improve. They still have a long way to go - this is one of their biggest perceived problems - poor management and planning of projects. The contractor is therefore not recognised as an equivalent member of the team. The contracting system in Malaysia is multi-layered with large contractors on top, followed by specialist sub-contracts and then an array of trade based contractors. The top two strata are highly experienced and generally well developed within the industry. The lower levels there has been a problem of management. This is due to the age profile of the industry - it is generally very young and has limited experience.
4	The construction industry consists of a large number of subcontractors, with the main contractor taking the role of the management contractor (because he is responsible for the management, supervision and coordination of the numerous subcontractors on the site). The historical development of the subcontracting system in Malaysia and Singapore goes back to when these Chinese immigrants came in. When the Chinese entered, they began to learn various trades, and after a while they began to group together, developing trade groups of 4-5 carpenters, plumbers etc. Out of each group would emerge a leader or the head of the group, however they were all friends and equal within the group - it was not a company or a formal legal group. The leader had the responsibility of ensuring that the group was constantly employed. At the time the main contractors were primarily British Contractors, who would rely upon the Chinese subcontractors who were traditionally highly skilled and well coordinated. This has resulted in the high position of the Chinese in the construction industry in Malaysia and Singapore.

5	General contracts will make extensive use of subcontractors. It is usual for contractors to have preferred subcontractors, although there is a provision of nomination of subcontractors by the client. The subcontracting system in Malaysia has a long history and it is indeed entrenched in the characteristics of the industry. A problem is the planning, management and coordinating ability of subcontractors. As they rely on main contractors to carry out the management/planning function they have been unable to mature such characteristics themselves. Up till now anyone could set up as a contractor within the industry, and this has been a major reason for the poor quality of workmanship within the industry. There are about 15 contractors who are very large and are on the Malaysian Stock Exchange. Recently, there has been an increase in the number of large contractors in Malaysia (as a result of the building boom) - however they have to develop further particularly in terms of management and experience.
6	The main contractor will primarily be responsible for the planning, coordination and management of the site, and will carry out little construction work himself, with the work being executed by trade contractors. Very few contractors in Malaysia carry direct labour. It is considered to be an unnecessary overhead, and there are many trade contractors who offer this service. There is a 3 layered structure of the contracting system in Malaysia: with general contractors at the top. Then specialised sub contractors and finally many trade contractors at the bottom. 5 or 6 years ago the situation was slightly different, with there being a greater overall need for foreign expertise - now the Malaysian large contractors (Approximately 15) have developed their expertise - allowing them to build and compete with foreign contractors. A traditional deficiency has been management and control that's necessary to implement projects which has been limited. This situation is now beginning to change. The specialist subcontractors are very specialist and have a good level of experience. The lowest level of trade contractors is very dense - there are many layers of trade contractors with varying levels of skills and experience and competence.
7	There are not enough skilled workers - and their integration into the industry is insufficient. Better training facilities are required, along with the cultivation of a better image of the industry, so students want to learn construction skills and stay within the industry. The poor quality of work is often a result of unskilled labour and poor supervision and the client at the end of the day is given little protection for poor quality work. The reason for the poor quality of workmanship is due to the lack of skilled labour within the industry and the general reliance of foreign labour within the industry (Indonesia and Thailand). Because there is so much construction activity at present, contractors tend to just make use of all/any labour they can get
8	The contractor basis in Malaysia is made up of a 3 tier structure: (i) Main contractors (ii) Specialist contractors - both sophisticated and capable of managing (iii) an array of trade based contractors. The main contractors have a level of sophistication but which is not comparable with interactional contractors. They have not been forced to become sophisticated as their work has usually been based on negotiation and personal relationships, so sophisticated planning, co-ordination and management expertise has not been developed indigenously. These competencies are still not in place. The approach to the construction industry is still relatively unstructured and unsophisticated.
9	There is an in depth technical knowledge that is not in place for indigenous contractors. The best construction skills within the Malaysian construction industry are indigenously held by the Chinese and Indians.

10	Contractors tend not to carry out much construction work themselves - they tend to subcontract it to trade based contractors. General contractors are now becoming more "Contract Managers" where their role is to manage a project and use subcontractors to carry out the construction work. The history of contracting in Malaysia started with the Chinese who brought their skills and knowledge from China. The Chinese traditionally have been the Master Craftsmen and so became the Master Builders in the industry (MBAM). The contracting system is referred to as "Kampala" which means head - the Chinese contractors became organised as labour only subcontractors specialising in various trades. The older companies have developed into general contractors, whilst the younger companies do not tend to follow tradition and are forming subcontracting companies which service the main contractor. The current crisis in the industry is the lack of skilled workers. There are traditional long-term links between general contractors and subcontractors in Malaysia.
11	The profile of main contractors in Malaysia is made up of:(i) **15** very large contractors (who are all on the Stock Exchange), who are very advanced and have a high skill level in planning and management. These are the big multi-national companies and are comparable to international contractors with a high level of professional expertise. (ii) Large contractors who are based on a traditional family ownership system - predominantly medium sized contractors but still family businesses and moving towards modernisation. Such companies are also involved in other associated concerns such as development materials manufacture and supply. This is the important sector of contractors - as they will be the future multi-national contractors of Malaysia. (iii) Small contractors made up of companies which have a small employment and turnover level and of new companies which are continually entering and leaving the construction market. These are mostly novice companies which have decided to enter into the construction industry and also trade based subcontracting companies. Trade based contractors have traditionally had poor training facilities provided for them. There have been some formal training organisations around the country and the traditional way of learning skills was by them being passed down from father to son. The majority of main contractors will not carry out much construction work themselves, sub-contracting the work out to trade based contractors and taking the role of a manager within the construction process. Main contractors usually have their own set of domestic sub-contractors with whom they work and who will be frequently used on projects.

12	The categories of contractors include; 1)Large general contractors who are multi-national organisations, with great experience and expertise in all facets of construction and who undertake large projects throughout the country and abroad. These companies are very sophisticated. 2) Specialist sub-contractors are experienced and sophisticated companies in their own specialist area of work. 3) Small contractors/trade leased contractors. There are many layers of these companies who have varying levels of experience and expertise in construction. These are not very sophisticated in their approach to building in terms of organisation, planning, co-ordination and management. There are many small contractors who operate within the industry. The majority of small contractors will be trade based so there is a higher level of subcontracting within the industry. There is a tendency for subcontracting in Malaysia, even large general contractors do not employ many tradesman themselves they will just get subcontractors to do the various parts of the work. The main contractor will do just piling work or foundations, and the majority of the work is subcontracted out. The main contractors employ no hired labour. They are not keen in taking the risk of not having constant employment for their direct labour staff. Most main contractors will have a range of subcontractors which they will use regularly (but there is no exclusivity as in Japan). They usually have a range of domestic subcontractors which they have previously worked with, and are satisfied with their performance. Some of our members have been using the same subcontractors for 10 years. The level of skilled workers within the industry is relatively low, the industry has a poor image so manpower is a problem. As a result skilled Malaysian workers don't want to work in construction and move to other industries, so the construction industry is made up of approximately 95% foreign labour (Indonesian and Thia). These people come and go they are only allowed to stay in the country for 3 years. The biggest problem is that we train them for 3 years and by the end we have skilled labour and then they are sent back to their own country. This means that the skills we are developing in the country are constantly being taken out, leaving us with mostly semi-skilled/unskilled labour. Malaysians are not keen on working in construction and indeed at present there are a lot of other employment opportunities around why should people work on building sites when they could work in offices and earn more money. The problem is that for Malaysians, there is better chances of employment. The level of craftsmanship has also fallen. In the late 1960's and 70's, the level of skilled craftsmen within the industry was high. Today such skills are very difficult to find, and therefore the level of quality ultimately falls.
13	The contracting basis in Malaysia is predominantly family based companies with promotive management and organisational understanding and with conservative attitudes. The construction industry requires keeping up with technology and a more dynamic type of thinking. Because of this attitude and legislation/regulations in the industry it has remained stifled for all these years, so growth has been slow resulting in Malaysian contractors not being exposed to Western Technology. The majority of the large contractors are Chinese educated, whilst others are not educated at all.
14	The large experienced, sophisticated contracts within the industry will offer the service of MC: who have good experience of site and project management, planning, scheduling and control. They will prepare the organisational charts and construction schedules. This gives the client the benefit of getting the project started on site faster, and competitive prices as each trade/work package will be tendered competitively:- and get the most suitable contractor for the job. The down side to this is that we end up with a lot of work packages/subcontracts who have to be managed and co-ordinated. The major problem for clients is that there are few experienced contractors who can offer the services of a MC. The client is also not given cost certainty until all of the work packages have been let. The subcontractors which are used on such projects are usually the domestic subcontracts which have traditionally worked with the main contractor (who now is the management contractor). The management contactor will usually do all of the planning and management for the subcontractors. The subcontractors and trade contractors are developing their skills continually and are getting better in management and organisation. Generally there is no problem in getting good -highly skilled subcontractors - as long as the client is willing to pay for it. There is however a shortage of skilled labour within the Malaysian industry. There are many foreign workers who are semi - or unskilled operating in Malaysia.

15	The subcontractors and trade based contractors are generally not well organised and have poor management and organisational, planning and co-ordination skills. They are often not registered under any trade body, and there is very little control over the supervision of their work. The market allows anyone to set up such a company with no previous experience or expertise in the field.
16	The industry is made of 3 contracting groups:- a) The large general contractors who are publicly listed in the stock exchange are very experienced and well organised companies who can manage, plan, co-ordinate well, and have financial strength and the ability to accept risk. These companies can undertake any type of work including international projects. b) The mid-sized contractors, are reasonably well managed but lack a degree of experience and sophistication. c) Masses of small contractors or trade based contractors who are generally inexperienced and have poor financial and management capabilities, and limited understanding of the industry. The contractors will undertake projects in both sectors working for a main contractor or on small projects (class based contracts). The construction industry is going through a boom and so there is mass development, clients are becoming more experienced, projects more complex and contractors more sophisticated. In the future there will be more mega projects being implemented by the government, particularly infrastructure projects. As a consequence many large foreign companies will enter the market increasing the competition between local firms. The belief is that there will be more joint venture projects and projects where there is collaboration between groups of contractors.

Interview	Table B5(viii): Malaysia Verification of Competency: Allocation of Risk
1	In the PAM contract the architect assumes absolute power, however in the JKR the supervising officer may be an Architect or Engineer. These documents have been criticised for being biased towards to clients, and calls have been made for a more fair and equitable document to be produced. Moves are being made to create a more equitable contract.
2	A more equitable contract form is required, but we still have a long way to go to achieving this.
3	The PAM69 contract is still widely used and has been tried and tested within the industry. Although traditionally the industry here has not been adversarial it is becoming increasingly so. As contractors are becoming larger and more experienced and the projects are becoming more complex, costly and more risk prone, contractors are standing up to their legal liabilities and are becoming more legally minded. Projects are generally becoming more adversarial. The eventual result of this structure will be the development of a new form of contract:- but the industry has still got to undergo a level of development and sophistication.
4	One of the key areas is the contractual documentation which is often used by the construction industry in developing nations, which has originally been developed and adopted from developed nations. More equitable agreements are required between the parties involved. A new way to deal with this is to introduce the concept of partnering into developing countries -where the client and contractor are both trying to achieve the same aims, a building which functions within cost and on time, promoting a non-adversarial attitude within the industry. This would expand the situation of cooperation and unity within the industry.
5	There is still no contract which is specifically suited or tailored for the Malaysian industry. There are however moves to establish a Malaysian form of contract. The PAM contract is adversarial as it does not spelt out in enough detail the obligations and duties of the parties and it is too legally orientated. The terms in the contract are often unclear. However the nature of the people who implement the contract is non-adversarial. The contract is important, but personal relationships and negotiations are crucial to the working of the industry. "Goodwill" within the industry is vital for the success of the industry and dulls the adversarial nature of the construction contracts used. This is why there has been no real urgency to change the contracts. The contract says one thing and in practice something else may be done - the client does not always insist on all the strict contractual rights - having a clear and good understanding between the parties is vital for success.
6	Although these contracts are potentially adversarial in their structure, the way they are implemented in Malaysia makes them less adversarial. The culture of Malaysia is very different from the UK. Although these contracts have been developed from UK forms and have been suggested to result in the industry becoming more adversarial, this is more a consequence of the culture in the UK, than the contract itself. The Malaysian culture is less adversarial. The contract is only part of the agreement - verbal discussions and agreements are also crucially important - and are often more binding than the contract. The Malaysian culture is one of non-confrontational of resolution by discussion, negotiation and business dealings are with known colleagues. Only in extreme will situations be taken to courts. Malaysia lies in between Japan and the UK and the spectrum. Relationships are important and people are not used to dealing with strangers - building up trust and confidence between the partners is important.
7	Moves have been made to introduce a more fair and equitable document in the industry. Particularly with the JKR form - the contract tends to favour the clients rather than the contractor. Improvements are required in our standard documents.
8	The contract in Malaysia is only ½ an agreement, with the personal contracts and negotiations between the parties forms the other ½.

9	The current contract conditions favour the clients and designers and has therefore remained in place. The Malaysian industry is at least 10 years behind the UK industry at present. The inherent cultural differences between Malaysian and the West have profound affects on the operation of the industry. The culture of the nation also influences the industry especially in terms of personal contracts, and negotiations. Political contracts also seem to be important in maintaining a constraint and valuable workload. Competitive tendering goes much further with personal contracts. Personal contracts filter throughout all facets of the industry, and is immensely important. Relationships are paramount, along with the desire not to confront. Its better to maintain relationships then enter into confrontational situation. Although the contract is potentially adversarial, the operations within the industry and the importance placed on the contract also influence the adversarial nature of the industry as a whole.
10	The way that contracts are administered in Malaysia is different; there is a balance between the client and contractor rather than favouring the client which has traditionally been the case. The balance is developed through our culture more than anything else:- the contract and the formalities which go along with that are only part of an agreement. When it comes to the implementation of the contract Malaysian culture tends to advocate discussion, negotiation and agreement between the parties, rather than implementing the actual contract. Moves are being made to change the PAM contract to a more equitable form of contract - but there are problems of "inter-professional rivalry" between the architects and quantity surveyors. The PAM contract traditionally gives high power to the architect and they are reluctant to give up this position. A draft has been drawn up which is applicable to our local need - but there is still an attitude which prevents change. People do not like change. Personal contracts and business relationships are important. The culture of Malaysia has an influence on the business environment in Malaysia.
11	Personal contacts and relationships are extremely important in business in Malaysia. Negotiation and discussion between parties is vital to success and the contract is almost secondary.
12	Standard contracts exist but they have been imported and modifications are needed to make them suitable for the Malaysian construction environment.
13	Standard documents exist.
14	The contract documents have been criticised for not being fair, being too legally orientated and difficult to understand; but in practice the PAM for is not strictly used, modifications and amendments are always made to the contract. There are certain clauses which we foresee that with course problems, and these are amended, to try and be fair to both parties (eg The Extension of time (clause 23 PAM)). Malaysian culture is non - adversarial and when disputes arise they are discussed, negotiation and finally agreed between the parties - most of the time. We make endeavours to avoid litigation and arbitration if we can in Malaysia, because its time consuming, costly and at the end one party has lost. Its better if both parities can resolve the issues together:- "we go for compromise", - its better to work our solutions between the two parties.
15	Although the contract has got the potential to be adversarial, the working attitude in Malaysia is different. Contractors realise that you have to have a "give and take" attitude - and there are few cases of contractors going to court to challenge the client. Most cases are either resolved through arbitration, or through negotiation and discussion between the parties. The form of contract (PAM) has been used for a long time and will continue to be used; and there is generally little criticism of the document. There are however some moves to create a more fair and equitable contract as this arrangement does give the client more power than the contractor in the contract. However, it is not a vital need in our industry - our contracting system is not as sophisticated as in the UK in the sense of the contractual aspects of it. Most contractors are not accustomed to putting in formal claims to the client. There is not really a claims culture in Malaysia. Business dealings, personal contracts, negotiation and compromise are all important facets of our culture which affect the construction industry.

16	The construction industry is not very particular on the contracts and legal terminology, this is only half of an agreement. The other half is based on personal contact/business relationships, negotiation, discussion an agreement between the parties. The amount of litigation in the industry is relatively small disputes are settled amicably and usually out of court, negotiation and compromise are to essential concepts to understand. Even though the contract has got the potential to be adversarial, the way it is implemented and used within the industry makes it less adversarial. This is because of the nature of society and the culture of the people. The "Asian" culture is very different from Western culture, and the method of dealing with disputes is different, they are never brought into the open or into court, and they are settled between the parties in private. Its about maintaining trusting relationships and honour. In a spectrum of contractual arrangements with Japan at one end and the UK/US at another Malaysia would lie somewhere in the middle.

APPENDIX C

Results of the interviews for the Validation of Institutions Models

USA	C1 (i, ii, iii, iv, v and vi)
Japan	C2 (i, ii, iii, iv, v and vi)
France	C3 (i, ii, iii, iv, v and vi)
India	C4 (i, ii, iii, iv, v and vi)
Malaysia	C5 (i, ii, iii, iv, v and vi)

Interview Number	USA Interviews Name and Company
1	Mr Nicholas Renny, President Chesterton International, New York
2	Mr Denis Higston, Executive Vice President, Tillyards, New York
3	Mr Wilson C Barns, Principle Lecturer, Department of construction Management, College of Engineering and Design, Florida International University.
4	Mr John Robbins Architects, Cost Engineers, Florida
5	Mr Karl Marriot, Project Manager, Abacus Project Management, Arizona
6	Mr Alister Roberts, President, Ackroyd Cost Control Consultants, Seatle

Interview	Table C(i): USA Verification of Institutions: Initiator/ Promoter
1	Institutions exist in both the public and private sector.
2	Institutions exist. Private sector has major clients but the public sector is the largest single client
3	Institutions exist.
4	Institutions exist.
5	Institutions exist in the public and private sector.
6	Institutions exist.

Interview	Table C(ii): USA Verification of Institutions: Fund
1	Institutions exist including banks, insurance companies, pension funds bond companies.
2	Institutions exist in the public and private sector.
3	Institutions exist.
4	Many institutions exist in the public and private sector.
5	Institutions exist including insurance companies and commercial banks.
6	Many institutions exist.

Interview	Table C1(iii): USA Verification of Institutions: Design
1	Many institutions exist including the American Institute of Architect, the American Society of Civil Engineers, the National Society of Professional Engineers, Professional Engineers in Construction, American Planning Association and America Association of Cost Engineers.
2	Each consultant in the industry will have their own institution and registering body. The major ones include the American Institute of Architects, the American Association of Cost Engineers, the American society of Civil Engineer and the National Society of Professional Engineers.
3	Institutions and boards exist. State licences are not transferable and if an architect moves to another state then he/she must obtain a licence from that new state.
4	Many Institutions exist including the American Institute of Architects, the American Association of Cost Engineers and the American society of Civil Engineer
5	Many professional institutions and licensing boards exist to register and licence design consultants to operate in the USA.
6	Major institutions and licensing boards exist including the American Institute of Architect, the American Society of Civil Engineers, the National Society of Professional Engineers, Professional Engineers in Construction, American Planning Association and America Association of Cost Engineers. Licences are not transferable from state to state.

Interview	Table C1(iv): USA Verification of Institutions: Management of Construction
1	Institutions available including the Construction Management Association of America.
2	Institutions available including the Institute of Projects Managers, the Construction Managers Association of America and the various other consultants associations.
3	institutions exist including most of the consultant Associations, the Construction Management Association of America, and the Institute of Project Managers.
4	institutions exist including the Construction Management Association of America.
5	Institutions available.
6	Institutions available including the Institute of Project Managers and Construction Management Association of America.

Interview	Table C1(v): USA Verification of Institutions: Construction Production
1	Institutions exist including the Association of General Contractors, Association of Builders and Contractors.
2	Hundreds of trade associations and contractor institutions exist. Contractors have to sit an exam to practice in a state and if they wish to work in another state they must sit a further exam.
3	Institutions available. Contractors must sit a state exam to obtain a licence and must be registered and licensed to practice contracting.
4	Many institutions exist including the Associated General Contractors of America, Association of Building Contractors, National Association of House Builders, National Contractors Association, and many more trade associations.
5	There are many institutions and trade associations in the USA, the main ones being the Associated General Contractors of America, Association of Builders and Contractors, National Association of House Builders and National Contractors Association. Contractors must have a licence to build in the various states around the USA.
6	The major institutions include the Association of General Contractors, Association of Builders and Contractors.

Interview	Table C1(vi): USA Verification of Institutions: Allocation of Risk
1	Standard forms of Contract are produced by the American Institute of Architects.
2	Institutions available which produce standard forms of contract.
3	Institutions available including the AIA, AGC and various state departments.
4	Institutions available including the Association of General Contractors and the American Institute of Architects.
5	Institutions available in the public and private sector. Public contracts are produced by state departments and private contracts are generally produced by the AIA and AGC.
6	Various institutions available.

Interview Number	Japan Interviews Name and Company
1	Mr Shigeru Taki Director, Shimizu Corporation Inc. London.
2	Mr Kevin P Tyler, Shimizu Corporation Inc. London.
3	Professor Roger Flanagon, University of Reading.
4	Kumagi Gumi Inc, London.
5	Mr Masafumi Anami (Director), Taisie Europe Ltd. London.
6	Mr Tatsuya Sugawara (Marketing Manager), Taisie Europe Ltd. London.
7	Mr Nagai: Regional Manager, Takenaka UK Ltd, Birmingham.
8	Mr Steve McWigg, Senior Specialism Purchaser, Toyota Motor Corporation, Burnaston.
9	Mr Yamamoto, Kajima UK. London.
10	Ass Professor Yashiro, University of Reading.

Interview	Table C2(i): Japan Verification of Institutions: Initiator/Promoter
1	Institutions exist.
2	Institutions exist.
3	Japan has a fairly big public sector which are diffused into prefectures, governments, municipalities and the whole way the procure projects is different. Ministry of Construction.
4	The Ministry of Construction plays a major role in the industry. The public and private sector are very active.
5	Institutions exist.
6	Institutions exist both in the public and private sector.
7	Institutions exist. The relationships which exists between clients and the industry is very important.
8	Institutions exist.
9	Institutions exist.
10	Institutions exist.

Interview	Table C2(ii): Japan Verification of Institutions: Fund
1	Institutions exist.
2	Many institutions exist, and the contractor can also organise finance for the project
3	Finance institutions include banks, insurance companies, pension funds, investment trusts. Japan has one of the worlds highest level of personal savings (savings to earnings ratio), this forms a vital source of revenue for construction. There are very few company take-overs in Japan, and this has a bearing on their financial structure. There is also continuous infrastructure developments being carried out in Japan predominantly funded by the government.
4	Sources of fiance include Government, savings, Banks, Insurance/Investment companies.
5	Finance in the Private sector predominantly comes from corporate fiance, savings, and Banks. Insurance companies play less of a role. Banks generally have a big influence on the construction industry in Japan, as they are major shareholders in most of the major Japanese corporations.
6	Finance in the Private sector predominantly comes from corporate fiance, savings, and Banks. Banks generally have a big influence on the construction industry in Japan, as they are major shareholders in most of the major Japanese corporations.
7	Funding is obtained in the public sector from the government, local authorities and the National Fund: which provides finance for major civil engineering and infrastructure projects.
8	Institutions exist.
9	Public sector finance comes from central government and local authorities. Private sector finance comes from Banks, Security houses provide the most and most private companies are part of a group who have their own bank in that group of companies. Insurance companies, Personal savings, pension funds also provide finance but limited amounts.
10	Institutions exist.

Interview	Table C2(ii): Japan Verification of Institutions: Design
1	Institutions exist including the Architectural Association of Japan, the Architectural Institute of Japan, Heating, Air conditioning and Sanitary Engineers of Japan.
2	Institutions exist
3	Institutions exist including Architectural Association of Japan, Architectural Institute of Japan, Japan consulting Engineers Association, Japan Federation of Architects and Building Engineers, Japan Institute of Architects, Japan Society of Civil Engineers.
4	The Japanese education system for architects and engineers promotes 'generalism' rather than 'specialisum' which you have in the UK, resulting in the Japanese architect appreciating many aspects of engineering and cost control and visa-versa. There is a better general foundation of understanding by Japanese construction professionals as they often have worked in many different departments of the company, and are less 'separated'. However, their future of life time employment is security unknown now in the UK.
5	Many Institutions exist.
6	Institutions exist including Architectural Institute of Japan, Japan consulting Engineers Association, Japan Institute of Architects, Japan Society of Civil Engineers.
7	Many Institutions exist
8	Many institutions exist including Japan Institute of Architects, Architectural Association of Japan, Architectural Institute of Japan, Japan consulting Engineers Association, Japan Federation of Architects and Building Engineers, Heating, Air Conditioning and Sanitary Engineers of Japan and Japan Society of Civil Engineers.
9	Institutions exist
10	Musashi Institute of Technology, Architectural Institute of Japan (AIJ)

Interview	Table C2(iv): Japan Verification of Institutions: Manager of Construction
1	There are no independent managers.
2	There are no independent managers.
3	The function of management is carried out by the constructor and there are many contractors institutions.
4	-
5	-
6	-
7	There is no independent construction professional that can act as the construction manager at present in Japan.
8	The function of management is carried out by the constructor and there are many contractors institutions.
9	The function of management is carried out by the constructor and there are many contractors institutions.
10	It is a trend now to have some sort of independent managing body or professional in the construction process like project managers.

Interview	Table C2(v): Japan Verification of Institutions: Constructor Producer
1	Many Institutions exist. Ministry of Construction.
2	Many institutions exist including Builders Contractors Society, Association of General Contractors, Japan Federation of Construction Contractors.
3	The 'Kiretsu' (trading groups/companies) also impact on the operation of the industry. This cross share holding within and between companies, making these large construction firms impenetrable. The consequence of this is that the likelihood of possible take overs is very low, and so is the possibility of a company going into liquidation, or have financial problems due to the way the 'kiretsu' is structured. This structure therefore has an influence on the way work is secured. Registration of contractors is a prerequisite to practising in Japan. All contractors are registered. Many institutions exist.
4	Institutions exist. Ministry of Construction.
5	Many institutions exist, contractors have to be licensed in order to practice in Japan.
6	Contractors institutions exist including Builders Contractors Society, Association of General Contractors
7	Institutions exist including Building Centre of Japan, Builders Contractors Society, Association of General Contractors, Japan Federation of Construction Contractors.
8	Institutions exist. Ministry of Construction licences all contractors.
9	Institutions exist
10	Institutions exist.

Interview	Table C2(vi): Japan Verification of Institutions: Allocation of Risk
1	Institutions exist
2	Contracts are produced by the public sector and private sector.
3	The Contractors Law 1949 states that the contractor is responsible for checking all the design details, so effectively he is responsible. Even where a pre design procurement structure is chosen, the contractor has the responsibility to make sure that the designs are adequate and not defective, he is the person who will build the project and so is the most qualified to advise on these issues. There are no forms of collateral warranties used as they are not needed.
4	Standard contracts are used.
5	Institutions exist.
6	Institutions exist, standard contracts used in the public and private sector.
7	Standard contracts used in the public and private sector.
8	Institutions exist.
9	Institutions exist.
10	Institutions exist, standard contracts use in the public and private sector.

Interview Number	France Interviews Name and Company
1	Mr Stephen Pearson, South Bank University
2	Mr L Willmott, Willmott Lewis Architects France
3	Ms Helene Chavet, CSTB Research Institute
4	Mr Phil Corbett, Gleeds, Paris
5	Ms Rebeca Newman, Architect Richard & Newman, Paris
6	Mr Jean-Luc Salagnac (Project Manager), CSTB Research Institute
7	Mr J P Pajon, Gleeds, Paris
8	Mr P J Braithwaite, Cyril Sweet, Economiste

Interview	Table C3(i): France Verification of Primary Institutions: Initiator/Promoter
1	Institutions exist.
2	The public sector client is subject to a whole array of legislation, the *code de marches de public*, forms of contract, and the process is well documented.
3	Public, private, primary and secondary, as they will have different requirements, expertise and levels of involvement within the project. The client is known as the Maitre d'ouvrage. For institutional clients then there is usually a body who will provide information on how to acquire a building; This is true for social housing, the organisation is known as UNFOHLM. There are some associates of the maitre d'ouvrage, in the public sector the role is particularly codified and dictated by law, particularly the *Code des Marches Publics*. There are informal groups which discuss the role of clients, but not formal bodies.
4	Public, Private clients exist who may be further defined as primary and secondary clients. Client organisations do not exist formally, although for the public sector work, duties and obligations are heavily regulated. There are generally many codes and decrees which affect the roles and responsibilities of practitioners in the public sector, and less in the private.
5	Public, private, primary and secondary, as they will have different requirements, expertise and levels of involvement within the project. The client is known as the Maitre d'ouvrage. Associations of the maitre d'ouvrage, in the public sector the role is particularly codified and dictated by law, particularly the Code des Marches Publics. For institutional clients then there is usually a body who will provide information on how to acquire a building; This is true for social housing, the organisation is known as UNFOHLM.
6	Institutions exist.
7	Institutions exist.
8	Major clients include: The Public Sector; the Private Sector Owner occupies and Developers, Investors, the Developer is an important part of the industry. There are no real independent bodies who provide clients in the private sector with advice on building acquisition.

Interview	Table C3(ii): France Verification of Primary Institutions: Funder
1	Institutions exist.
2	Institutions exist.
3	These include predominantly government sources and Banks. In the private sector we don't really have building societies in France, Banks tend to provide the majority of finance for construction. Pension funds and insurance companies also provide finance for construction, but they tend to be developers/investors in construction themselves. Sale of stocks/shares is also a way of raising finance for construction. There are some specialised banks who predominantly finance construction projects. One in particular is in a bad state at present due to the poor economic climate (Company la BTP) and the lack of demand for property.
4	Finance Institutions include the Public sector (Government Sources) ,Banks:- various savings plans exist, which are run by banks, and the revenue is used for certain types of investment including construction work. Banks encourage the public to save money in such schemes, which then are used to finance other sectors of the economy (including industry and manufacturing), Building societies don't really exist in france. Pension funds and Insurance companies however do invest in building; but it depends on the level of returns. In broad terms, the construction industry is looked upon with more favourable opinions than in the UK. Traditionally there has been a high level of public sector investment in construction, which tends to set a precedent. At least 1/2 of the major French banks are fully or partially government owned, so its unlikely that large construction companies will have a bank with their group of companies.
5	Institutions exist.
6	Finance Primarily Banks and Government sources, although Insurance companies and pension funds provide some finance. These latter sources tend to be investors or developers themselves. There are some specialised banks who predominantly finance construction projects. One in particular is in a bad state at present due to the poor economic climate (Company la BTP) and the lack of demand for property. Finance institutions include Government Banks, Pension Funds and Insurance companies as well as personal savings and the sale of stocks and shares. In the private sector we don't really have building societies in France, Banks tend to provide the majority of finance for construction.
7	Institutions exist.
8	Finance Institutions include:- government loans/grants, Banks, insurance companies - and sales of shares. We don't have building societies. The Bank and insurance companies are the major funders.

Interview	Table C3(iii): France Verification of Primary Institutions: Design
1	Institutions exist including the *Conseil National de l'Ordre des Architectes, Chamber des Ingenieurs- Conseil de France, Office Professional de Qualification des Technicies de l'Economie, Organise Professionnel de Qualification des Ingenieurs- Conseil et Bureau d'Etudes.*
2	Institutions exist such as the Conseil National de l'Ordre des Architectes, Chamber des Ingenieurs- Conseil de France, Office Professional de Qualification des Technicies de l'Economie, Organise Professionnel de Qualification des Ingenieurs- Conseil et Bureau d'Etudes.
3	Design team (Maitre d'oeuvre); including the architect, the BET, The Engineer, The Economist and sometimes The Pilot. Each consultant has its own governing bodies, Architects: *Order des Architect*, Engineers: *Engineer Conseil*, BET: *SANTEC*, Economiste: *UNTEC, Pilotage.*
4	All parties who come under the title of "constructers" (including, The Architect, BET, Economiste, Contractors, Trade contractors and subcontractors) must take out a 10 year decennial insurance system. Historically, the architect has designed buildings, not contractors. The level of insurance premium paid depends on the volume of work your company is responsible for each year. The insurance systems in France has major implications on how the industry works and operates. Insurance companies have a lot of influence on the industry and to some extent much of the law which surrounds the industry. The decennial insurance is very tightly connected to French law, and has been so far nearly 200 years, (introduced in the 18th Century; related to the Code Civil). The key feature for clients in France is that with this policy they do not have to prove negligence, and will get their damaged property repaired within this 10 year period. The generai level of litigation in the industry is also less than what exists in the UK. For each consultant in the industry there are registration boards and professional institutions, but their presence and activities are far less apparent than their UK counterparts. For the Economiste the UNTEC/OPQTEC are trying to establish themselves. A code of conduct and procedure is established by such organisations, for their members to follow, however they tend to be more controlled by law, rather than such organisations. It is likely for the government to establish the duties of architects which operate in France, with the organisations being more of a registration mechanism. The French generally don't promote the division of groups by professional organisations. the organisations are more like "Unions" rather than professional organisations in France; which exists to protect the interests of its members.
5	The roles and duties of the architect are organised by the "Ordes des Architect". There are standard conditions of contract which defines the role of the architect, the owner, and sets limits on their respective roles - this however is not required by law on all projects. Its used more often as just a guideline, and is often not signed by the client and architect. Its a short, 4 page document which guides both parties. This is the skeleton structure of a contract, but usually requires additional details and amendments to make it an appropriate form of contract for a project.
6	Design team known as the Maitre d'oeuvre includes the architect, the BET, The Engineer, The Economist and sometimes The Pilot who all belong to respective boards and institutions. These include for Architects: Order des Architect, Engineers: Engineer Conseil, BET: SANTEC, Economiste: UNTEC, Pilotage.
7	In France you have within the public sector different types of services offered by the maitre d'oeuvre; which will include the Architects, BET and Economiste, ranging from M1 to M12. Many Institutions exist including the *Conseil National de l'Ordre des Architectes, Chamber des Ingenieurs- Conseil de France, Office Professional de Qualification des Technicies de l'Economie, Organise Professionnel de Qualification des Ingenieurs- Conseil et Bureau d'Etudes.*

8	Professional Institutions include ;Architect: Order des Architects: in order to practice as an architect you must be registered within the order. However their role is less prevalent that the role of the RIBA in the UK. Economiste: are a new profession who are becoming increasingly established in France - their main body is known as UNTEC - but has no real similarities with the RICS:- again UNTEC is more of a registration and approving body, rather than a marketing, co-ordinating body like the RICS. There are not as many rules and regulations than there are in the UK - but this is an anglo-saxon tradition. UNTEC are beginning to establish agreements with the public sector, drawing up codes of conduct etc - but its and evolving process. BEC: are independent organisations to make sure that the design, structure and materials used for a project are safe. They are employed directly by the client and their role is to make sure that their construction conforms to the French Building Regulations. Their minimum mission will be to ensure that the building is structurally stable for example, foundation drawings would be sent to the BEC for them to check the strength and reinforcement details. This organisation take a somewhat passive role - as they will inform on what is wrong, but will not advise on how to put it right. Therefore limiting their overall liability. They will verbally discuss possible ways of overcoming problems, but are reluctant to give written evidence. However, they have now gone to an extreme where they are requesting extensive modifications to designs, so that they will be certain that no problems will occur. BEC: and their existence in France can be linked to the 10 year guarantee and associated insurance system. If the 'client' appoints a BEC, their premiums on their insurance will be subsequently reduced, which provided and increased incentive for their employment. When the BEC are appointed and approve designs this provided comfort for the client, architect, insurance companies and contractors:- its deeply entrenched with the insurance provisions in France.

Interview	Table C3(iv): France Verification of Primary Institutions: Constructor Manager
1	Institutions exist.
2	Institutions exist.
3	Institutions exist.
4	All parties who come under the title of "constructers" (including, The Architect, BET, Economiste, Contractors, Trade contractors and subcontractors) m take out a 10 year decennial insurance system.
5	Institutions exist.
6	Institutions exist.
7	Institutions exist.
8	Institutions exist .

Interview	Table C3(v): France Verification of Primary Institutions: Constructor Producer
1	Many institutions exist including the *Association Francaise pour la Construction, Association Francaise de Normalisation, Centre Scientifique et Technique du Batiment, Centre Experimental de Recherches et d'Etudes du Batiment et des Travaux Publics*, Confederation of International Contractors Association, *Organsie Professional de Qualification et de Classificationd du Batiment et des Activites Annexes.*
2	Institutions exist.
3	The institution for Contractors is the OPQCB. All parties who come under the title of "constructers" (including, The Architect, BET, Economiste, Contractors, Trade contractors and subcontractors) must take out a 10 year decennial insurance system.
4	All parties who come under the title of "constructers" (including, The Architect, BET, Economiste, Contractors, Trade contractors and subcontractors) must take out a 10 year decennial insurance system. Contractors are registered by the OPCQB. This system sets down names of contractors who are considered to be capable of carrying out certain trades of work. The document is broken down by trade, with a rating for each contractor, indicating the level of skill they posses in that trade. However many practitioner in the industry do not believe this system is very efficient, so it tends not to be used by large contractors. Additionally, the system is not obligatory, however most BEC's will check to see if contractors on a project are registered, and so do architects and economists. The criteria for inclusion into such a document is based on wether you have individuals in the company who are qualified to carry out such work and types of training schemes rather than past experience.
5	Contractor are registered by the OPQCB. All parties who come under the title of "constructers" (including, The Architect, BET, Economiste, Contractors, Trade contractors and subcontractors) must take out a 10 year decennial insurance system.
6	Many institutions exist including the *Association Francaise pour la Construction, Association Francaise de Normalisation, Centre Scientifique et Technique du Batiment, Centre Experimental de Recherches et d'Etudes du Batiment et des Travaux Publics*, Confederation of International Contractors Association, *Organsie Professional de Qualification et de Classificationd du Batiment et des Activites Annexes.*
7	Many institutions exist including the *Association Francaise pour la Construction, Association Francaise de Normalisation, Centre Scientifique et Technique du Batiment, Centre Experimental de Recherches et d'Etudes du Batiment et des Travaux Publics, Organsie Professional de Qualification et de Classificationd du Batiment et des Activites Annexes.*
8	There is a form of registration, which is not obligatory for contractors known as the OPCQB, which without being registered architects are reluctant to select contractors. At tender stage the contractor will submit a range of registration/administrative documents which indicate the registration, insurance, finance, track record etc of the contractor. Non registered contractors are particularly used on small scale value projects. Increasingly contractors are requested to be registered - or where the work is of a very specialist nature - so only a few contractors can perform. This organisation has now been taken over by QUALIBAT, it must be recognised that the qualification or rating given to each contractor depends upon the size of projects they have undertaken. In a vicious circle if you have not worked on a large project, you will not have the rating to do so, and so you will not be selected to work on such projects! For contractors to move up to a new category they must be nominated by the Architect.

Interview	Table C3(vi): France Verification of Primary Institutions: Allocation of Risk
1	Institutions exist.
2	Primarily governed by the public sector.
3	Governed by the public sector.
4	Contract documents in The Private Sector is based around the CCAG and CCAP (2 parts); The CCAG; provides a model produced by the Norm Frances (similar to UK BS) which is a general contract document, and this is supplemented by the CCAP; which is adapted tot he specific nature of the project in question:- which only consists of articles and their respective codes. French contracts are far less legally orientated in their wording than UK contracts. The contracts simply refer to the relevant articles.
5	Institutions exist.
6	Public sector contracts tend to be replicated in the private sector, although there are more alternatives in the private sector.
7	Institutions exist.
8	Public sector dictates the pace. Institutions exist.

Interview Number	India Interviews Name and Company
1	Mr Arun Singh (Masons Solicitors), London
2	Mr Rao (Nicmar), Bombay.
3	Mr T S Kashyap (Management Consultant) Bangalore
4	Mr T Srikanth Bhagarat (Financier) Bangalore
5	Mr Shimms Jagislam (Management Consultant), Bangalore
6	Mr M Romonias (Client), Bangalore
7	Mr Nainesh Jaisingh (ANZ Bank), Bangalore
8	Mr R Vishwanathan (Client), Bombay
9	Mr A Nagabushana Rau (Nicmar), Bangalore
10	Mr K V Harsha Babu (Architect), Bangalore
11	Mr M S Ramaswany (Engineer), Bangalore
12	Mr M K Vishwanath (Nicmar), Bombay
13	Mr Kulkami (Nicmar and MBAI), Bombay
14	Mr Choudhury (Contractor) and MBAI), Bombay
15	Mr Abhjit Tanna (Contractor & MBAI), Bombay
16	Mr Beji E Billimoria (Contractor & MBAI), Bombay

Interview	Table C4(i): India Verification of Primary Institutions: Initiator/Promoter
1	Government departments - no formal body.
2	Majority of work by Government bodies. Private sector becoming increasingly involved. No formal client body exists.
3	Institutions exist.
4	Majority of the work is from the public sector but the private sector is playing an larger role in the industry.
5	-
6	-
7	-
8	Public and private sector - with the private sector becoming more influential in the industry since the 1991 government reforms and the liberalisation policies resulting in privatisation.
9	Registration of certain approved contracts exists in many private works Departments in each state. The private sector is becoming increasingly influential in the construction industry, particularly with the amount of privatisation of infrastructure work in the industry.
10	Generally the public sector commission the majority of building work within the industry. Since the liberalisation policies of 1991, the private sector have been taking a more active role.
11	Public sector have been primarily concerned with building infrastructure provisions, and also public buildings. The role of the private sector is increasing. There is no single body that represents clients in the industry. Each government department is allocated an annual budget - to carry out construction work. The availability and supply of finance is problematic.
12	Public and private sector are major clients. The public sector has been the major client within the industry for infrastructure projects and the private sector for building works. This is however changing since the 1991 liberalisation policies introducing privatisation. The industry needs to be regulated and co-ordinate as an industry. NICMAR have made attempts to provide the establishment of a Ministry of Construction to undertake this role.
13	Major projects are traditionally by the public sector including infrastructure projects and some building work. Building work is controlled by several organisations: National Building Construction Corporation (NBCC), City and Industrial Development Corporation (CIDCO) and Housing Development Finance Company (HDFC). The private sector have taken an increased role within the Building sector.

14	Major clients are the public sector Works Department and Ministries, the private sector is also increasing its workload within the industry. There have been recommendations by the MBAI and NICMAR to establish a Ministry of Construction but this has not yet been established. Such a ministry would be involved in co-ordinating, organising, and monitoring the construction industry in India. The construction industry in India, like many other developing nations have is a very conservative arena, we like to follow what has been done in other countries, and we maintain a traditional system of thoughts/processes. A ministry of construction is required to supervise, maintain and develop the Indian construction sector. Greater government legislation and assistance is required to develop the industry. The government have made moves towards this by establishing a division in the Planning Commission to deal with the construction sector. This is the first step towards getting a Ministry of Construction.
15	Various public work departments have their own procedures for executive construction work. There is no single body in the private sector which is responsible or organises the construction sector. Calls have been made to establish Ministry of Construction.
16	Public and private sector exist although there is no single body which is responsible for the organisation and monitoring of the construction industry. The government authority in India is the most suspicious client, and this is why they have their own overstaffed design departments. They tend not to trust contractors and believe they are the most qualified to do the job.

Interview	Table C4(ii): India Verification of Primary Institutions: Fund
1	Government finance, banks, private money lenders, savings, black market finance.
2	Government finance: each state responsible for their own state projects - funded by state-grant departments. Foreign finance:- World Bank, Asian Development Bank, UN. Public bodies - eg Water and Sewerage Board, foreign Aid. Banks, Private money lenders, Housing Development Finance Company (HDFC), Black market finance.
3	-
4	Government departments, banks and private individual finance institutions in India need to be developed further to allow easier acquisition of finance for construction. Only banks exist for the private sector - insurance companies and pension funds are not involved.
5	Government departments and banks.
6	Government Departments and State, banks, private lenders.
7	Finance institutions include government sources, and banks. Other financial institutions such as pension funds and insurance companies don't lend to construction. More institutions which provide finance for construction are needed. There is a lack of developed financial institutions.
8	Few finance institutions lend to construction the availability and supply of finance is problematic. Increasingly finance is being arranged from external international sources, whilst the construction is being carried out by the local private sector, under the supervision of international managers.
9	Government department and private Banks. Recently there has been the development of 'Housing Banks', to assist with finance for public and private housing, financial institutions have not been adequately developed to provide finance for construction. The Contracts Association of India have established a co-operative bank to provide finance specifically for construction projects.
10	Financial institutions are reluctant to lent to construction. The Government will allocate finance for construction to the various departments. Financial institutions need to be further developed in India.
11	New financial institutions are emerging in the private sector for construction but they are still at an embryonic stage - traditionally finance comes from Government, Banks or individual lenders. The nations financial structure needs to be improved.
12	Finance comes from Government, Banks and private money lenders. More equitable arrangements and new institutions are required to provide finance for construction. The HUDCO has developed to provide finance in the industry.
13	Finance is provided by the Government and International agencies for the private sector from Banks and private money lenders. The finance system is rigid making it difficult to obtain finance. Foreign finance is increasingly being used for major projects. High interest rates are charged by national banks because there is not a lot of money available and also because the construction is considered to be risky.

14	Finance is from Government through taxation and fiscal policies and Banks - who charge hugh interest rates, Private money lenders and personal savings are used. Several banks exist which provide finance including The National Housing Bank, and The Industrial Development Bank of India Insurance companies and Pension Funds have played a limited role in providing construction finance. There is a need to improve the financial basis of the country and to allow easier access to finance specifically for construction projects. Finance is being obtained through bilateral and international loans and aid.
15	Government finance is obtained through taxation and fiscal policies and is distributed at central state, and local government levels. International loans, bilateral aid is also obtained. There is a growing trend for the private sector to be involved in the construction of infrastructure projects within India through both schemes. In such cases foreign finance is from banks, private money lenders, savings and black money. Increasingly developers are requiring deposits from tenants at the start of construction easily - it is considered to be a risky business. Obviously a flow of finance for the duration of construction is a problem in India.
16	HDFC is proving finance for housing, including the Government departments and private banks. Banks want documentation and substantiation from clients in order to provide loans. More financial institutions are required.

Interview	Table C4(iii): India Verification of Institutions: Designer
1	Boards & Institutes exist - but they only have a few members relative to the population. The main institutions include the Indian Institute of Engineers, the Association of Consulting Civil Engineers, Indian Institute of Architects and the Institute of Surveyors.
2	Boards & Institutions - membership and registration to institutions required approved training.
3	institutions and boards exist to register and licence designers, but may who practice in the industry are not registered.
4	-
5	-
6	Institutions and boards exist to register and licence designers, but may who practice in the industry are not registered.
7	Boards & Institutes exist - only a few members. The main institutions include the Indian Institute of Engineers, the Association of Consulting Civil Engineers and Indian Institute of Architects .
8	Institutions and boards exist to register and licence designers, but may who practice in the industry are not registered.
9	Boards and Institution exist to register and qualify designers to operate within the industry. However in rural areas registered designers are often not used which results in poor building design and construction. The main institutions include the Indian Institute of Engineers, the Association of Consulting Civil Engineers, Indian Institute of Architects and the Institute of Surveyors.
10	Architects receive a good technical education and training, however management and planning is neglected. Various schools of architecture at University level provide education for architects. Qualified architects are expected to register with The Institute of Architects (Bombay). In the last 50-60 years better education training, postgraduate and research activities have been established. The Council of Architects established The Architects Act 1972 to protect the title of the Architect and laid down guidelines for the ethical standards and codes of conduct for consultants. The Indian Institutes of Architects (which has formal limits with the RIBA in the UK) are professional institutions involved in CPD and accreditation of courses. Other professional institutes include The Indian Institute of Consulting Surveyors etc.
11	Both councils (Boards) and Institutions exist for design consultants. The former is to register qualified consultants and the institution is to provide continual professional development, and accreditation of courses at various education and training organisations.
12	Design Institutions exist to register and qualify approved designers include the Indian Institute of Engineers, the Association of Consulting Civil Engineers, Indian Institute of Architects and the Institute of Surveyors. Technical education is provided but great attention is required:- management and planning skills.
13	Design Institutions exist; each professional consultant has its own governing body which registers practitioners for its members:- Institute of Architects India, Institutes of Engineers India, Institute of Surveyors and Master Builders Association of India. There are many operatives who practice in the construction industry who are not members of such institutions. India is a vast nation with many people practising in the industry. At present there is no clarification or registration of all practitioners in the industry.

14	There is a major shortage of management training for consultants who are otherwise technically highly qualified. Consultants are required to register with the appropriate boards and are usually members of associated institutions. Ethical codes of practice/procedure are provided by such boards and institutions for those members. In major cities or urban areas the ethical codes and qualification/ registration of consultant is important, however in rural areas less emphasis is given to them.
15	Professional Boards exist to register consultants and institutions exist to develop consultants skills further, however they are more socially oriented. Management training is neglected, whilst technical skills are provided.
16	Institutions exist which accredit courses, register consultants who are licensed to practice in the industry. Their training is primarily technical with management skills being neglected.The main institutions include the Indian Institute of Engineers, the Association of Consulting Civil Engineers, Indian Institute of Architects and the Institute of Surveyors

Interview	Table C4(iv): India Verification of Institutions: Management of Construction
1	Few institutions exist.
2	Poor formal training, large contractors developed expertise through experience and 'inhouse' training. NICMAR is attempting to develop skills and Master Building Association of India.
3	Poor training exists - little formal education is conducted in this area.
4	-
5	Adequate management training is not provided in the formal education of construction professionals. Recently, there has been the development of several construction and project management courses at Universities. It is hoped that these institutions will begin to defuse the importance of management in the construction industry.
6	Not much formal education or training exists in management. Greater training should be provided.
7	Few institutions exist. The major one in NICMAR.
8	Need to develop management skills indigenously. International managers are being used as Indian projects.
9	Management training is required. NICMAR has established a number of courses and education programmes to develop such skills in India.
	Management training in India is currently inadequate. Construction management courses are being run at several National Universities.
11	In the training of professional consultants management and planning training is not offered. There are few consultants who are training in management. Several courses have been established at national Universities in Construction Management to develop such skills in India.
12	NICMAR over the last ten years have been developing management skills within the industry. Planning and management skills are required to be distributed into the industry.
13	There is a lack of management skills in the industry. NICMAR has established a range of courses and having programmes to improve these skills within the industry.
14	Urgent training is required in the area of management and planning for all construction practitioners. There has traditionally been no formal education or training in this area. During the last decade construction management has become increasingly important. There are now few education and training institutions which are providing formal qualifications in this expertise (including NICMAR). The number of qualified and experienced managers within the industry is very few.
15	Management skills are required within the industry for all consultants and practitioners. Training provisions are being provided by Universities, NICMAR and MBAI however the majority of contracts don't have these skills.

16	There are no real trained professionals in the industry who can provide/meet the international standards and qualifications of construction managers. Particularly in Government staffed departments poor management skills exist. The industry at present has not got sufficiently training personnel in management and planning skills but also the number of qualified skilled professionals are depleting. Large experienced companies who have been operating for many years have developed their own "working culture", management, planning and co-ordination expertise. These skills filter down to employees within the company. There does need to be more formal training in this area for construction professionals. NICMAR and some Universities are now providing training in these areas. Increased skills will be provided by technology transfer with international firms.

Interview	Table C4(v): India Verification of Institutions: Constructor Producers
1	No institutions exist to formally train construction workers. Constructor institutions include the Builders Association of India but its members are the large sophisticated contractors. Many thousands of contractors exist who are not members of any institution.
2	Skilled workers originate from various parts of the country - traditional training techniques used.
3	Few formal training institutions exist.
4	-
5	No training institutions exist. There is a large shortage of skilled labour.
6	Institutions do not train construction workers, skills are traditionally passed down from father to son.
7	Limited training institutions exist. Constructor institutions include the Builders Association of India but it has only a few hundred members out of the many thousands of contractors in India.
8	No training institutions exist, skills are learnt on the construction site.
9	Traditionally there has been poor formal training for construction workers. There is no training schemes for various trades to produce skilled labour. Many attempts have been made by both the public sector and NICMAR to establish training programmes for workers but they have failed. Such training programmes has been traditionally based on UK schemes and construction technique which is inappropriate for our nation. Training institutions for skilled labourers is urgently needed of the informal system of passing skills down from father to son - which is no longer occurring.
10	Limited training institutions exist. Institutions such as the Builders Association of India, but it is only the large sophisticated contractors which are members.
11	Few training institutions exist. Other institutions for constructors include the Builders Association of India but there are only a few members.
12	The poor supply of materials and plant within the industry. Trade associates exist for contracts including the MBAI. There are no official statistics in the number or size of constructions which operate within the industry.
13	There is a lack of skilled qualified labour, inadequate materials and plant supply within the industry.

14	There are poor/limited formal training programmes for construction workers. Skills tend to be passed down from father to son - along with bad habits - which has resulted in poor quality construction in this country. Attention should be given to establishing training schools and programmes for all trades within construction. The industry employs many people so Government intervention is required to implement and establish training and education courses for tradesmen. Large contracts are relevant to maintain their own skilled staff as the industry is so mobile and seasonal. Skilled craftsmen can command high wages, so there is no incentive for contracts to train their staff, as they will move to more lucrative employers. A more structured work-training programme is required in India. Better technology should also be used. On large projects, up to date technology is used, but on small projects older traditional methods and procedures are used. Prefabrication should be particularly used in developing nations, however prefabricated components are classified as 'manufactured' and are liable for taxation, which pushes up their costs. There are very poor statistics on the number and size of contractors in the industry. In general each government department has a list of approved contracts who are suitable to execute their work. There are various classes of approved contractors: A - E; with A being an unlimited value construction and E being a limited value and specialist items of work. The vast majority of contracts within the industry are not licensed, approved or registered. The MBAI also has approved contracts - but these are a fraction of those who operate in the industry.
15	There is little formal training provisions for trade contractors and skilled workers within the industry. Few institutions exist for constructors including the Builders Association of India but it has very few members.
16	There are now many jobs in the industry but there are fewer and fewer trained qualified personnel. The traditional system of skilled labour passing down their skills from father to son is no longer the case, and increasingly we are faced more and more poorly trained and skilled workers. There is a need for more formal training in this area with the increased amount of international work. I believe that there will be technology transfer between companies.

Interview	Table C4(vi): India Verification of Institutions: Allocation of Risk
1	Each government department and each private sector consultancy firm are producing their own contracts. No institution exists.
2	Government departments produce their own standard contracts based on RIBA 63 and FIDIC contracts.
3	No institution exists to produce a standard form of contract for the whole industry.
4	-
5	-
6	No institution exists which produces a standard form of contract for the whole industry. Various government departments and privet consultancies produce their own.
7	Contracts used originate from JCT and FIDIC and each government department produces its own specific contract. Need to develop a standard contract for India.
8	Contracts are produced by the public and private sector but there is no standard document.
9	Need to develop equitable forms of contract which are suitable to the nations working environment. NICMAR and Master Building Association of Government departments produce their own standard contracts based on RIBA 63 and FIDIC contracts. India have produced a draft copy of an new standard from of contract for India - which is awaiting government approval.
10	New contracts are in the process of being established.
11	The systems which are still used today in India have been adopted from the UK. This legacy still continues today. A new Indian standard form of contract is currently under review by the Government.
12	Appropriate, and equitable forms of contracts are being developed by the MBAI and NICMAR to be used as a standard document within the industry. This will be specific to the legal system and the operating environment of the Indian industry.
13	Most contracts used in industry have their roots in RIBA 63 or FIDIC contracts. Standard contracts are often drafted by each government, department and each architectural practice. There is no nationally recognised standard form of contract in the industry.
14	No national standard form of contract is used within the industry. They have been adopted from RIBA 63 and FIDIC contracts. The industry is looking at its contracts in an endeavour to change them, making them fewer and more equitable. Based contracts result in distrust and disputes within the industry. The MBAI and NICMAR have drafted a new standard form of contract for the Indian construction sector which is currently being received by various government departments. The Central Public Works Department (CPWD) are convinced that an equitable standard form of contract is required within the industry.
15	Contracts are protected by various government agencies including The Public Works Department (PWD), The Ministry of Housing, Then National Building Organisation (NBO). These contracts are formed from a combination of RIBA 1963 and FIDIC, fair and equitable contracts need to be developed, which are suitable for the Indian construction industry.

16	Traditionally contract conditions have not been equitable and have tended to favour the client. This will change as standard equitable forms of contract begin to be used within the industry. The MBAI have drafted a standard form of contract which is currently being reviewed by various government departments. This contract is mainly based on the FIDIC contract and appropriate to the Indian construction industry. Generally clients have been trying to pass too much risk to the contractor. They should accept risk which is their concern and not include clauses which pass the risk to the contractor.

Interview Number	Malaysia Interviews Name and Company
1	Ms Mizon Rung, QS Senior Lecturer, University of Technology Malaysia, Johar Baru.
2	Mr Mohameddin, QS Lecturer, Johar Baru.
3	Mr Mike McIver, Director, Plus 3 Consultants, Kuala Lumpur.
4	Dr George Ofori, National University of Singapore.
5	Mr Lenard Kok, Executive Director, J R Knowles Malaysia, Kuala Lumpur.
6	Mr M Milford, John Laing International, Commercial Director, Malaysia, Kuala Lumpur.
7	Ms I Khatjah BT Mohd Al Piah, Public Works Department, Senior Architect, Kuala Lumpur
8	Mr Abdullah Bin Che Mat, Public Works Department, Quantity Surveying Department & Board of Surveyors, Kuala Lumpur.
9	Mr Bruce Schlautzer, Project Manager for Bovis International, K L Towers, Kuala Lumpur.
10	Mr Abdullah Bin Che Mat, Chartered Quantity Surveyors & Institute of Surveyors, Kuala Lumpur.
11	Mr Abd Shahar Abd Karim and Mr Khairuddin Bin Abdul Rashid, Construction Industry Development Board, Kuala Lumpur.
12	Mr Shar Ipuddin Muis and Lawrence Hokhai Toon, Master Builders Association Malaysia, Executive Officers, Kuala Lumpur.
13	Mr Abdul Rohman, Promot Consultants, Architect, Kuala Lumpur
14	Mr Tay Toong Soong, Baharuddin Ali and low Sdn, Kuala Lumpur
15	Mr Lai (Director), Davis Langdon & Seah, Kuala Lumpur.
16	Mr Rosden, Head of Department (Surveying) University Technology Malaysia, Principle Lecturer/QS, Kuala Lumpur

Interview	Table C5(i): Malaysia Verification of Institutions: Initiator/Promoter
1	Clients include private and public sector: owner occupiers, developers, investors. The majority of clients are inexperienced although large experienced clients are becoming more active and are making moves towards new procurement options such as D & B and Management contracting.
2	Public and Private sector; owner occupiers, developers and investors most of which are inexperienced.
3	Public and private:- owner occupiers, developers and investors, with the majority of clients being inexperienced.
4	There is a need for some central focus for the construction industry such as the CIDB: which provides a framework for the industry to develop within. This framework provides a structure and direction for the industry to develop within leading and monitoring the performance of the industry. The "framework" is a plan establishing the goals of the industry and how they will be reached. It also includes a set of bodies, groups and organisations which facilitates the industry meeting its objectives eg CIDB departments within various ministries. Having administrative bodies in charge of the construction industry, such as a Ministry of construction or CIDB, is essential for the development of a nations industry. Such organisations must have the prestige and competence to lead and develop a nations industry, taking a long term view of the industry. Although the origins of such boards or groups would be state owned, in the long run they should be handed over to the private sector, becoming self financed and sufficient, essentially becoming an agency which manages itself.
5	The major clients include - public, private, owner occupiers, developers and investors. (Experienced/Inexperienced/Primary/Secondary definitions have not been used in Malaysia). There is a need for a body on the side of clients to provide impartial advice. The closest we have to such an organisation is the Housing Developers Association (HDA) which represents developers who build houses.
6	Public, private, owner occupiers, developers and investors. At present there are some large corporate clients who are experienced - but because Malaysia is going through a boom, the majority of clients are new developers so they are inexperienced. The setting up of the CIDB is a response to move control and regulation of the industry. 0.25% of project value over ½ million ringgit have to be paid to the CIDB etc.
7	Clients are public and Private although no institution exists which provides advice for clients during the procurement process.
8	Institutions exist and its anticipated that the CIDB will assist clients in acquiring buildings.
9	Public and private clients exist.
10	Institutions exist.

11	The establishment of the CIDB is due to a host of reasons; and its promotion within the industry began in the mid 1980s and it was officially launched in 1993 (December). During the 1970s there was not as much rapid development of the country or industry as we are currently experiencing. The country traditionally concentrated on agriculture/rubber, oil, tin for exports and we are now moving towards manufacturing and other capital intensive exports. Also with the government's policy of privatisation and The Vision 2020 concept the building sector has become more influential and important to the development of the economy as a whole. The CIDB has been launched to restructure the industry and maintain its continuous improvement and development. Also the fragmented nature of the industry will be reduced by having a single body overseeing the whole industry. Since the development of the CIDB, a more structured approach has been taken to the development of the industry. Traditionally the industry has been fragmented, with everyone looking after their own specific interests, rather than the interests of the clients and the industry. In the mid 1980s, when discussions were heard about the establishment of the CIDB, some interest was paid to providing a more organised approach to the industry, but it was not until the Highland Towers disaster that things began to advance more rapidly and greater regulations and controls were imposed into the industry.
12	Public and private clients exist.
13	Institutions available.
14	The CIDB will provide guidance for clients and there are many public sector departments that provide advice.
15	The majority of clients are defined into public and private sector clients. The public sector is the government and statutory bodies, but there is a trend now for major projects to be privatised and executed by the private sector. The bigger portion of the work in the industry now comes from the private sector. As yet there is no independent body which provides advice to clients regarding the industry and from whom to obtain a building. The CIDB may be doing this in the future. At present the advice their clients receive is from their consultants.
16	The clients within the industry is made up of two types of client private and public. The public sector clients are owner occupiers and are from the various government ministries public agencies. In the private sector is made up of both primary and secondary clients ie -owner occupiers, developers and investors. The majority of clients are inexperienced, however there are a small amount of clients who are very experienced (property developers/corporate clients). Prior to the setting up of the CIDB which will advise both clients and contractors/consultants about the construction industry there has been no independent advice for clients. Clients will usually get advice form consultants (most often Architect).

Interview	Table C5(ii): Malaysia Verification of Institutions: Funder
1	Funding institutions include government loans, and foreign aid loans, banks, insurance companies, building societies, pension funds, savings, sale of shares.
2	Government, banks, building societies, insurance companies, pension funds, self finance, sale of shares.
3	Government, pension funds (limited - through the Employees Provident Fund), Building Societies, Banks and Insurance Companies. Although the finance sector is developing, the majority of finance is from the banking sector.
4	The sources of finance includes governments, banks, pension funds (Employers Provident Fund), insurance companies, building societies, self finance and the sale of shares.
5	Banks, pension funds, insurance companies, building societies, government and savings. Such institutions are generally ready to provide finance on a long-term basis - 7 to 10 years ie more stable long-term returns. Traditionally the public sector had been the major financier of construction, but with the privatisation policies, the private sector is now in the lead.
6	Finance institutions include government, banks, insurance companies, building societies, pension funds and self finance - with banks being the major source for private clients.
7	Institutions available.
8	Financial institutions include government, foreign banks/aid finance, banks, pension (Employees Provident fund) funds and insurance companies (both have a lower involvement than in the UK), savings and the sale of shares.
9	Institutions available.
10	Institutions available.
11	The sources of project finance include:- government, foreign banks/aid, banks, pension funds (Employees Provident Fund) - but their role is not as extensive as in the UK insurance companies. Such institutions are generally quite willing to provide finance for construction. Nationalised Corporate Bodes (PNB) also provide finance for construction projects (involved in investment of the government resources).
12	Public and Private institutions are available.
13	Finance for construction projects comes from banks and through the Government. The activity of pension funds and insurance companies is limited.
14	Institutions in the public and private sector provide finance for construction.

15	The financial organisation in Malaysia includes the government, foreign loans/aid, and banks -or internal funding. Pension funds (The Employees Provident Fund) provides finance, but their role is smaller than that of banks. The links between finance houses and the industry are reasonable, although there are no special links between the two. Commercial banks will judge an investment on its commercial basis. If the track record of the construction industry is however good (despite the recession), it is a good form of investment.
16	Financial institutions include the government, commercial banks, internal funding. These are the major sources of finance although pension funds, only finance on request by the government - for major government based projects.

Interview	Table C5(iii): Malaysia Verification of Institutions: Design
1	Designers include architects, engineers, surveyors who are all registered and regulated by their associated boards. These boards will register each qualified professional allowing them to practice in Malaysia, setting their standards and ethical codes, and code of conduct. The Associations are however far more a social club of professionals, although increasingly they are playing a greater role in the development of professionals (CPD).
2	There are various registering bodies for designers who regulate and licence the practice of design consultants. Each designer has an "institution" (including the Institute of Architects, the Institute of Engineers Malaysia, the Association of Consulting Engineers and the Institute of Surveyors) which are more of social clubs - rather than regulatory bodies. They also conduct exams and carry out more CPD work.
3	The various consultants who operate within the industry all have their respective trade organisations and boards which register, control and approve professionals, setting internal regulations of their qualifications, CPD setting ethical standards etc.
4	Institutions and Boards exist for Surveyors, Architects and Engineers including the Institute of Architects, the Institute of Engineers Malaysia, the Association of Consulting Engineers and the Institute of Surveyors
5	Designers have their own governing bodies (boards) and institutions. The purpose of the institutions is a social-orientated organisation where like minded individuals can collect together. The boards are registrative and regulative; setting the codes of conduct and professional practices of the members and licences individuals to practice as consultants within the industry. All members must renew their membership to each board annually. Most of the designers are overseas trained
6	Designers have a regulating and registration authority known as Boards. Each professional have their respective trade institutes also - but these are more socio-orientated. The Boards generally licence and regulate the members of the industry. No foreign consultant is allowed to practice here without being registered with the associated board. Foreign consultants can work in Malaysia, but the work must be approved and signed off by a registered consultant (locally).
7	The boards and institutions (for professionals) are becoming aware of the need for insurance provisions for their members. The Boards license, register and approve individuals to practise as consultants in Malaysia; setting out the ethical codes and procedures which should be adopted by the respective professionals. The Institutions tend to concentrate more on CPD and are a "socially-orientated" organisation. Although the codes and ethical standards are clearly written for all the members to follow, in reality they are not always maintained. The majority of "young" registered architects are educated abroad and come back to work in Malaysia:- This was particularly the case during the mid 1970s to the mid 1980s. The majority of foreign trained architects are British graduates and so the majority of the administrative structures (such as PAM and IAM) and procedures are entrenched within the British system. There have been more recently moves to try a break away from this traditional arrangement; with the advent of students studying in other foreign countries such as US, Canada, Australia and Japan.
8	The Board of Survey registers QS within Malaysia and regulate their ethics, and that they protected the clients (or their parties) interests. Code of conducts exist and we have a licence system which all professional surveyors must obtain in order to practice as QS's. The board has been established since 1982; and prior to this there was only legislation governing the practice of QS's (Act of QS 1967). The board is only a skeleton organisation, whose main function is to register and provide a code of procedure for its members - so we do not actively get involved in R & D or CPD. There are approximately 700 fully registered QS's and 400 probationary registered members.

9	The bulk of design consultants are registered with their associated boards including the Institute of Architects, the Institute of Engineers Malaysia, the Association of Consulting Engineers and the Institute of Surveyors
10	The role of the ISM is to jointly publish the PAM69 standard form of contract, being arbiters in construction disputes, being involved in CPD and carrying out a limited amount of research. The membership is approximately 1000. This is in effect a carbon copy of how the RICS is organised - indeed we started out as a branch of the RICS before independence.
11	Design consultants including architects, engineers and surveyors are all registered and licensed to operate nationally by their respective Boards. As well as registering consultants these boards also provide ethical standards and codes of procedures to be followed by their members. The Institutes are more socially orientated, grouping together like individuals and assisting with the CPD of their members. The "Board" is the regulating and controlling Body ensuring that consultants practise within the confines of their professions and licensing them to operate in the country. In the private sector an unregistered consultant such as an architect may not practise as an architect unless his/her work is approved by a registered architect. When designs are produced to obtain planning approval, for tendering and as built, all have to be signed by a registered architect. The registered architect will generally oversee the work of the draughtsman underneath him/her, but will be required to sign all drawings, approving them and accepting responsibility for them. Professional boards/institutions have begun to produce guidelines for clients regarding procurement advice although they are not very comprehensive.
12	Institutions exist. Main institutions include the Institute of Architects, the Institute of Engineers Malaysia, the Association of Consulting Engineers and the Institute of Surveyors
13	PAM sets standards and code of ethics for Architects in Malaysia, and also register and license architects to practice nationally. There are approximately over 1000 architects which are registered by the board, although there are many more architects that practice within the industry.
14	The Institute of Surveyors will register members who are qualified and licensed to work as professionals in the industry, and provide codes of conduct and ethical standards for their members - its very similar to the RICS. There is currently a shortage of QS's in Malaysia - this reflects on a larger problem of the general shortage of skilled labour within the construction industry.
15	Consultants are governed by boards and institutions. The boards are there to register and license consultants to practice and they establish ethical standards and codes of procedure/conduct for their members to follow. The Institutions are more involved in current issues affecting the profession, CPD and are socially orientated. PII is not compulsory and is only required for large projects, or if the client insists that it should be taken out. If a consultant is found to be negligent the board of (Registering each consultant) have various acts which would protect the rights of the client, and when their drawings/documents are submitted for approval they are responsible to the local authority (approving authority).
16	Consultants are governed by both boards and institutes which are regulated by an Act of Parliament. The function of boards is to register and license consultants to enable them to practice setting up codes of procedures and ethical standards for them to follow. The institutions are more for CPD, dealing with current affairs and generally more socially orientated approximately: Engineers 15,000, QS 2,000, Architects 4-5,000.

Interview	Table C5(iv): Malaysia Verification of Institutions: Managers of Construction
1	There has been little training of construction practitioners in the area of management and planning.
2	Lack of training institutions in this area especially to train management contractors. Traditionally the main contractor takes on the function of management.
3	Institutions to train managers are not available. Management procurement systems are beginning to be introduced but many of the professionals and their respective institutions are reluctant to change as their positions are safeguarded with the use of conventional systems.
4	Institutions do not exist. The general contractor traditionally manages the construction process but when management contracting is used there are few qualified MC's.
5	Only a few firms within the industry offer management services. This is because there are limited training facilities to gain such skills. These companies are large and sophisticated.
6	-
7	There is a lack of training in the management of construction field in Malaysia. Management contracting is used on a limited basis as there are only a few experienced companies which can offer these skills in the industry. Training in this area is required.
8	Institutions to train consultants do not exist.
9	The CIDB may assist in training managers in the construction field.
10	Institutions do not exist. Under the lump sum and design and build system the contractor takes on this role. There is a need to train management contractors. Management orientated procurement systems are gaining more attention in the private sector but these systems have not caught on. The skills are not in place: there are few experienced management companies, subcontractors are not adequately experienced, and the general management within the industry are not in place.
11	Master Builders Association is attempting to assist in the training of managers.
12	Moves are being made to establish a "Construction Academy" modeled on the Australian system concentrate on construction issues including skills, training, management, planning etc. The Master Builders are attempting to initiate training courses.
13	Institutions to train these consultants do not exist.
14	Institutions not available.
15	Management of construction has been traditionally done by the general contractor, but as management orientated procurement systems are used more training institutions are required. Management systems are only used by a certain sector of clients and is only provided by a few experienced practitioners within the industry due to lack of knowledge and understanding. Training in the area of management and planning is required.

16	Institutions not available. The general contractor has traditionally carried out this function.

Interview	Table C5(v): Malaysia Verification of Competency: Constructor Producer
1	Contractors institutions include the Master Builders Association of Malaysia, The Malaysian Chartered Institute of Builders, The Bumiputra Contractors Association. Traditionally, the registration of contractors was only required for those contractors wishing to work on public sector projects. However, due to the CIDB, all contractors and subcontractors are now required to be registered, and they are required to pay a fee of 0.25% of every contract they win to the CIDB for the development of the basis contractors in Malaysia. The purpose of the registration facility is to give clients a list of pre qualified contractors for all trades, establishing a higher degree of confidence within the industry. In terms of formal training facilities for trade works, there are limited courses and training centres available. Generally each contractor runs his own training programme to train his staff, and there is no real central training programme for construction works. This has been one of the goals of the MBAM, and is also going to be looked at by the CIDB.
2	Associations for contractors include the MBAM and the Bumiputra Contractors Association. The major foreign contractors in Malaysia are the Japanese and Koreans, who utilise the majority of our labour to carry out the works. On the surface this looks as if we are benefitting from the process of technology transfer, but in reality it is only superficial. The technology is brought to Malaysia, but it is not transferred to the people.
3	There is limited training facilities provided for trade contractors - such as colleges and technical institutions but it has been limited. There is no apprentice system. These businesses are usually family operated - with skills being passed down - and management is one of their major weaknesses.
4	Registration of contractors offers a pre-qualification process and allows an objective assessment to be made of the contractor in terms of ability, resources and financial stability, ensuring that the client is selecting a capable contractor to execute the works. However, the criteria for registration may vary and needs to be analysed to assess its suitability. What is needed is continuous and constant monitoring of contractors within the industry. The subcontracting basis in Malaysia and Singapore is not very sophisticated because the majority of works in such firms are foreign workers, who are subject to lots of controls in terms of number of employees, for how long and what pay, (there being a foreign worker levy on projects). Small subcontractors particularly have a problem in managing their workers, and quality of work. The contracting associations are beginning to play a large role within the procurement process. Particularly with the amount of involvement the contractor can have. In such contracting organisation, even though they do not have a large membership, the members they do have are of the most influential within the industry, being the largest and carrying out the majority of the workload. Systems such as design and build are being promoted as new procurement techniques.
5	Subcontractors are not formally trained, it tends to be passed from father to son; individuals from craftsmen within the industry. This informal tradition of passing down skills is now beginning to change. Organisations are beginning to be established which are addressing the formal need for education and training of craftsmen. Course are being set up nationally to improve the skill level of construction works. The CIDB has begun to set up such schemes -to promote formal training for tradesman and craftsman. Contractors up till now did not have a similar registrating/regulating body, but the CIDB is now going to undertake this responsibility. All contractors and subcontractors are required to register with the CIDB in order to tender for work or execute any construction work within the industry (public and private sector). Traditionally there has been little training and research done by the large contractors, however a more long-term approach is now being adopted within the industry. There is little formal training for such trade contractors. Skills tend to be passed down from father to son rather than to be formally training facilities being provided.

6	There are several organisations which currently exist for contractors including the MBAM and the Bumiputra Contractors Association (PKK) and more recently the CIOB. JKR registered foreign contractors and this role is now taken over by CIOB. There is limited formal training for craftsmen by the government establishing vocational training schools, but these have not generally been too successful - and skills tend to be passed down. A major problem of Malaysia is that it has a population of 17 million and to supply labour for all sections with construction being one of the most labour intensive it must bring in foreign labour.
7	Trade contractors have limited formal training organisations which produce skilled workers. This has been a limitation in our country and the CIDB have recognised this and are making efforts to introduce more training schools and qualifications for skilled construction workers. The Singapore CIDB has introduced such schemes which have worked successfully. Certain training institutions exist in Malaysia such as (MARA: local) but they tend to train staff in general construction areas. More in-depth training is required. The majority of labour within the industry is semi or unskilled. There are relatively few skilled workers within construction. The traditional way of training is to pass down skills from father to son (informal systems). The CIDB have made it one of their functions to establish within two years a substantial number of new training institutions nationally offering vocational qualifications on 15 different trades. The majority of contractors in the industry fall into the smaller brackets - and have limited experience and management skills - however they are constantly developing:- (class A-F). Underneath these contractors are a range of trade based small contractors who are relatively unsophisticated. Courses and seminars are being run to try and improve the "standard" of contractors and the CIDB will assist in this process.
8	Some assistance is being given to such companies to improve their skills by introducing training courses on how to develop companies into general contractors, various aspects of construction, the types of contracts used and site management. This is however a long and slow process. The government has run a scheme known as "Accredited contractors", which consists of contractors who have been through such training courses and assess their development in the industry. Most of the contractors in the A - F classification system are on this scheme. The lower classes of contractors are the most important and require the most assistance as they are the smallest and the potentially most capable group of contractors to grow. For Contractors there is the Guild of Accredited Bumiputra Contractors, the MBAM, the Bumiputra Contractors Association - however their membership is relatively small, and the majority of contractors in the Industry are not members of these organisations. The function of these boards is to register, and safeguard the interests of their members.
9	Contractors Institutions exist but their membership is relatively low. There is poor training institutions for construction workers. We have 93% employment so few people want to work in construction.
10	Training institutions are required for construction workers. We rely on foreign workers who are unskilled.

11	Registration of contractors in Malaysia is one of the major functions of the CIDB. This is done to establish who the builders are in the industry, regulate their performance and also to provide a sort of pre-qualification process for them. Clients will then be assured to get reliable contractors whose work is of good quality. It is a way for the CIDB to improve the contracting basis in Malaysia, by providing training facilities and improve the quality of their workmanship. The registration procedure is thorough, going through a list of criteria and contractors are required to register/renew their registration every two years. Prior to the setting up of the CIDB there were no regulations in terms of experience and qualifications of companies entering the market so many non-experienced companies were established in the construction sector. This has been a major reason for the poor level of quality within the industry. This has been the case within the private sector because in the public sector there has been the registration of contractors by the Central Contracting Service providing a list of government approved contracting companies for public sector works. However quality has also been a problem for the public sector. The CIDB registration system applies to all contractors operating in Malaysia, employing more than three employees. The CIDB is aiming on improving the formal training organisations available for trade based construction workers. Currently there is a National Qualification Standard. However this is very general and not specific to the construction industry. The CIDB have introduced 15 different trades within the construction industry and we will be responsible for setting up training organisations to teach these skills and developing new national standards for the minimum qualifications in such trades. The number of skilled workers within the industry is relatively low - the majority of tradesmen have no formal qualifications. Again, by having more qualified skilled workers within the industry the level of quality and client satisfaction will increase.
12	The role of the MBAM is to represent the contractors to the government, and other bodies. If there are any disputes or problems on contracts between our members and other parties we will step on to assist and try and sort out disputes. The focus is more on the relationship between our members and the government, with the advent of the new public sector budget, we can begin to discuss the new types of work and how we can assist. There are approximately 170 members in the MBAM but there are thousands of contractors who operate within the market. A very small % are members of trade organisations like the MBAM. The role of the CIDB is very different from the role of the MBAM, CIDB is enacted through government legislation, and their aims are different to ours. The MBAM is purely a voluntary organisation. Indeed there is a close working relationship between the CIDB and the MBAM we have assisted in preparing registration and heavy guidelines for all contracts in the industry. The training/apprenticeship/special skills (eg masonry, carpentry , glazing) facilities are provided when students leave secondary school. Technical colleges which are vocational schools provide such training for construction workers. However the training is very general, and there are not many training centres. The main problem is that the graduates leaving such technical colleges are not going into the construction industry once they have been trained, they tend to move into other industries. The construction industry has a bad public image considered to be a dirty, dangerous and dispersed industry. Traditionally skills have been passed on from father to son and more recently some formal training institutions have been established. But how will the high level of foreign works in construction, who back home are farmers or fisherman and have no construction skills at all, they are learning while they are working on site through other workers.
13	The formal training of trades in construction has been limited - and traditionally skills were passed on from father to son. This is a problem within the industry, limited supply of skilled labour. The Government has been called for the introduction of new training centres and the better organisation of training facilities for the industry.

14	Traditionally, there has been poor formal training facilities for construction workers. The problems is now being recognised and organised training programmes are being developed - and the CIDB will be introducing more in the next 2 years. There has not really been much technology transfer - which has been an issue here. The attitude has been that local engineers and works have not been interested in learning foreign skills but the issue is more complicated. Contractors working in the public sector are classified by the government into class A - F, depending on their size and capability. In the private sector there is the MBAM and the Bumiputra Contractors Association which registers some contractors.
15	In the contracting sector there are various groups which have developed including the MBAM & Bumiputra Contractors Association and more recently there has been the development of the CIDB. Training facilities have traditionally been poorly organised or carried out on an internal basis. At present we are very short of skilled workers. There is a large influx of foreign workers currently working in construction, and most of them do not have the skills or expertise in construction - and even though they work under supervision they have little or no formal training or craft training in their respective trades. The government is keen to see that the trades are formally trained and that formal organisations are established to train skilled staff, but this will take time. There is no really formal training for sub-contractors/trade contractors, and this applies to their construction skills as well as their management and organisational skills. It tends to be picked up through experience. The large contractors have gained management skills through experience, as well as being able to attract professionals with this skill and to keep them in house.
16	The contractors have various groups; MBAM and Bumiputra Contractors Association. The CIDB is a new development which will be involved in licensing all contractors in Malaysia. The role of the bodies is to control the quality of work, promote the standards in the construction industry. The government have implemented various training programmes to increase the skill level within the industry, but is really directed towards small contractors. Large contractors either have their own training facilities or only employ trained staff. The tradition arrangement of acquiring skills in construction is from father-to-son approach, with very little or no formal organisational training facilities being provided, most workers have joined the industry and developed their skills as they gain more experience. The CIDB will now be providing more formal, organisational system of training for construction staff, regulating the performance and skill level within the industry.

Interview	Table C5(vi): Malaysia Verification of Institutions: Allocation of Risk
1	Current contracts for private sector works is PAM 69 which is based on RIBA 1963, whilst in the public sector JKR 203A (with Quantities) and 203 (without).
2	The current contract documents in the public and private sector are developed from RIBA 63 and tend to favour the client. The PWD contracts ultimately favour the government rather than the contractor. They have to protect the interests of the public (the tax payers).
3	The contract used are in the private sector PAM69 (based on RIBA 63) - has come under the same criticism as in the UK:- ie it is too legally orientated and contains terms which are often difficult to interpret. There is a residual British influence here - which is manifested in the forms of contract and in business administration, but in terms of culture there are differences.
4	Most contract documents in previous British colonial nations are based on RIBA 63 - with power being given to the client rather than the contractor. This is because these contractors were originally developed to be used within the public sector, where the government was given the upper hand as the client. Indeed the indigenous contractors in many ways have not helped to make their position any easier. For example, there are many nations which provide advance payment provisions to the contractors, helping them establish basic infrastructure, before construction starts on site, however many contractors here "made off" with such payments. The constant occurrence of this problem, results in clients being justified in imposing onerous contractual documents on their contractors. Although contracts may contain numerous clauses and conditions, placing the contractor responsible for many instances, such conditions are not always imposed.
5	Contract documents are based on RIBA 63: with the PAM 69 (private) and the JKR 203(A) contractors (for public sector). This contract is made up of JCT 63, ICE (4th Ed) and FIDIC 3rd Edition.
6	The two contracts are PAM 69 (Based on RIBA 63) for private projects and JKR 203 (A) for the public sector. Although there has been moves to restructure the PAM form of contract to be more fair and equitable I don't know whether this will make a great deal of difference as the contracting system in Malaysia relies heavily on personal relationships rather than contract documentation (liquidated damages often do not apply in contract).
7	The current contractual documents for the private (PAM69) and public (JKR203) sector are based on RIBA 1963 forms.
8	The contract used in the industry have their roots in JCT and RIBA 63 - with modifications (1983). However there are moves to revise the contracts again. The major difference between PAM 69 & JKR 203 (A) is that the former contract gives high power to the architect whilst in the latter contract the power is given to the SO (supervisory Officer) who can be a QS, Engineer or Architect. Public contract tends to favour the client more than the contractor.
9	Contracts are generally based on RIBA63 and include PAM69 (Private) and JKR 203 (A) for public works. Although these contracts are often legally worded and contain certain conditions which are difficult to interpret, they have not resulted in the manifestation of an adversarial construction industry as in the UK.
10	The PAM69 contract has been derived from RIBA63. It has not been reproduced word for word but the essence of the contract is the same. Although technically the contract may be criticised (in the UK) as being legally based, adversarial, unequal, difficult to understand, we have not faced the same problems in Malaysia. The contract used in the private sector is PAM69. In the PAM contract you do not have insurance/workmen compensation clauses - when we prepare contract conditions for the client, additions/omissions can be made to standard conditions.

11	Contracts in Malaysia are still based on RIBA 1963 forms. In the public sector in the late 1960s, early 1970's a standard contract was developed within the public sector which was closely related to the RIBA form. In 1983 this contract was revised and a new set of contract forms were introduced for the public sector - the JKR 203 series. In the private sector the PAM69 contract is still extensively used. The structure of the contract is different in the private sector as the project supervisor is named as the architect. However many private companies are looking towards the JKR forms as a more suitable contract. This is because the JKR form seems to serve clients' needs more clearly than the PAM form.
12	The private sector contract is the PAM 69 contract, which is considered to give the architect a lot of power. From the contractors point of view there is a lot wrong with this contract and changes must be made. The contract generally favours the client. Another problem is that the contract does not really conform to the local by-laws. Other parties to the industry don't really want to change the contract. The consultants (Architects) wrote the document, and it supports their position, and the clients are given a higher position in this contract so their is no reason for these parties to complain. The government however are more open to negotiations as how the contract may be changed.
13	The PAM 69 contract has been successful in the industry, but it is often the case that extra conditions will be added to the contract by the client and architect. The PAM 69 contract was produced by the ISM and PAM although changes are being currently discussed.
14	Various institutions in the public and private sector produce standard contracts.
15	The contract in the public sector is the JKR203(A) form and in the private it is the PAM69 form - which has been derived from RIBA63.
16	The contracts used are based on RIBA 63 - PAM69 which is used in the private sector and JKR 203 (A) in the public sector. The PAM contract is based on a UK form of contract which has been suggested to be adversarial, legally orientated, and often difficult to understand and interpret by its numbers.

APPENDIX D

Questionnaire 1

Please indicate your opinion by placing a ✓ in the box provided.

Please indicate the name of your country .....

Please indicate the name of your company .....

Please indicate your position in the above company .....

Terminology Definitions

Promoter	initiating group, person or body who required the construction project
Funder	provides finance for the project
Constructor	physically builds on site
Client	group, person or body for whom the construction project is provided for use
Traditional	UK system requiring design to be complete and documented before constructors are chosen
Design and Build	where constructor completes part or all of the design of the construction project
Turnkey	where constructor provides all that is necessary for the client
Management Contracting	where the constructor manages subcontractors for a fee
Construction Management	where the constructor managers trades contract (employed by the client) for a fee
D.D.O.T.	where the promoter arranges construction and the operation of the facility

1. a) Please indicate which of the following you carry out the most work for. (hereafter known as the 'client'. Please complete the questionnaire with reference to the answer given in this question).

i.	Industry	Public	
		Private	
ii.	Commerce	Public	
		Private	
iii.	Public/State		
iv.	Housing		
v.	Others		

If others please specify .....

b) What type of construction work do you mostly carry out

1.	New Building Work	
ii.	Civil Engineering Work	
iii.	Civil Engineering and Building Work	
iv.	Repairing Existing Construction	
v.	Others	

If others please specify .....

c) Please indicate how you would classify the size of your organisation.

i.	Large	
ii.	Medium	
iii.	Small	

d) Please indicate the number of employees work under your direct control in your organisation

i.	0 to 3	
ii.	4 to 13	
iii.	14 to 59	
iv.	60 to 100	
v.	100 to 200	
vi.	Over 200	

SECTION A: GENERAL ARRANGEMENTS

2. Please answer this question with reference to your answer given in question 1 a. As the constructor do you carry out any of the following functions?

1.	Promote		
ii.	Fund		
iii.	Design	a. Concept Design	
		b. Detailed Design	
		c. Minor Design	
iv.	Management of Construction		
v.	Construct		
vi.	Other		

If others please specify

.....

.....

3. Which of the following factors are considered in the selection of the 'Constructor' for a project? (Rank 1, 2, 3 in order of importance)

i.	Past Experience of Constructor	
ii.	Price Constructor will carry out the work for	
iii.	Reputation of the Constructor	
iv.	Capability and Size of Constructor	
v.	Financial Position of Constructor	
vi.	Timescale of Project	
vii.	Others	

If others please specify .....

.....

4. Which of the following parties are involved in the construction process?

i.	Subcontractors	
ii.	Specialist Subcontractors	
iii.	Skilled Labour	
iv.	Unskilled Labour employed when required	
v.	Others	

If others please specify .....

.....

5. Are payments made to the constructor

i.	Every month	
ii.	At set stages during the duration of the project	
iii.	Others	

If others please specify .....

.....

6. Are the payments made to the constructor

i.	Dependent upon the amount of work completed	
ii.	A fixed sum	
iii.	A percentage of the total contract sum	
iv.	Others	

If others please specify .....

.....

7. Are the building materials provided by

i.	The 'client'	
ii.	The constructor	
iii.	State government bodies	
iv.	Others	

If others please specify .....

.....

8. Who specifies the building material required for the project

i.	The Client	
ii.	The Designer	
iii.	The Constructor	
iv.	The State	
v.	Others	

If others please specify .....

.....

SECTION B: LIABILITIES

9. Who is liable for any design failure

i.	The designer	
ii.	The constructor	
iii.	The client	
iv.	Others	

If others please specify .....

.....

10. For how long after completion of the project is the above party liable

i.	Up to 1 year	
ii.	1 to 5 years	
iii.	5 to 10 years	
iv.	10 years and above	

11. Is there an insurance policy to cover design inadequacies?

Yes	
No	

12. If Yes, who is responsible for obtaining the insurance?

i.	The client	
ii.	The designer	
iii.	The constructor	
iv.	Others	

If others please specify .....

.....

13. Is there insurance to cover

13.1	Architectural Design	Yes	
		No	
13.2	Structural Design	Yes	
		No	
13.3	Mechanical/Electrical Services	Yes	
		No	
13.4	Construction Quality	Yes	
		No	

13.5 Others, please specify .....

.....

SECTION C - QUALITY

14. Who specifies the standard of workmanship to be achieved?

i.	The client or his representative	
ii.	The designer	
iii.	The constructor	
iv.	State appointed party	
v.	Other	

If other please specify .....

.....

15. Is there one overall managerial/controlling body to check all of the workmanship?

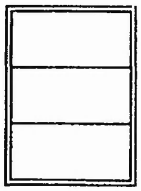
Yes	
No	

16. At what stage of the construction project does this process occur?

i. At Stages Throughout the Project

ii. At the End of a Project

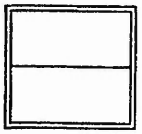
iii. Others



17. Does the client check on the quality of work as it proceeds?

Yes

No

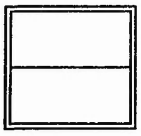


SECTION D - CONTRACT ARRANGEMENTS

18. Is there a single National standard form of contract which is used in the construction of a building project?

Yes

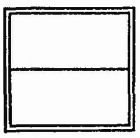
No



19. Are there published standard forms of contract?

Yes

No



20. If 'Yes', please specify the name of the most commonly used contract

.....

.....

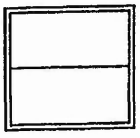
.....

.....

21. Are these forms of contract amended for each construction project?

Yes

No



22. Where a non-standard form of contract is used, is it

Verbal	
Written	

23. (Table 2)

24. Please indicate if any of the following contract arrangements are recognised in your country?

i.	Traditional	Yes	
		No	
ii.	Design and Build	Yes	
		No	
iii.	Management Contracting	Yes	
		No	
iv.	Contract Management	Yes	
		No	
v.	Design, Develop, Operate, Transfer	Yes	
		No	
vi.	Turnkey	Yes	
		No	
vii.	Others	Yes	
		No	

If others exist, please specify .....

.....

.....

.....

Table 2

Please specify if there are any contractual agreements between the following parties:

	The Funder	The Promoter (Client)	Principle Designer	Structural Designer	Estimator of Construction Costs	Main Constructor	Specialist Trade Constructor	Others	Others	Others
The Funder										
The Promoter (Client)										
Principle Designer										
Structural Designer										
Estimator of Construction Costs										
Main Constructor										
Specialist Trade Constructor										
Others										
Others										
Others										

25. What is the usage of the above methods by % in your country in terms of total project costs?

	0-10%	11-20%	21-30%	31-40%	41-50%	51-60%	61-70%	71-80%	81-90%	91-100%
Traditional										
D + B										
Man Contracting										
Contract Man										
Turnkey										
Others										

SECTION E - SATISFACTION

26. Please 'rank' each criteria in importance starting with (1) as the most important. If you consider any of the criteria to be of equal importance please use the same value.

	Industry		Commerce		Public/ State	Others Specify
	Public	Private	Public	Private		
Speed of Completion						
Price Certainty of Project						
Quality of Project						
Complexity of Project						
Adaptability of Project						
Completion of Project Price						
Competition of Project Design						
'Image' of Project						
Others						
Others						

27. Please indicate any additional satisfaction criteria considered by clients in the above construction markets

.....

.....

.....

APPENDIX E

Questionnaire 2

Date

Our Ref; MAL/AS1

Ext ; 2522

Dear Mr/Ms/Dr,

Re: Dominant Building Procurement Systems in .....

I am currently studying for a PhD researching into the characteristics of the Construction Industry, and Building Procurement (project delivery) systems which exist in a range of countries including ..... Your name has been passed to me by ..... as a source of possible assistance.

I would be most grateful if you and your colleagues could spend a little time to complete the attached system specific questionnaires regarding the dominant building procurement systems used in ..... Also enclosed is a list definitions of terminology used in the questionnaires and a non system specific questionnaire to identify the existence of any dominant procurement systems not identified.

This information is vital for the progression of my work and the completion of my PhD, so I would be most grateful if you would assist me in any way possible.

I wish to take this opportunity for thanking you for your assistance in completing the questionnaires and look forward to hearing from you at your earliest convenience.

Yours faithfully,

Asif Sharif.
Research Assistant/ Lecturer
Department of Surveying.

Glossary of Terms

Generic Function	Definition
1. **Initiate/ promote**	The party who recognises that a new building is required for owner occupation, as an investment, or as a speculative development.
2. **Fund**	The party who provides the finance required in order for the project to be undertaken.
3. **Design**	The translation of the verbal or written requirements of the initiator/promoter into drawings and specifications, prepared to facilitate construction. This process is sub-divided into concept/schematic design, detailed design and specialist design.
Concept/ schematic design	The process of translating the requirements of the initiator/promoter into a basic design form, indicating the general design in terms of shape, size and function of the building.
Detailed design	The production of detailed drawings and specifications, from the concept/schematic designs,detailing and describing each element of the building so that it may be constructed.
Specialist design	The development of detailed drawings and specifications for a specific component or element within the structure, which requires specialist technical knowledge to design and construct.
4. **Construct**	The process of physically fitting the various components of a building together, to form a final structure. This process may be sub-divided into the management and physical action of the process.
Manager of Construction	The independent party who management of the building process for the initiator/promoter
Construction Producer	The party who physical construction of all or part of the structure for the initiator/promoter, in accordance with the detailed designs (may also include the general management of construction).
5. **Risk**	The susceptibility of each of the above generic functions to varying degrees of risk. The degree of risk is dependent upon the type of procurement system implemented and the individual functional roles.

Functional Model Questionnaire

Please complete the following questionnaire with regards to the (*Name of procurement system)* which operates in (*Name of Country)* by inserting a tick (✓) into the appropriate box.

---

1. Please identify the most likely category of initiator/promoter who will use this procurement system

Public			Private
			Owner Occupier
			Developer
			Investor
			Other

If other please specify

.....

.....

2. Please indicate the most likely sources of finance used by the above initator/ promoter

	Government
	Individual
	Bank
	Pension Fund
	Insurance Company
	Other

If other please specify

.....

.....

3. Who produces concept designs for the proposed building for the initiator/ promoter

	Designer
	Constructor
	Other

If other please specify

.....

.....

4. Who produces detailed drawings and specifications of the proposed building (see also question 5)

- [ ] Designer
- [ ] Constructor
- [ ] Other

If other please specify

.....

.....

5. Indicate who produces drawings and specifications for specific specialist parts of the building

- [ ] Designer
- [ ] Constructor
- [ ] Other

If other please specify

.....

.....

6. Please indicate who is predominantly responsible for the specifications of design standards for the project

- [ ] Initiator Promoter
- [ ] Funder
- [ ] Designer
- [ ] Constructor
- [ ] Other

If other please specify

.....

.....

7. Under this method please indicate with whom the concept/ schematic designer enters into a formal relationship

- [ ] Initiator/ Promoter
- [ ] Funder
- [ ] Detailed Designer
- [ ] Specialist Designer
- [ ] Manager of Construction
- [ ] Construction Producer
- [ ] Other

If other please specify

.....

.....

8. Under this method please indicate with whom the detailed designer enters into a formal relationship

- [ ] Initiator/ Promoter
- [ ] Funder
- [ ] Concept/ Schematic Designer
- [ ] Specialist Designer
- [ ] Manager of Construction
- [ ] Construction Producer
- [ ] Other

If other please specify

.....

.....

9. Under this method please indicate with whom the designer of specialist elements of the building enters into a formal relationship

- [ ] Initiator/ Promoter
- [ ] Funder
- [ ] Detailed Designer
- [ ] Concept/ Schematic Designer
- [ ] Manager of Construction
- [ ] Construction Producer
- [ ] Other

If other please specify

.....

.....

10. Is there one or are there a number of producers involved with the construction process

- [ ] One
- [ ] Many

11. Is there one or are there a number of producers who enter into a formal relationship with the initiator/ promoter

- [ ] One
- [ ] Many

12. Please indicate if the Management of Construction process is separate to the Construction Production process

- [ ] Yes
- [ ] No

13. Who is responsible for the risk of the project being completed to a stipulated completion date

- ☐ Initiator/ Promoter
- ☐ Funder
- ☐ Manager of Construction
- ☐ Construction Producer
- ☐ Other

If other please specify

.....

.....

14. Who is responsible for the risk in terms of certainty of total building price and price escalations

- ☐ Initiator/ Promoter
- ☐ Manager of Construction
- ☐ Construction Producer
- ☐ Other

If other please specify

.....

.....

15. Which party carries the risk of the building facility performing its proposed function

- ☐ Initiator/ Promoter
- ☐ Concept/ Schematic Designer
- ☐ Detailed Designer
- ☐ Specialist Designer
- ☐ Manager of Construction
- ☐ Construction Producer
- ☐ Other

If other please specify

.....

.....

16. Which party is responsible for achieving the quality of the workmanship and materials in the construction process

- [ ] Manager of Construction
- [ ] Construction Producer
- [ ] Other

If other please specify

.....

.....

17. If a separate construction management function is employed in this procurement system please indicate with whom they have a formal relationships

- [ ] Initiator/ Promoter
- [ ] Concept/ Schematic Designer
- [ ] Detailed Designer
- [ ] Specialist Designer
- [ ] Construction Producer
- [ ] Other

If other please specify

.....

.....

18. Under this method please indicate with whom the construction producer has a formal relationship

- [ ] Initiator/ Promoter
- [ ] Concept/ Schematic Designer
- [ ] Detailed Designer
- [ ] Specialist Designer
- [ ] Manager of Construction
- [ ] Other

If other please specify

.....

.....

Thank you very much for taking the trouble to complete this questionnaire.

Date

Our Ref; MAL/AS1

Ext; 2584

Dear Mr/Ms/Dr,

Re; Dominant Building Procurement Systems in

I am currently studying for a PhD project researching into the characteristics of the Construction Industry, and Building Procurement systems which exist in a range of countries including ..... Your name has been refer to me by .....,as a possible source of assistance.

My aim is to study and examine on the contractual and managerial systems used in the Malaysian Construction Industry. Unfortunately, I am having great difficulty locating publications and sources of data on the above in the UK.

I would be most grateful if you could send me any information on the attached questions and any references of publications which you consider may be of use to my study.

I wish to take this opportunity to express my thanks for you assistance with this matter, and look forward to hearing from you in due course.

Yours sincerely,

Asif Sharif.
Research Assistant/ Lecturer
Department of Surveying.

AS/EB/003
Ext.2584

The Nottingham Trent University

Faculty of Environmental Studies

Department of Surveying
Head - Professor J A John Moohan BA MA Hon Assoc RICS
Associate Head - Paul R Collins MSc (Urb Plan) A RICS

Monsieur/Madame

Recherche des systèmes d' approvivsionnement de bâtiment international.

Veuillez trouver ci-joint un questionnaire concernant les systèmes d'approvisionnement de bâtiment en France.

Ainsi que j'ai dit dans les lettres précédentes, datées du 12 avril et du 26 mai, je fais actuellement des recherches sur des industries du bâtiment, y compris celle de la France. Donc, bien que je comprenne que votre temps est précieux, je vous serais très reconnaissant de remplir le questionnaire et me le renvoyer aussitôt que possible.

Je me tiens à votre entière disposition pour toute demande de renseignements supplémentaires.

Dans l'attente de votre réponse, je vous prie de croire, Monsieur/Madame, à l'assurance de mes salutations distinguées.

Asif Sharif
Assistant de recherche/professeur
Department of Surveying

Burton Street
Nottingham NG1 4BU
Tel: (0115) 9418418
Telex: 377534 Polnot G
Fax: (0115) 9486507

AS/RK/001

Ext 2584

Monsieur/Madame

Recherche des systèmes d'approvisionnement de batiment international

Comme étudiant chercheur je fais actuellement mes études sur des systèmes d' approvisionnement de batiment les plus utilisés dans certain pays, y compris la France. J'usqu'á present, j'ai examiné les structure organisationnelles de l'industrie de construction en France je suis en train de developer un modèle, gerant une base de données constituée des principaux systemes utilités y compris ceux de votre pays . J'ai préparé un questionnaire (voin ci joint) pour mettre à l'épreuve et valider ce modèle.

Pourriez-vous, ainsi que vos collègues, répondre á ce questionnaire et me l'envoyer dans l'enveloppe ci-joint.

Je me tiens à votre entière disposition pour tous renseignements. Si vous etes intéressés pour nous assister dans ce project, veuillez prendre contact avec moi.

Dans l'attente de votre résponse, je vous prie croire, Monsiour/Madame, à l'expression de mes salutations distinguées.

Asif Sharif
Assistant de recherche/professeur
Department of Surveying

LES CINQ FONCTIONS GENERIQUES D'UN SYSTEME D'APPROVISIONNEMENT DE BATIMENT

Fonction Générique	Définition
.Initier/ Promoter	La Reconnaissance de besoin d'un bâtiment neuf pour propriétaire occupant, comme investissement ou comme développement speculative
. Fonds	L'approvisionnement de finance exigée pour faire l'entreprise
. Conception	La traduction des exigences du client, exprimées verbalement et par écrit, en dessins et spécifications, préparés pour faciliter la construction. Le rôle d'économiste est intégral au fonction de conception. Le process de conception est subdivisé entre conception d'avant-projet, conception (détaillé) et conception de lot spécialisé
Conception d'avant-projet	Avant-Projet Sommaire (APS)
onception létaillé)	Avant-Projet Détaillé (APD) } Spécifications Techniques Détaillés (STD) } par maître d'oeuvre Plans d'Éxecution des Ouvrages(PEO) }
onception e lot spécialisée	Spécifications Techniques Détaillés (STD) } par entreprises Plans d'Éxecution des Ouvrages (PEO) }
Construction	Le process de fabrication du bâtiment Le procédé est subdivisé entre la direction des travaux et les opérations actuelles de construction
irection s opérations	Gestion des procédés de construction pour le client
pérations de nstruction	La construction actuelle de toute ou une partie de la structure, pour le client, conformément aux STD et PEO - y compris direction des opérations
Allocation s risques tre tervenants	La susceptibilité à des facteurs de risque variables de chaque fonction generique au-dessus. Le facteur de risque depend du système d'approvisionnement utiliseé et la fonction individuelle.

Questionnaire d'un modèle fonctionnel

Veuillez répondre aux questions suivantes au sujet du système d'approvisionnement des marchés de construction, *'Lots Séparés*, qui existe en France.

---

1. Veuillez identifier la catégorie de client la plus probable qui utilise ce système

Public ☐ ☐ Privé

☐ ☐ Propriétaire occupant

☐ Promoteur immobilier

☐ Épargnant

☐ D'autres

D'autres, veuillez spécifier

.....

.....

---

2. Veuillez indiquer les sources les plus probables de finance pour les clients mentionnés ci-dessus.

☐ Gouvernement

☐ Individuel

☐ Banque

☐ Caisse de retraite

☐ Compagnie d'assurance

☐ D'autres

D'autres, veuillez spécifier

.....

.....

---

3. Quelle personne prépare les dessins d'avant-projet pour le client?

☐ Concepteur

☐ Constructeur

☐ D'autres

D'autres, veuillez spécifier

.....

.....

4. Quelle personne prépare les dessins d'avant-projet détaillé et les CCTP?

- ☐ Concepteur
- ☐ Constructeur
- ☐ D'autres

D'autres, veuillez spécifier.

.....

.....

---

5. Quelle personne prépare les dessins d'avant-projet et les CCTP des lots spécialises des travaux ?

- ☐ Concepteur
- ☐ Constructeur
- ☐ D'autres

D'autres, veuillez spécifier.

.....

.....

---

6. Quelle personne prépare le Document Technique Unifié ?

- ☐ Client
- ☐ Financier
- ☐ Concepteur
- ☐ Constructeur
- ☐ Bureau de contrôle
- ☐ D'autres

D'autres, veuillez spécifier.

.....

.....

---

7. Dans ce système le maître d'oeuvre /architecte /dessinateur s'engage légalement avec quelle personne ?

- ☐ Client
- ☐ Financier
- ☐ Concepteur de lot spécialisé
- ☐ Directeur des travaux
- ☐ Entreprise
- ☐ Bureau de contrôle
- ☐ D'autres

D'autres, veuillez spécifier.

.....

.....

---

8. Dans ce système avec qui le maître d'oeuvre s'engage légalement ?

- ☐ Client
- ☐ Financier
- ☐ Concepteur de projet
- ☐ Concepteur de lot spécialisé
- ☐ Directeur des travaux
- ☐ Entreprise
- ☐ Bureau de contrôle
- ☐ D'autres

D'autres, veuillez spécifier.

.....

.....

---

9. Dans ce système avec qui le concepteur de lot spécialisé s'engage légalement?

- ☐ Client
- ☐ Financier
- ☐ Concepteur de projet
- ☐ Directeur des travaux
- ☐ Entreprise
- ☐ Bureau de contrôle
- ☐ D'autres

D'autres, veuillez spécifier.

.....

.....

---

10. Dans ce système combien d'entreprises (pas sous-traitants) font participer dans les travaux ?

- ☐ Un
- ☐ Plus qu'un

---

11. Combien des entreprises s'engagent légalement avec le client ?

- ☐ Un
- ☐ Plus qu'un

---

12. Est-ce que la direction des travaux est distincte de l'exécution des travaux ?

- ☐ Oui
- ☐ Non

---

13. Quelle personne comporte le risque du non-achèvement de délai d'exécution des travaux ?

- ☐ Client
- ☐ Financier
- ☐ Concepteur de projet
- ☐ Entreprise
- ☐ Directeur des travaux
- ☐ D'autres

D'autres, veuillez spécifier.

.....

.....

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14. Quelle personne comporte le risque de la certitude du prix global et les effets de l'inflation ?

- ☐ Client
- ☐ Financier
- ☐ Concepteur de projet
- ☐ Entreprises
- ☐ Directeur des travaux
- ☐ D'autres

D'autres, veuillez spécifier.

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.....

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15. Quelle personne comporte le risque de le non-performance de la commission du bâtiment ?

- ☐ Client
- ☐ Concepteur d'avant projet
- ☐ Concepteur (détaillé)
- ☐ Concepteur (lot spécialisé)

☐ Directeur des travaux
☐ Entreprises
☐ Sous-traitants
☐ D'autres

D'autres, veuillez spécifier.
.....

.....

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16. Quelle personne comporte la responsabilité de l'achèvement de la qualité des travaux, des matériaux et des fournisseurs.

☐ Concepteur
☐ Directeur des travaux
☐ Entreprise
☐ Bureau de contrôle
☐ D'autres

D'autres, veuillez spécifier.
.....

.....

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17. Si un système de direction des travaux distinct est utilisé, avec qui le directeur des travaux s'engage légalement ?

☐ Client
☐ Concepteur d'avant projet
☐ Concepteur (détaillé)
☐ Concepteur (lot spécialisé)
☐ Entreprises
☐ Sous-traitants
☐ D'autres

D'autres, veuillez spécifier.
.....

.....

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18. Avec qui l'entreprise s'engage légalement ?

- ☐ Client
- ☐ Concepteur d'avant projet
- ☐ Concepteur (détaillé)
- ☐ Concepteur (lot spécialisé)
- ☐ Directeur des travaux
- ☐ D'autres entreprises
- ☐ Sous-traitants
- ☐ D'autres

D'autres, veuillez spécifier.

.....

.....

Appendix F.

PROCUREMENT

What are the differences between construction procurement methods in the USA, the UK and Malawi? Researchers are about to find out.

The UK construction industry knows exactly how procurement works in the home market, but it has a far from complete understanding of how systems operate overseas.

This gap in industry knowledge is being addressed by the International Procurement Research Group. It has launched a major study into the procurement methods of the construction industries of 12 countries, a mix of developed, developing and underdeveloped nations.

The study is expected to produce pioneering information on how the British construction industry can provide a service for overseas construction projects. The IPRG will aim to identify procurement methods and the context they operate in.

When the research is complete, probably within the next three years, it should be an aid to undeveloped countries in identifying and implementing appropriate procurement strategies. And it should be useful for companies wanting to carry out work in underdeveloped and developing countries.

Seeds for the study were sown in 1991 at a meeting of the international building research body CIB (Conseil International du Batiment pour Recherche L'etude et la Documentation).

The meeting discussed procurement systems nationally and internationally and identified the need for research. The IPRG comprises a collaborative agreement between the University of Glamorgan, Liverpool John Moores University and The Nottingham Trent University.

The research group is looking to discover

- the major contextual legal, economic, social and political factors within which the construction industries in various stages of development operate.
- the formal and informal relationships between participants in the construction process;
- the procurement methods operating within the construction industries in countries falling within the stated categories.
- the usage of various types of procurement methods;
- any correlation between the contextual factors and the procurement methods adopted;
- how a framework can be developed to identify the most appropriate procurement method for a given set of circumstances, with particular relevance to emerging countries?

The process of classifying countries into the broad barriers of developed, developing and underdeveloped nations was a difficult one.

A country may be classified in terms of gross national product per capita or human development, and/or general development. The World Bank has for its own purposes classified countries in terms of GNP/capita income. But it recognises that "classification by income does not necessarily reflect a country's development status".

As the process of development is continuous the project has sought countries across the spectrum. The IPRG has produced its own classification of nations, using aggregated figures of GNP, human development and general development. The countries chosen for the pilot study are: UK, USA, Canada, Japan, France, Algeria, Malaysia, Argentina, China, India, Pakistan, Malawi.

The project will establish a database of contacts in these countries to help with the research. It will collect and collate information, through literature searches and interviews, on the various construction industries, and the context within which they operate. Particular reference has been given to the understanding of countries in terms of legal frameworks, economic issues, political or social issues, and the nature of the construction industry.

Data will be collected by questionnaires, which may be followed by interviews. Designing the questionnaire has been a difficult task. There had to be a single questionnaire which could be administered internationally and which would use basic terminology to alleviate the problem of misinterpretation.

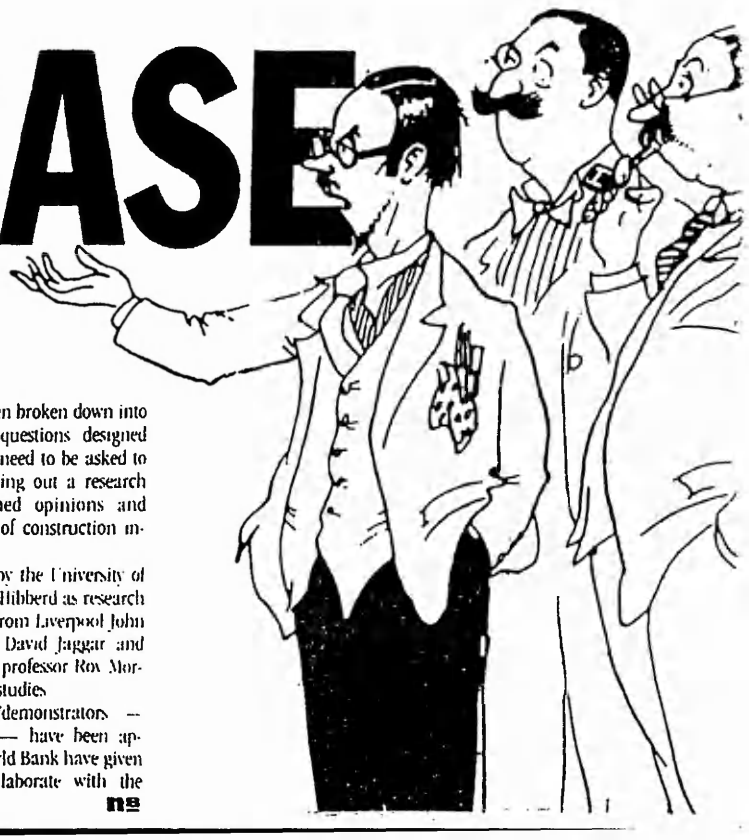
It was recognised early on that the questionnaire could not include terminology used in the UK and which the UK industry takes to be of a basic nature, including such terms as architect, quantity surveyor and procurement. It was decided that a functional approach would be taken with the questions and terminology.

Each stage in the construction process, from inception to product, has been broken down into individual functions, and questions designed around the functions. They need to be asked to avoid the difficulty of carrying out a research project with pre-determined opinions and assumptions on the nature of construction industries internationally.

The project is being led by the University of Glamorgan's Professor Peter Hibberd as research director, with collaboration from Liverpool John Moores University professor David Jaggar and Nottingham Trent University professor Roy Morledge as fellow directors of studies.

Two research assistants/demonstrators — Asif Sharif, Darryl Sheath — have been appointed. The CIB and the World Bank have given their support and will collaborate with the research.

DATABASE



Better built in the Third World

Asif Sharif reports for *CQS* on a new research project aimed at identifying appropriate methods of procurement for construction projects in the developing world

In December 1991, the CIB (Conseil International du Batiment pour Recherche L'etude et la Documentation) held a meeting of its Working Commission W92 (procurement systems) in Las Palmas.

At this meeting, papers were presented concerning the subject of procurement systems both nationally and internationally. The meeting recognised that large areas of research were required and W92 became the catalyst that inspired three of its members to establish The International Procurement Research Group (IPRG).

The IPRG is an organisation which has been established to investigate the procurement methods adopted in the construction industries of developed, developing and underdeveloped nations.

It is a body comprising a collaborative agreement between three educational establishments, namely the University of Glamorgan, Liverpool John Moores University and The Nottingham Trent University.

The directors of studies involved in the project are respectively: Professor Peter Hibberd, Professor David Jaggar and Roy Morledge, who have also had involvement for a number of years in the CIB working commission W92. The IPRG specifically seeks to answer the following questions:

- What are the major contextual legal, economic, social and political factors within which the construction industries of countries in various stages of development operate?
- What are the formal and informal relationships between participants in the construction process?
- What are the procurement methods operating within the construction industries in countries falling within the stated categories?
- What is the usage of the various types of procurement methods?
- Is there any correlation between the contextual factors and the procurement methods adopted?
- How can a framework be developed to identify the most appropriate procurement method for a given set of circumstances, with particular relevance to emerging countries?

The countries under study

In attempting to classify the list of countries for investigation in this research, many difficulties were encountered due to the variety of ways in which a country may be classified.

A country may be classified in terms of GNP (per) capita or human development, and/or general development. The World Bank has, for its own purposes, classified countries in terms of GNP/capita income. However, at the same time, it recognises the fact that: "classification by income does not necessarily reflect a country's development status...".

So it is evident that the process of classifying countries into the broad barriers of developed, developing and underdeveloped nations is a difficult one. It is maintained that the process of development is a continuous dynamic one, therefore this project has sought countries across the spectrum.

Consequently, the IPRG produced its own spectrum of classification of nations using aggregated figures of GNP, human development and general development.

The list of countries which have been chosen as a pilot study for this research are: UK, France, Turkey, USA, Canada, Japan, China, Algeria, Argentina, India, Pakistan, Malawi and Ethiopia.

Questionnaire design

The process of designing the questionnaire for this project has also proved to be a difficult one. The IPRG was immediately faced with the problem of designing a single questionnaire which could be administered internationally and one which used the most basic of terminology to alleviate the problem of misinterpretation.

It was recognised at an early stage that the questionnaire could not include terminology which is used in the UK and which we take to be of a basic nature, including words such as architect, quantity surveyor and procurement. Consequently, it was decided that a "functional" approach would be taken when designing the questions and the terminology to be used. Each stage throughout the construction process was broken down into their individual functions, and questions were designed around the functions. Such questions were required to be asked in order to attempt to avoid the difficulty of carrying out a research project with pre-determined opinions and assumptions of the nature of construction industries internationally.

Research methodology

Progress to date includes the establishing of a database of contacts in the above stated countries to assist with the research, and the collection and collation of information through literature searches and interviews, on the various construction industries, and the context within which they operate in the selected countries.

Particular reference has also been given to the understanding of countries in terms of:

- Legal frameworks;
- Economic issues;
- Political or social issues; and
- The nature of the construction industry in each selected country.

Data collection will be achieved by the use of questionnaires, which may then also be followed up by interviews with the respondents.

The IPRG project is being led by Professor Peter Hibbard as research director, along with collaboration from Professor David Jaggar and Roy Morledge as fellow directors of studies. Two research assistants/ demonstrators have also been appointed on a three-year contract to carry out the project: Asif Sharif has been appointed at Nottingham Trent University, and Darryl Sheath at Liverpool John Moores University.

The CIB and the World Bank have additionally given their unqualified support for the project and have indicated the importance of improving the global understanding of procurement systems, and hence are to collaborate with the research team.

Project output

The International Procurement Research Group will aim to identify construction procurement methods which are used in the context in which they operate. The research, when completed in 1996, should contribute to providing:

- An aid for underdeveloped countries to identify and implement appropriate construction procurement strategies; and
- An aid for organisations wishing to carry out construction work in underdeveloped and developing countries.

The cooperation and assistance by fellow professionals in the construction industry is vital for the successful completion of the project and it is believed that this study will produce pioneering information on how the British construction industry can provide a service for overseas construction projects. The IPRG believes that this research will give a greater understanding of the construction industries of developing and underdeveloped nations and will be valuable to both national and international construction industries and those requiring their services.

- For further information please contact: Asif Sharif at the department of surveying, Nottingham Trent University, Burton Street, Notts. NG1 4BU

By defining the functional processes of construction in generic terms, Roy Morledge *and* Asif Sharif *have devised a procurement system for international use.*

A functional approach to the modelling of international procurement systems

Current collaborative research into International Building Procurement Systems at Nottingham Trent University is indicating that it is possible to model procurement systems by the pattern of the generic functions involved. The ability to model procurement systems by the functional approach will make easier the identification and comparison of procurement systems in the ever increasing "globalised" construction industry.

In 1989 Working Commission W-92 of the Conseil International du Batiment pour la Recherche, l'Etude et la Documentation (CIB) was the catalyst that inspired three of its members to establish the International Procurement Research Group (IPRG).

The IPRG comprises of a collaborative agreement between the University of Glamorgan, the Liverpool John Moores University and Nottingham Trent University, the directors of study are Professor Peter Hibbered, Professor David Jagger and Roy Morledge respectively.

The main objective of the IPRG is to identify and investigate the procurement systems adopted in the international construction industry, with particular reference to developing countries.

As the world recession begins to abate, the major construction powers of the world are beginning to recognise the benefits of international trade, as their national markets become increasingly saturated.

The world construction market is becoming highly deregulated, with a general move towards large, multi-disciplinary companies, offering

PROCUREMENT

clients either a complete package of construction services or a single point of responsibility.

The construction industries of the west are increasingly concerned with the selection and adoption of the most appropriate procurement strategies for construction projects.

The selection of the most suitable procurement system brings the building team closer to fulfilling the client's needs in terms of the three main criteria of cost, time, and quality. The achievement of these basic criteria should be of paramount importance to all professionals in the construction industry, so enabling client satisfaction.

It is apparent that in the context of an international investigation, the use of existing procurement criteria would be unsuitable. The general deficiencies of the existing approaches are that they do not take into account the differences of language, meaning and culture.

As these systems have been developed predominantly in the UK or USA, they use Anglo-American meanings and terminology, in association with the legal, political, and socio-economic conditions prevailing in these countries.

For example, in many cases descriptors of roles are misleading and there is no common language or structure in terms of the roles performed or titles held by individuals in the construction process.

In the context of the increasingly global construction arena, it is essential that there is no misunderstanding of the nature, characteristics and theoretical foundation to a particular procurement system.

When considering the roles and definitions of participants and management processes involved, it is maintained that there are few universally accepted meanings. It is often the case that the culture, legal and political systems existing in a country will determine the roles of individuals, and the manner in which the country organises and executes its business.

"In the context of the increasingly global construction arena, it is essential that there is no misunderstanding of the nature, characteristics and theoretical foundation to a particular procurement system."

The authors contend that although there is no universal agreement as to the defined roles of the various parties involved in the construction process, the generic functions involved in construction are universal. This has led to the development of the functional approach to procurement.

FUNCTIONAL APPROACH

The concepts developed for this project are simple. The functional approach was devised by isolating and separating all of the primary operations and activities in the construction process into the generic functions involved in those operations. By doing so, the problem of universally accepted terminology has been alleviated.

For example, the term and role of the "architect", may not be recognised internationally or have a fixed definition. By splitting the role of the architect down to its most basic form, it is contended that the generic function of an architect is to design, which is universally recognised, so the expression "designer" is used.

By carrying out this process for all of the generic members involved in the construction process, the key functional roles have been developed. They include:

i) the initiator/promoter, ii) the funder, iii) the designer, iv) the constructor.

It has been recognised that the role of the constructor may be separated into a) the manager of construction, and b) the process of construction, which have been acknowledged.

It is thus contested that building procurement systems are composed of five generic functional processes, which include:

i) initiation/promotion

ii) funding

iii) design (for the purpose of this work it is necessary to subdivide the design process into its three components: schematic, detailed design and specialist design)

(iv) construction (again this role is separated into the management process and the physical construction process)

v) risk allocation among the functions mentioned above.

Various systems exist because of the nature and the arrangement of each of the functions and processes adopted.

All procurement systems

carry an inherent diversity of risk. The generic characteristics of each system will present a distinct combination of risks to either the initiator/promoter, the funder, the designer, or the constructor. By the nature of the procurement system, these risks will place a responsibility on the respective party.

In an attempt to identify procurement systems internationally, not only will the generic functions of the system need to be isolated, but the inherent risks of each system must also be identified.

The array of current procurement literature indicates that all procurement systems in the UK are susceptible to three generic categories of risk: time, cost/price, and design/quality.

For the purpose of this investigation the categories of risk considered include time, price, design liability, project finance, function ability of project and quality. Three basic working frameworks have been devised, showing the relationships that exist between:

- the functional role and each functional process (framework 1)
- each functional role and risk inherent in any particular systems (framework 2)
- functional role and the formal relationship that exists between the parties (framework 3).

These frameworks illustrate the generic characteristics of a particular procurement system, facilitating its identification and comparison.

FRAMEWORK 1

This framework has been devised to show who does what in the procurement process. The framework details the four generic functional roles in all procurement systems, which include:

- the initiator/ promoter (the client)
- the funder, the designer (this role is split into schematic designer, detailed designer and specialist designer)
- the role of the constructor (consisting of the management of the construction process, which can be an independent function, and the role of the product constructor, who physically builds the project).

FRAMEWORK 2

The risks inherent to each party's involvement is established by this framework. It is contended that each of the four generic functional roles will have certain risks associated to them.

The pattern and profile of the risks to each of the functional roles will be influenced by the distribution of the functional processes, and the formal relationships that exist in a particular procurement system (frameworks 1 and 3).

FRAMEWORK 3

At different stages throughout the procurement process, various formal relationships will be established. This framework will illustrate the existence of formal relationships with each of the generic functional roles. These formal relationships may be written or verbal agreements between the parties involved. Traditionally, they will be backed up by legal contractual documentation.

These frameworks will illustrate the pattern of functional responsibilities and functional risks inherent in the various dominant procurement systems. Each procurement system identified will have a particular arrangement in terms of the above frameworks. An amalgamation of the three will produce a Procurement System Model (PSM), illustrating the dominant procurement systems in a country.

It is envisaged that an array of models will emerge and these may then be classified. To avoid the problems of misinterpretation, all of the procurement system models are to be enumerated. At this point it will be possible to conduct a comparison and appraisal of the procurement systems identified.

The resultant models will simplify the appraisal of the various dominant procurement systems found in the countries under investigation. It is envisaged that the study will highlight the underpinning legal, political and socio-economic practices and procedures which must be in place before a particular procurement system can be used with any reliability.

Currently, PSM's have been created for the UK, France, and the USA, while one is in the process of being completed in Japan. Once the models are completed, their reliability will be tested by academic and construction professionals in their countries.

The outcome from the model will provide useful information to nations with growing construction industries in terms of the most appropriate procurement systems to use on their construction projects, given the context and project typology.

It is believed that the identification of the most appropriate procurement system in a given country, by the functional approach, will facilitate the increased harmonisation and globalisation of the world's construction industries.

This research will certainly provide valuable market information for constructors and/or consultants who wish to consider exporting their services internationally.

• For further information on the research activities of the IPRG contact Asif Sharif at Nottingham Trent University, Department of Surveying, Burton Street, Nottingam NG1 4BU, Tel: 0602 418418 or Fax: 0602 486507.

• Roy Morledge is assistant head of the department of surveying at Nottingham Trent University. Asif Sharif, also based in the department of surveying, is research assistant demonstrator.

In a disaster, setting up an infrastructure to get the aid through is vital. RedR can do that.

Playing an active part in disaster relief

CHARITIES

In response to disasters, the aid provided by relief agencies involves setting up water supplies, sanitation, buildings and transport systems. Delivery of that aid sometimes requires building roads, mending bridges or constructing an airfield.

It is well recognised that in such situations, members of the construction industry play a very important role. With their help, the risks of disease can be minimised, medical teams can get to work to save lives and food and other aid can get through.

Yet there is only one organisation that is exclusively involved in funding, training and supplying people to fulfil this vital role. And that organisation is RedR – one of the construction industry's top charities. RedR's most valuable asset is its membership, which totals over 400 relief professionals. Their backgrounds cover a wide range of engineering disciplines plus closely-related skills such as logistics and relief administration.

The charity is currently looking to recruit more personnel to its register. In recruiting new members, it looks in particular for skills in the following areas: water supply, sanitation, roads and bridges, project management, camp planning, mechanical engineering, electrical power and telecommunications, infrastructure, ie construction logistics and transport.

Working for RedR is one of the best and most positive ways in which people can use their professional skills to help others. Membership offers the potential for a practical outlet for humanitarian concern for others.

For more details, how to apply for membership, or how to donate funds, please write to: RedR, 1-7 Great George Street, London SW1P 3AA. Tel: 071 233 3116. Fax: 071 222 7500.

Department of Surveying
The University of Hong Kong

Proceedings of CIB W92 Symposium
East meets West

Procurement Systems
Hong Kong, 4-7 December, 1994

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pour la Recherche, l'Etude et la
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A FUNCTIONAL APPROACH TO MODELLING PROCUREMENT SYSTEMS INTERNATIONALLY AND THE IDENTIFICATION OF NECESSARY SUPPORT FRAMEWORKS

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KEYWORDS

Procurement Systems, International, Functions, Indigenous, Support Frameworks

Summary

This paper examines the development of a Functional Model which will provide a unique framework to enable the objective identification, comparison and appraisal of procurement systems globally. The paper illustrates how the use of existing classification criteria for building procurement systems (CIB 1991) is uninformative in the context of an international investigation, since account is not taken of the differences which exist in terms of language, meaning, and culture.

It is contended that building procurement systems are composed of five generic functions which include; i) Initiate/ Promote, ii) Fund, iii) Design, iv) Construct, and v) Risk allocation. The nature and the arrangement of each of the various functions and processes adopted will enable the modelling of procurement systems in any given country.

The paper explains how the Procurement Systems Model (PSM) relates the generic functional roles with the processes, risks, and formal relationships in the construction industry, in a country.

Finally, the paper investigates the necessary indigenous competencies and the particular indigenous organisational support frameworks required for the operation of a specific procurement system to operate.

This research paper forms part of a wider portfolio of building procurement research being conducted by the International Procurement Research Group (IPRG); which comprises of a collaborative agreement between the University of Glamorgan, Liverpool John Moores University and the Nottingham Trent University.

Introduction

Current research into international building procurement systems at The Nottingham Trent University is indicating that it is possible to model procurement systems by the pattern of the generic functions involved. The ability to model procurement systems by the functional approach will facilitate the identification and comparison of procurement systems internationally.

In the international arena many procurement systems have been inconsistently identified and described, perhaps due to their titles being misleading or uncertain. This research project attempts to redress this problem, providing a functional model of the dominant procurement systems in a country and the specific indigenous organisational support frameworks which must be in place for the operation of a particular procurement system.

It is anticipated that the outcome of this research will allow advice to be provided to the construction industries of the developing world on the most appropriate procurement systems for their construction industries, in the context of their social, political, legal and economic climates.

Context

For the purpose of this investigation, Building Procurement has been defined as;

> **".....the framework within which construction is brought about, acquired, or obtained"** CIB (1991).

The works of Masterman (1992) and Morledge (1991) amongst others, have highlighted that the selection of procurement systems in the UK, can be haphazard, ill-timed and lacking in logic and discipline. The construction industries of the Western world are increasingly concerned with the selection of appropriate procurement strategies for construction projects, bringing the building team closer to fulfilling the clients needs in terms of the main criteria, of Cost, Time, Quality and in terms of a equitable distribution of risk.

During the last 40 years in the UK there has been the development of various 'alternative' procurement systems, in an endeavour to suit the changing face of the construction industry, the changing needs and expectations of its clients, and the specific needs of projects, which are becoming increasingly complex.

The choice of the correct procurement system for a particular project is of paramount importance, to achieve success for the client in terms of Cost, Time and Design/Quality. The correct procurement choice should reflect the needs of the client and the specific characteristics of the project. As Masterman (1992) states;

> **"There is no standard solution or 'best buy' amongst procurement systems .....no single method of procurement can be suitable for every project for all of the time".**

The importance of the implementation of the most appropriate procurement system to suit a clients requirements has been illustrated by Nahapiet and Nahapiet (1985) who suggest that procurement system selection is important as it establishes the overall organisational frameworks within which project delivery takes place. The authors go on to suggest that different procurement systems offer different costs and benefits to the client.

Criticism has been levied at the array of procurement systems available to UK clients due to their failure to meet clients generic satisfaction criteria of Cost, Time and Design/Quality.

The range of available procurement systems has developed in an endeavour to elicit the most suitable procurement system for projects. This proliferation has been accelerated by the increased complexity of building designs, increased demands of clients, the magnitude of projects and escalating costs. This is however not merely a problem being faced in the UK, but an international phenomenon.

The report produced by Sir Michael Latham (1994) concerning the problems facing the UK construction industry, has highlighted the importance of procurement systems with particular attention to the choice of system. The report suggests that selection of a system should be determined by the nature of the project, the clients requirements and the clients decision on how much risk to take.

Procurement Classification

Current literature including the works of Masterman (1992) and Morledge (1991) have confirmed that the use of any existing procurement system classification criteria is unsuitable in the context of an international investigation. Essentially this is because they have been formulated and evolved using Anglo-American terminology and interpretations.

Most conventional classifications of procurement systems such as the 'Lump Sum/Traditional' method have originated from the UK, whilst, other approaches to procurement including 'Construction Management' and 'Management Contracting' have been cultivated in the USA and the UK.

The general deficiencies of the existing classification approaches is that they do not take account of the differences which exist in terms of language, meaning, culture and context. As they have been developed predominantly in the UK or USA, they have been constructed using Anglo-American meanings, and in association with the legal, political, and socio-economic conditions which prevail in these countries. Thus, for example, descriptors of roles are misleading and there is no common language or structure in terms of the roles performed or titles held by

individuals. In the context of the international construction arena, it is essential that there is no misunderstanding in the nature, characteristics and theoretical foundation to a particular procurement system. This has led to the development of a model which will provide a framework to enable the identification, comparison and appraisal of procurement systems in a particular country.
Research on the French procurement systems, (Meikle & Jeffery (1989) and RICS (1993))have highlighted the importance of cultural differences in the construction industry of France and the UK. The French government's economic and social policy towards building has major ramifications on the operation of her construction industry. The DATAR, the French regional development agency, provides substantial public funds to assist industrial development throughout France, particularly in the south and west of the country. Additionally the Chambers of Commerce are major participants in the promotion and implementation of development, and can subsidise building work or provide low cost finance.

A study of the American construction Industry has indicated that both the nature of the culture of the American people has major influences on the operation of the nations construction industry (Bennett (1991)).

Investigations into the Japanese construction industry have also indicated that the culture of the country heavily influences the business practices of the industry (Bennett, Flanagan & Norman (1987)). Levy (1990) in his study has also concluded that there are several basic differences between Eastern and Western culture, and these have influences Japans approach to construction.

Literature on building procurement produced by Franks (1990) and Masterman has emphasised that problems are often encountered when considering the meaning of procurement. They advocate that a 'systems' approach should be taken towards procurement. In an attempt to reduce this problem Masterman (1992) has devised the following categories for procurement systems;

- Separated and co-operative procurement systems. (responsibility for design and construction are separated)
- Integrated procurement systems. (design and construction become the responsibility of one organisation)
- Management-orientated procurement systems. (emphasis is placed on overall design and construction , usually involving an independent manager)

The Functional Approach

A functional approach to building contracts was discussed by Mathurin (1990) and Greenhalgh (1990), who both considered the concept of the 'functions' implicit in building contracts. These studies were based on the definition and classification of the main functions and the responsibilities of those involved in the act of construction. Both authors concluded that a single generic form of contract may be possible, based on project functions and responsibilities. This functional approach has been translated for use in the context of procurement rather than just contract.

It became evident that to facilitate an international investigation of procurement systems, it was necessary to devise an objective model which would identify what procurement systems exist internationally, taking into account cultural, language and meaning variations.

The functional approach to the identification of procurement systems has been established by isolating and separating all of the key operations in the procurement process into the generic functions involved in those operations. Five generic functions have been identified and are be discussed below.

During the development of the functional model of procurement systems the first obstacle to overcome was one of universally understood terminology. This was achieved by breaking down the primary functional roles and activities of the industry into their generic functions referred to above. An example includes the term 'Architect' which may not be a universally recognised term, but the role of design is understood internationally. The generic function is therefore, design, so the expression 'Designer' is used. By carrying out this process for all of the members and activities in the construction process, the key functions of procurement have been devised.

It is thus contested that building procurement systems are composed of five generic functions (processes), which include;

i) Initiate/Promote,

ii) Fund,

iii) Design;(which is subdivided into schematic, detailed and specialist design),

iv) Construct;(which includes the management process and the physical construction process), and

v) Risk Allocation amongst the aforementioned functions.

Once the functional processes had been identified, it became necessary to identify the primary functional roles involved in those processes. They include;

i) the Initiator/Promoter,

ii) the Funder,

iii) the Designer, (separated into schematic, detailed and specialist)

iv) the Constructor; (which may be separated into the Manager of construction, and the individual, group, or organisation responsible for the process of construction).

The five generic function of any procurement system include;

Generic Function	Definition
1. Initiate/promote	The process of recognising that a new building is required for owner occupation, as an investment, or as a speculative development.
2. Fund	The provision of the finance required in order for the project to be undertaken.
3. Design	The translation of the verbal or written requirements of the initiator/promoter into drawings and specifications, prepared to facilitate construction. The role of the estimator or cost manager is an integral procedure carried out during the design function. *The design process is sub-divided into concept/schematic design, detailed design and specialist design.*
Concept/ schematic design	The process of translating the requirements of the initiator/promoter into a basic design form, indicating the general design in terms of shape, size and function of the building.
Detailed design	The production of detailed drawings and specifications, from the concept/schematic designs, detailing and describing each element of the building so that it may be constructed.
Specialist design	The development of detailed drawings and specifications for a specific component or element within the structure, which requires specialist technical knowledge to design and construct.

4. Construct	The process of physically fitting the various components of a building together, to form a final structure. This process may be sub-divided into the management and physical action of the process.
Construction management	The management of the building process for the initiator/promoter
Construction process	The physical construction of all or part of the structure for the initiator/promoter, in accordance with the detailed designs (may also include the general management of construction).
5. Risk Allocation amongst Functions	The susceptibility of each of the above generic functions to varying degrees of risk. The degree of risk is dependent upon the type of procurement system implemented and the individual functional roles.

All procurement systems carry an inherent diversity of dominant risks. The generic characteristics of each system will present a distinct combination of dominant risks to either the initiator/promoter, the funder, the designer, or the constructor. By the nature of the procurement system, these risks will place a responsibility on the respective party which has been referred to in terms of Low, Medium or High Risk levels.

In an attempt to identify procurement systems internationally, it has become apparent that not only will the generic functions of the system need to be isolated, but the inherent risks of each system must also be identified.

Research carried out on UK procurement systems by Turner (1990), Morledge (1991), Masterman (1992) et al, have indicated that all procurement systems in the UK are susceptible to three generic categories of risk; Time, Cost/Price and Design/Quality.

For the purpose of this investigation the following categories of risk are to be considered;

Definition of Risks	
Time	Risk for the achievement of the completion date for the project. Timing of the project is considered in terms of the building being completed before the completion date, or on the stipulated completion date, or after the completion date. One of the generic roles identified will bear the risk of the project being completed on or before the completion date. (The overall programme time of the project will often have a premium on the price/cost and quality of the product).
Product Price	Risk in terms of total building price and price escalation. (The use and certainty of cost estimates is significant in the allocation of this risk).
Design Apportionment liability	The responsibility for design and design standards in the project. (Issues such as the reliability and durability of the designs will be considered).
Project Finance	The risk involved in providing the funding for the proposed project and the potentiality for loss.
Effectiveness of Building in operation (building Functionality)	Risks associated with the completed project not fulfilling the requirements stated in the brief. These risks are considered in terms of whether the project meets the stated requirements, can perform its proposed function, and is suitable for its intended purpose.
Quality of Product	Risk of the project being of unsuitable construction quality. Quality is a very subjective issue, and for the purpose of this study the risk has been assigned to the party who is responsible for the quality of workmanship and materials in the construction process.

Three basic working frameworks have been devised, showing the relationships which exist between;

- Functional Role and each Procurement Function (Framework 1),
- Functional Role and Risk inherent in any particular procurement systems (Framework 2), and
- Functional Role and the Formal Relationship which exists between the parties.(Framework 3).

These frameworks illustrate the generic functions of a procurement system, facilitating its identification and comparison.

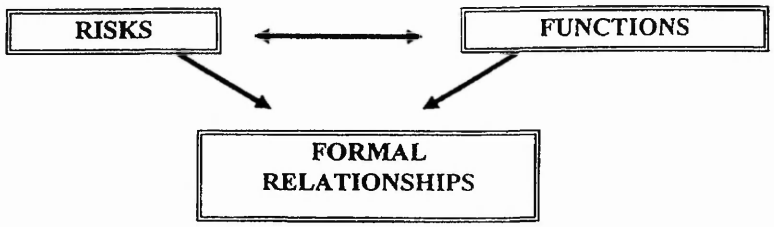

Diagram to Indicate the Relationship between Functions, Risk and Formal Relationships

As indicated above the primary functions and the risks associated with the procurement system are interdependent and influence the formal relationships which established within a particular procurement system.

Framework 1. (Fig.1)

This framework has been devised to show 'who does what' in the procurement process. The use of this framework will facilitate the objective establishment of which primary role carries out each generic process. (The benefits of this framework will become apparent when used in countries with less technologically sophisticated construction industries.)

Framework 2. (Fig2)

The dominant risks inherent to each primary function is established by this framework. It is contended that each of the four generic primary functions will have certain dominant risks associated with them. The pattern and profile of the dominant risks to each of the functions will be influenced by the processes, and the formal relationships which exist in a procurement system (Frameworks 1, and 3).The extent of each of the risk is measured in terms of being Low, Medium and High.

Framework 3. (Fig3)

At various stages throughout the procurement process, various formal relationships will be established. This framework will illustrate the existence of formal relationships with each of the generic primary functional roles. These formal relationships may exist as written or verbal agreements between the parties involved. Traditionally, they will be backed up by legal contractual documentation.

These frameworks will exemplify the pattern of Functional Responsibilities and Functional Risks inherent in the various dominant procurement systems. Each procurement system identified will have a particular arrangement in terms of the above frameworks. An amalgamation of the three will produce a 'Procurement System Model'(P.S.M.), illustrating the dominant procurement systems in a country. It is envisaged that an array of models will emerge and these may then be classified. To avoid the problems of misinterpretation, all of the procurement system models are to be enumerated. At this point it will be possible to conduct a comparison and appraisal of the procurement systems identified.

As the models have emerged, it has become clear that certain common types of dominant procurement systems exist internationally. Currently, the PSM have been created for the UK, France, and the USA, and Japan. The reliability of the models will be tested by academic and construction professionals in the countries under investigation.

Necessary Support Frameworks for Procurement Systems.

Investigations carried out of the dominant procurement systems in the UK, France, the USA and Japan indicate that similar procurement systems exist in these countries. The development of the Procurement Systems Model (PSM) has facilitated the objective comparison of procurement systems in each of the countries and has illustrated that similar procurement systems operate in countries with dissimilar structured construction industries.

The identification of this apparent paradox has led to the investigation of what is required to be in place in any country in order for a particular procurement system to operate. The development of the functional approach to procurement systems has highlighted that there are minimum competencies which are necessary for the operation of any procurement system in a country. These minimum competencies are defined in the table below;

Definition	Minimum Competencies
Initiation/ Promotion	The ability to understand need and to express that need. The ability to understand the procurement process or to understand how to initiate the process.
Funding	The ability to understand the nature of the process of funding and funding strategy.
Design	The ability to interpret the needs of the initiator/ promoter and to communicate those needs through a process resulting in a building which meets the functional, physical, and economic parameters established or presumed.
Construction	The ability to understand the requirements of any design and to adapt such designs through a process of construction to produce a building of acceptable quality, within acceptable tolerances and within an acceptable time frame for a specific client.
Risk	The ability to understand types of risk and the implications of risk, or the ability to obtain advice about risk, risk allocation, and risk management.

Indigenous Organisational Support Frameworks

Contiguous with these minimum competencies being in place, it is suggested that there are certain indigenous organisational frameworks which must exist in order for a specific procurement system to operate. The Indigenous organisational frameworks include;

Definition	Indigenous Organisational Frameworks
Initiation/ Promotion	Government, corporate, group, or individual promoters or promoting frameworks which own or have; authority or delegated authority, adequate funding or the ability to obtain adequate funding.
Funding	Banks, government funding agencies, or other financial agencies able to obtain indigenous or imported finance.
Design	Indigenous licensed, approved or accepted design individuals or corporate groups.
Construction	Indigenous individuals, bodies or corporate groups possessing the skilled labour, and having the ability to obtain the appropriate materials and/or appropriate machinery.
Risk	Adequate formal relationships to enable risk to be reliably allocated. Sufficiency of the ability to accept risk and to obtain security for that risk.

The research programme will seek to investigate;

1) the need for the existence of the minimum competencies required for a procurement system to operate.

2) the ability to produce a conceptual model of the indigenous organisational support criteria which must exist to enable the identified dominant procurement systems to operate.

Conclusion

The functional approach to modelling procurement systems has facilitated the objectivity which is unaffected by role descriptors, such as 'Architect', 'Engineer' and 'Quantity Surveyor', which are neither constant nor recognised in many construction industries internationally. Consequently, this approach may be implemented in any country in order to observe the dominant procurement systems.

This functional approach will also assist in the comparison of procurement systems which are adopted by major construction exporting and major construction importing countries. The importance of the ability to model such systems in this way will be highlighted with the continual globalisation of the construction industry and increased international trade.

Further development of this approach will allow the examination of the specific indigenous organisational support frameworks which are required to be in place in order to allow the effective application of a particular procurement system. It is anticipated that this will assist in the identification of what is required in a particular country before a procurement system can be used effectively.

The outcome from the Procurement Systems Model will additionally provide useful information to nations with growing construction industries in terms of the most appropriate procurement systems to use on their construction projects, given the context and project typology.

PRIMARY ROLE PROCESS		Initiator/ Promoter	Funder	Designer			Constructor	
				Sch.	Det.	Spe.	Management	Product
Initiate/ Promote		√						
Fund			√					
Design;	Schematic			√				
	Detailed				√			
	Specialist					√		
Construct;	Management						√	√
	Product							√

Framework 1.(Fig 1); Functional Role against Functional Process.

PRIMARY ROLE RISK		Initiator/ Promoter	Funder	Designer			Constructor	
				Sch.	Det.	Spe.	Management	Product
Time		LOW						HIGH
Product Price								HIGH
Design Liability	Schematic			HIGH				
	Detailed				HIGH			
	Specialist					HIGH		
Project Finance			HIGH					
Effectiveness of Building in operation (functionality)		HIGH						
Quality of Product								HIGH

Framework 2.(Fig 2); Functional Role against Risk

PRIMARY ROLE FORMAL RELATIONSHIPS		Initiator/ Promoter	Funder	Designer Sch.	Det.	Spe.	Constructor Management	Product
Initiate/ Promote			√	√	√	√		√
Fund		√						
Design;	Schematic	√						
	Detailed	√						
	Specialist	√						
Construct;	Management	√						
	Product	√						

Country; UK Model; A1 Assumptions; Use of JCT Standard Form of Contract

Framework 3.(Fig 3); Functional Roles against Formal Relationships.

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Appendix 1

FIGURE 1 LOTS (External
SEPARES Funding)

Framework 1 Functional role against Functional Process

PRIMARY ROLE PROCESS		Initiator/ Promoter	Funder	Designer Sch	Det	Spe	Constructor Management	Product
Initiate/Promote		✓						
Fund			✓					
Design	Schematic			✓				
	Detailed			✓	✓			
	Specialist					✓		
Construct	Management			✓			✓	
	Product							✓

FIGURE 2 LOTS (External
SEPARES Funding)

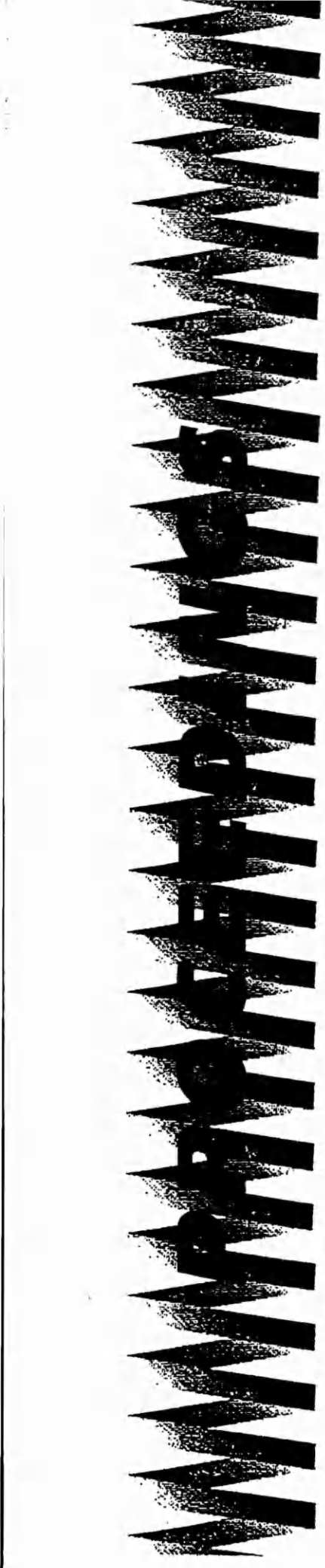
Framework 2 Functional role against Risk L = Low M = Medium H = High

PRIMARY ROLE RISK		Initiator/ Promoter	Funder	Designer Sch	Det	Spe	Constructor Management	Product
Time							M	M
Product Price		H						
Design	Schematic			H				
	Detailed				H			
	Specialist					H		
Project Finance			H					
Operational effectiveness (functionality)		H						
Quality of Product							M	M

FIGURE 3 LOTS (External
SEPARES Funding)

Framework 3 Functional role against Formal Relationship

PRIMARY ROLE FORMAL RELATIONSHIP		Initiator/ Promoter	Funder	Designer Sch	Det	Spe	Constructor Management	Product
Initiate/Promote			✓	✓	✓	✓	✓	✓
Fund		✓						
Design	Schematic	✓			✓	✓		
	Detailed	✓		✓				
	Specialist	✓		✓				
Construct	Management	✓						
	Product	✓						



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VOLUME 2

PROCUREMENT SYSTEMS AND INDIGENOUS ORGANISATIONAL SUPPORT STRUCTURES: THE DEPENDENCY LINKAGE

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Abstract

Current research at the Nottingham Trent University is indicating that the effective usage of any particular procurement system requires the existence of certain indigenous support structures.

This paper will addresses the relationship between the ability to procure buildings in an effective way and the existence in any society of indigenous vocational competencies, supporting organisations and ethical frameworks.

The relationship is addressed in the context of two countries, one of which is a major exporter of construction services and the other a major importer of construction services.

It is suggested that there is a dependency of effective procurement upon the existence of the competencies, organisations and frameworks and that without these criteria the procurement of buildings will show symptoms of ineffectiveness, weakness or system failure. The research for the paper has addressed procurement systems operational in the United Kingdom and in the Indian subcontinent and has concluded that there is a dependency on such criteria.

This research forms part of a wider portfolio of international building procurement research being conducted by the International Procurement Research Group (IPRG).

Key Words; Procurement, Indigenous, Competencies, Organisational Structures, India.

Introduction

Differences exist in the structure, participants and technology within the construction industries of the UK and India, but similar procurement systems have been identified and modelled.

The focus of this paper concentrates on the competencies and organisational support structures which are required to be in place before such procurement systems may operate effectively. The research underpinning this paper is indicating that in order for a particular system to operate effectively, it relies upon the existence of specific competencies. These competencies themselves are contested to depend upon the development of organisational support structures, which are not system specific, and which facilitate, allow or encourage the competencies to exist.

CIB (1991) working commission W92 Procurement Systems, defines building procurement as:-

> "...the framework within which construction is brought about, acquired or obtained."

Great attention is being focused upon the selection of appropriate procurement systems on construction projects internationally (Skitmore & Marsden (1988) and Davenport (1994)). The importance of system selection has become of increasing importance as it is becoming apparent to practitioners and clients of the industry that by selecting the most appropriate procurement system can lead to effective project delivery and client satisfaction in terms of the acceptable parameters of cost, time and quality (NEDO 1985).

Functional Approach to Procurement

Sharif and Morledge (1994) have developed a method of modelling procurement systems by generic functions. This analysis has been developed by isolating all of the primary roles operations and activities in the construction process, and redefining them as generic functions thus making them readily comprehensible to construction professionals internationally irrespective of traditional role or language barriers. The authors have isolated five generic functions of procurement as:-

1) Initiation/Promotion: (the role of the client, employer or developer)
2) Fund: (the process of securing finance for the project)
3) Design: (the translation of verbal requirements of the initiator promoter into drawings and specifications by an architect, engineer or designer).
4) Construct: Management (management of the construction process)
   Product (physical construction of the building).
5) Risk allocation amongst the above functions.

It is anticipated that the functional approach to the modelling of procurement systems could promote and facilitate the international understanding of indigenous procurement systems. Increased international competition coupled with globalisation of the construction industry sector makes it critically important for clients and practitioners to compare systems and select the most appropriate procurement route for each individual situation.

UK Procurement systems

The UK construction industry exhibits a range of procurement systems which may be used in the process of obtaining a building. The evolution and existence of such options has been the area of discussion for many authors. The works of Turner (1990), HMSO (1992), Masterman (1992) and Huru (1992) comprehensively outline the dominant UK procurement methods and their development within the UK context.

Masterman (1992 p4), from an adaption of the work of Perry (1985), illustrates the dominant array of procurement systems which exist in the UK, and provides a systems approach to their analysis (fig 1).

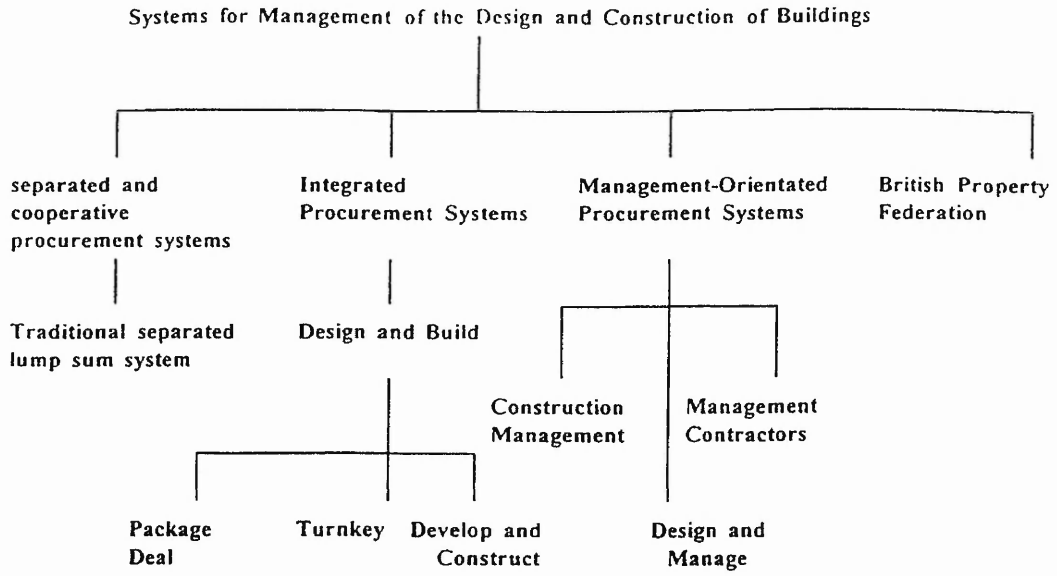

Fig 1; Systems for management of the design and construction of buildings.

Each dominant procurement system has been functionally modelled to establish the relationship which exists between the participants in terms of their operational features, risk distribution and contractual characteristics. Each of theses relationships have been represented by individual frameworks. The frameworks together will form the 'Procurement System Model' (PSM) for each system identified. Each procurement system identified will have a particular arrangement in terms of the three frameworks.

Procurement Competencies

Sharif and Morledge (1994*) have suggested that these are minimum competencies which are necessary in order for the operation of any particular procurement system. The authors propose that the existence of these minimum specific competencies relies upon certain indigenous organisation support frameworks being in place (Fig 2). The specific competencies which are associated with a procurement system are suggested therefore to depend upon various indigenous support structures, which facilitate, allow or encourage the competencies to mature. It is contested that without such competencies, and their associated indigenous organisational support structures, a particular procurement system will not operate effectively, or will only operate at a sub optimal level.

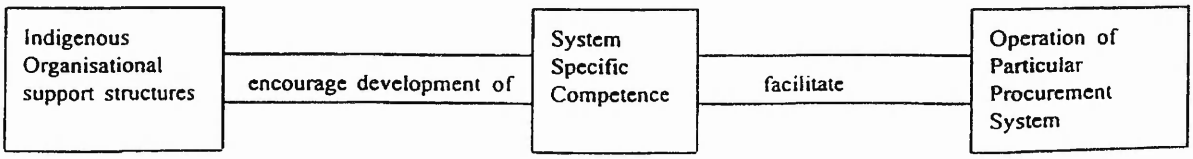

Fig 2; The Dependency Linkage

Each of the generic functions has been examined to establish what competencies are necessary to execute the associated function. It is contended that there are minimum competencies, which are required to operate any procurement system. These minimum competencies have been established by reviewing literature relating to the building procurement process in the range of countries in this investigation.

A further set of system specific competencies have been established which are required in order to operate a particular identified procurement system. These specific competencies have been confirmed by analysing literature and through informed opinion.

The indigenous organisational support frameworks which are required to be in place to facilitate or allow these identified system specific competencies to exist have been subsequently established. This process has been conducted by reviewing each system specific competency, and examining what organisational support structure must be in existence, or imported in order for that competency to exist.

In terms of the major exporters of construction services (such as the UK), the existence and maturity of organisational frameworks is often a consequence of the level of the country's industrial, economic and/or cultural development which itself may depend upon political or socio-economic stability. When compared with the organisational structures of major importers of construction services (such as India), it should be recognised that such countries will contain various support structures which have been influenced by the nations industrial, cultural, socio-economical development.

The analysis of procurement systems by this approach has enabled the following conclusions to be drawn;

a) Generic functions are common across procurement systems
b) Competencies are considered to be system specific
c) Organisational support frameworks are a consequence of external factors, and are therefore not system specific.

It is contended that the benefit of this analysis is to inform countries with less technologically sophisticated construction industries, what specific competencies and organisational support structures need to be imported or developed indigenously, before a particular procurement system may be used effectively.

Development of Procurement systems and Supports

It is evident that in the UK various procurement systems exist and have evolved as the indigenous construction industry has developed and matured. Hillebrandt (1984) and Turner (1990) discuss how the UK industry as result of its organisational structures and consultants developed various dominant forms of procurement. Turner (1990 p27) points to the industrial revolution in the UK as a major catalyst which led to the rapid development of the industry and its associated professionals. As a result of such industrialisation, a variety of dominant procurement systems began to emerge in the UK.

When this pattern of evolution is contrasted with that of the pattern in less technologically sophisticated industries such as India, there are stark differences.

Indian Procurement Systems

India is a nation with a rich heritage of majestic buildings. She is a country of great size, vast population, diverse climatic and geographical conditions, and her built environment reflects her history of various cataclysms, including numerous

invasions, famines and religious and political upheaval. Chandara (1990 p212) provides a scenario of the traditional Indian excellence in construction and Hussain (1988 p3) further discusses the ancient achievements of Indian builders and craftsman.

The Indian building industry for many years however has been plagued with huge cost overrun, large construction cycles and poor quality buildings. The Government of India (1985) and Chandara (1990 p215) confirm that these symptoms are endemic of the construction industries in many developing countries.

Mohan and Sofat (1987 p89) have observed that projects in India are seldom completed within the estimated project time and costs. The authors make reference to the earlier work of Singh & Sofat (1977 p331-316) which analysed the degree of time and cost overruns on projects with different procurement routes. Singh & Sofat (1977) and Mohan & Sofat (1987 p83) recognised that for the successful completion of building projects in India, the correct contracting philosophy, appropriate contract documentation and suitable tendering procedures are a prerequisite. The authors confirmed that the dominant building procurement systems in India include

a)	Lump Sum contracts	(Separate and cooperative
b)	Measurement contracts	procurement systems)
c)	Design and Build/ Turnkey	(Integrated procurement system)
d)	Piece work contracts	(primitive management orientated system)

Increased attention has been given to the evaluation of such time and cost overruns on construction projects. Kohli (1986) suggests that the cause of such project cost and time increases may be categorised as being due to;

i) inadequate project information
ii) insufficient project planning
iii) deficient management and coordination or projects.

The research by Sharif (1995) has enabled the dominant procurement systems to be modelled, using the functional approach, confirming that certain procurement systems exist in both India and the UK. This research was conducted by an initial questionnaire survey to establish the dominant procurement systems that exist in India. A series of structured interviews were also conducted to establish the competencies required in order to operate each system, and the form of organisational supports which exist indigenously. The questionnaire survey and interviews were administered to a range of academics and practitioners including clients, designers, financiers, and constructors who have experience of the Indian construction industry.

During this investigation it was recognised that although management orientated procurement systems (such as construction management and management contracting) are only beginning to be used in India, there is growing interest in implementation of such systems. Where such procurement systems are being used in India, either the indigenous consultants and companies with limited experience are sought after, or the skills and experience is imported. The interviews conducted confirmed that although such 'management-oriented' procurement approaches are being to be implemented in India, there are organisational constraints which are

affecting their usage.

Organisational Support Constraints

It is contended that for the effective operation of management-orientated procurement approaches, consideration must first be given to the existence of organisational support structures, which promote, encourage or develop the specific competencies required for the particular procurement system to operate. If the competencies do not exist indigenously they may be imported. The national development of such support structures is however, required on a long term basis.

The results of the interviews confirmed that the major organisational constraints in India include;

1) Lack of financial agencies willing to loan finance to the construction industry
2) Inappropriate contract documentation
3) Insufficient 'management' expertise in the industry.

Each of the issues highlighted are now discussed.

1) Lack of willing Financial Agencies

Nagabushana Rau (1982) and the Asian Productivity Organisation (APO) (1983) identified that a major reason for the continual construction problems in India is because the construction sector is not being recognised or organised as an "industry".

The APO (1983) further identified the common constraints facing the construction industries of its member countries and revealed that because the construction is not considered to be an "industry" in that same way as manufacturing, obtaining finance for construction activity is often difficult. The study confirmed that in many of its member countries, including India, banks an other financial institutions are reluctant to fund construction projects, as its considered to be a "risky" business. The APO (1983 p82) argue that due to limited financial agencies and difficulty in obtaining loans, projects are often abandoned during construction due to lack of funds.

The Indian Government has recognised the deficiency in this area and has taken measures to assist with the acquisition of construction finance, particularly for residential properties. Agencies such as the National Bank of Housing, the Housing Urban Development Corporation and the Life Insurance Corporation of India have been established to offer private clients more equitable access to finance for the construction of dwellings.

In the survey by Vaid (1990 p55) on the Indian Governments 8th Five Year Plan, he concludes the views of the key practitioners of the construction industry, and suggests that a major obstacle within the industry is the limited access to finance and the high interest rates which are charged on construction loans. Vaid (1990) and Chandara (1990 p221) confirm that separate banks or more willing finance agencies must be developed in India, in order for the industry to develop further. Until the financial sector is modified to allow easier access to project finance, continual problems will be encountered. Raj (1994 p208) further addresses the

difficulties associated with agencies willing to provide finance in the private sector.

The questionnaire surveys and interviews conducted indicated that there are limited agencies which are willing to provide construction finance. The major sources include Government sources, foreign loans, banks, raising capital through share offers, private money lenders and private savings. However, the main source of finance for private clients is thorough banks, and private money lenders who charge high interest on loans.

The interviews confirmed that as well as finance agencies considering construction to be "risky", most are even more reluctant to loan finance to projects based on management-orientated procurement systems as they are considered to carry greater risk.

2) Inappropriate Contract Documentation

The work of Turin (1973) highlights that forms of contract which are often used in the 'developing' nations are frequently adopted from 'developed' nations.

Ofori (1980) explored this argument and stated that in the context of the 'developed' (industrialised) nations, the construction industry has matured at a gradual pace, growing with a nation's economy and being structured by the nation's organisational forms and sophistication. He contrasts this with the pattern of growth with that of 'developing' countries. With particular reference to nations with a legacy of colonial rule, he states that these countries witnessed the introduction and imposition of construction materials, techniques, and contractual systems which evolved in 'developed' colonising nations, and implemented into 'developing' countries.

The APO (1983 p16) recommended that there is urgent need for the revision and updating of contract documentation used in 'developing' nations, concluding that such documents should be made "fair and equitable".

Edmonds & Mills (1984) in their study of aspects of the construction industry in developing countries identified the particular generic characteristics of the industry and further argue that although there is no reason to suggest that the *pattern* of the construction industry in industrialised countries is suited to the developing nations, this *pattern* has been reproduced internationally.

The World Bank (1984 p52) confirmed that contract documents which were used in 'developing' countries were often based on practices generated and associated with industrialised nations. Mohan & Sofat (1987 p84) exemplify that within the Indian construction industry, the contract documentation often used is derived from contracts such as JCT, RIBA, and FIDIC contracts, which are modified to suite individual client needs.

Mohan & Sofat (1987), Bhartikar & Bhorkar (1992 p128) and Verma (1994 p129) further discuss how each public sector works department in India has developed its own unique form of contract (based on the above documents) to suite its own specific requirements. This situation has resulted in the existence of many forms of contract, all usually being one-sided, placing the onus of risk in the agreement

firmly with the contractor. The distinct lack of clarity and contradictions in terminology incorporated into such documents has led to clients maintaining unrealistic powers, allowing them to make changes and modifications which culminates in cost and time overruns.

Nagabushana Rau (1990 p399) recognises the importance of appropriate contract documentation and the management skills and states,

> "....it is unfortunate that after 40 years of independence, we do not have a standard contract form to fit the requirements and aspirations of India. What we have today is still a colonially oriented document."

Chandara (1990 p222) further pursues this theme of the adoption of contract documents in India and suggests,

> "....modernisation is continual and ethno-centricity in planning and technological upgrading are a must. What is needed is adaption of technology, and not the adoption of technology evolved in the developed countries.....it could be adapted to suite our culture, social and economic conditions."

Again Nagabushana Rau (1995 p3), reflects on the immediate need for equitable contract documents in India, and discusses the draft standard form of contract proposed by National Institute of Construction Management and Research (NICMAR) and the Builders Association of India (BIA). It is suggested that this document has been prepared over several years, incorporating the requirements of both the client and the contractor, and is currently being reviewed by various public works departments, in the view to establishing this as the first nationally recognised standard form of building contract.

3) Management Expertise

The lack of adequate management expertise needed in the construction process has been the area of much discussion in India. In 1980, Nagabushana Rau identified that the necessity for project management in construction was unappreciated in India. He suggests that even a small improvement in the management of projects would lead to increased development and efficiency of the industry.

The APO (1983 p41-42) study indicated that due to the industry being made up of large number of small firms, the ease with which firms may enter the market, coupled with there being no formal means of regulation, has resulted with the manifestation of problems in the industry. It is suggested these structural characteristics has led to the grave and immediate need for technical and managerial training throughout India.

Moavenzadeh (1988 p72) in his examination of the exporting capabilities of the Indian construction sector concluded that there are excellent contractors operating throughout India in terms of their technical skills, and cheap labour. He identifies their major weaknesses as management capabilities.

This lack of training and developed expertise in the management of the construction

process has been recognised by the Government of India (1989 p1) and Chandara (1990 p215), who have analysed the proliferation of projects with time and cost overruns, and attribute them to a number of issues including "poor management".

Nagabushana Rau (1990 p393) comments on the industry's infestation with project delivery problems, and concludes that they are due to outmoded technology, and ineffective managerial and administrative systems.

The interviews conducted highlighted that a major limitation in the development of the Indian industry is the severe lack of management skills and competency. Such skills are being increasingly demanded by projects of a complex nature and the implementation of new procurement systems. The interviews confirmed that industry consists of excellently qualified technical staff, but is deficient of staff with a robust understanding of the management expertise required in construction. Adequate management training has not traditionally been incorporated into the formal training programmes for consultants, such as Architects, Engineers and Surveyors. An interviewee commented that,

> "....The value of good management has not been traditionally understood by our clients. In many ways they look upon a management consultant, who works as part of the clients team, purely as an additional fee. The perception is that this management function aught to be performed by the architect, engineer or contractor. However the reality is that these practitioners have limited formal training in such areas."

However, efforts are being made to address this shortage in management skills, with new education programmes being developed and run at various universities. Such courses pioneered by NICMAR, and other research institutes in India, will assist in establishing the organisational support structure, from which the respective competencies may develop.

The research confirmed that attempts are being made to implement management orientated systems, they are meeting with limited success. This is primarily due to the existence of few consultants who can offer the management services which are necessary for the implementation of such systems. The continued development of management competencies, appropriate forms of contract and more equitable fiance arrangements, is expected to result in increased implementation of management orientated systems and more effective performance.

Conclusions

When comparing the construction industries of two countries such as India and the UK, it must be recognised that these countries are dissimilar in the degree of evolution they have reached in their respective construction industries. Each country has different priorities of what modifications and advancements are required. However, the importance of procurement strategies, and appropriate system selection is increasingly being recognised in both countries.

Although the organisational structure of the UK and Indian construction industry are vastly different, dominant procurement systems have been modelled in both countries and particular procurement systems are common.

This paper suggests that the functions of procurement are common across the various systems irrespective of traditional roles or language barriers. The research further contends that associated with such functions are competencies, which may be system specific and are required in order to allow a particular procurement system to operate effectively. The existence of such competencies indigenously, relies upon the development and maturing of indigenous organisational support structures. These support structures are a consequence of external factors and are not system specific. In addition to such system specific competencies there are a menu of generic competencies which must in place in order for any system to operate.

The aim of this research is not to be 'ethno-centric' by suggesting a model of organisational supports which have been developed in the UK, and recommended for use in India, but to objectively analyse particular procurement systems in terms of the specific competencies necessary for them to operate. This will facilitate the identification of indigenous organisational supports which are required to propagate such competencies.

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Department of Defence

INTERNATIONAL CONSTRUCTION PROJECT MANAGEMENT SYSTEMS - A FRENCH MODEL

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ABSTRACT

The opening out of the boundaries of the international construction market has accelerated during the last two decades as a result partially of political and socio-economical developments in the expansion of the European Community and the creation of new market economies in the east. This has presented all nations with an incentive to reappraise and re-evaluate their project management systems in order to expand their range of commercial interests and promote international collaboration and consequently, to create new networks of competitive opportunities in the sphere of the international construction market. The French Construction industry, with a well-established and powerful base of technological and design expertise, have become leading contenders in the international construction sector, successfully forming joint venture consortia for projects at home and abroad, not only amongst French companies but also amongst UK and other European companies.

In the light of these developments this paper reviews the structure and major characteristics of French project management systems with emphasis on the most commonly used construction procurement routes and the functions and responsibilities of all those involved in the design and construction processes. The characteristics of the French system are redefined in generic terms in the form of a Procurement System Model (PSM). This model has been developed in order to facilitate universal understanding of functional roles in the construction process which, on an international sacle, share similar features. The functional role of the client, the designer and the constructor is examined in relation to :

- the functional process
- the level of risk undertaken by each party
- the formal, legal frameworks which exist

The paper goes on to examine the significance of French Civil Code legislation and its influence upon the definition of responsibilities of each functional role. Finally the paper reviews client categories and how these classifications may be generically redefined in order to extend the PSM model. A further stage in the development of the PSM would be to examine the effectiveness of the indigenous procurement systems in achieving performance standards as defined by the public or private sector client and promote the most suitable procurement path selection in order to achieve maximum client satisfaction with construction investment.

Keywords : construction, function, generic, international, model, procurement system, project management, risk

1 Introduction

A survey of current procurement systems operating in France, besides providing valuable information for international collaborators or competitors, will identify the characteristics of French project management methods which can then be redefined in generic terms as a basis for comparison with international methodology. This redefinition will be based on a functional model developed by Nottingham Trent University which identifies the dominant procurement systems operating within a country and the specific indigenous organisational structures which underpin them.

Analysis of systems used, carried out in relation to levels of client satisfaction with construction performance, will identify inherent strengths and weaknesses of each one and also promote the development of appropriate construction contract procurement route selection. The French model may be used to study the dominant project management systems operating in other countries with well-established or developing construction industries.

2 Functional approach to the modelling of international procurement systems

Sharif & Morledge (1994) have devised a system which isolates and separates all the primary roles, operations and activities in the construction process and redefines them in generic terms which make them readily comprehensible to construction professionals universally.

Key functional roles have been reduced to:

- initiator/promoter (client, employer, maître d'ouvrage, developer etc)
- funder (financer, bank etc)
- designer (architect, engineer, bureaux des études, maître d'oeuvre etc)
- constructor (contractor, specialist or works contractor, sub-contractor, project manager, construction manager etc)

A single company or person may take on any one or more of these key positions eg. a development company may also be financier and architect, a contractor may be designer and constructor.

Key functional processes are:

- initiation/promotion
- funding
- design (schematic, detailed, specialist)
- construction (project management, construction management)
- risk allocation

Using these generic terms three major frameworks have been developed as follows:

- **Framework 1** - the relationship between the functional role and each functional process. Alternatively this may be defined as 'who does what' in the project management process. The role of the constructor may be subdivided into two further identifiable roles - the manager of construction (project manager) and the product constructor (construction manager).

- **Framework 2** - each functional role and the risk inherent in each system. It is contended that each of the four generic roles will be subject to particular risks according to the functional process they deal with and the formal relationships within the project management system.

- **Framework 3** - functional role and the formal relationship which exists between the parties. This covers the formal legal and contractual obligations between the parties at various stages of the project management process.

These frameworks may be used to illustrate the pattern of functional responsibilities and risks inherent in specific contract procurement systems and used in combination will produce a Procurement System Model (PSM) which

will classify the dominant project management system in any country.

3 Predominant procurement systems in use in France

Meikle & Hillebrandt (1989), Davenport (1993) and Pearson (1994) have identified the predominant construction procurement systems in use in France amd these may be classified briefly under the classification devised by Masterman (1992) and highlighted by Sharif & Morledge (1994) as follows:

- **Separated and co-operative - responsibility for design and construction are separated**

Co-traitance
Separate *Lots separés*)
Groups *Groupement conjoint*)
Groupement solidaire)
Société En Participation)

Sous-traitance
Main Contractor
Entreprise Générale

- **Integrated - one organisation responsible for design and construction**

Sous-traitance
Design & Build
Conception Construction
Turnkey
Co-traitance
Entreprise Ensemblière

- **Management-orientated - independent project manager for design and construction processes**

Sous-traitance
Design & Build
Conception Construction

Co-traitance/Sous-traitance
Joint Venture

The US derived Construction Management or Management Contracting methods are less common in France than the UK and are used mainly where other countries, like the USA, import their own procurement systems.

Pearson (1994 p18-25) has comprehensively outlined the main French procurement methods and the formal contractual links between the parties and a brief review of these, in order to place them in the context of the subject matter of this paper, is made as follows. *Lots separés* and the groups *conjoints* or *solidaire* are traditionally the most common procurement systems operating in France. The responsibilities for design and construction and risks incurred by protagonists are more complex than traditional systems operating in the UK and other countries, where a single main contractor, not responsible for design, is appointed. Each works package is carried out by a specialist contractor who may be partially responsible for design (depending on the mission - see item 4) and who makes a formal contract directly with the client. A works contractor, usually the *gros-oeuvre* or substructure/reinforced concrete frame contractor, is appointed as *pilote* or co-ordinator of the construction works. In other cases the contractors may group together and appoint a *mandataire commun* (usually the *gros-oeuvre* contractor) who acts as representative and signs a single *acte d'engagement* on behalf of the group. Each works contractor remains directly responsible to the client for their portion of the construction works as well as for the whole of the contract. Separate works contractors may have sub-contractors but the relationship between all the contractors, including the *mandataire commun,* is one of *co-traitance* which may be likened to a joint venture type of contract. Grouped contractors are defined as *solidaires* when each is engaged for the whole of the works and must compensate or make up for any short-comings of their partners. *Conjoints* groups are formed when the work is divided into lots and each works contractor is engaged only for the period in which their particular works package is

being carried out. (Chambre de Commerce et d'Industrie de Grenoble 1992).

A further type of group is called *SEP (Société En Participation)* where each works contractor is a main contractor with sub-contractors and a *mandataire commun* is appointed in the normal way.

4 The Standard Missions (Missions Normalisées)

In the past the method of project management has been closely tied in with the French system of fee payment or *honoraires*, based on the Civil Code statutes issued since 1973 (Bonhomme 1992 p332) (Pearson 1994 p7-10) which sets out the remuneration of the designer, based on the value of the works, the complexity of the scheme and also on the specific participation of the designer at various stages of the project. (Chambre de Commerce et d'Industrie de Grenoble 1992) The legislation was intended to be mandatory for public works only but has been used on a wide scale by private clients. Pearson (1994) has detailed the evolving French legislation which governs this system, from the establishment of the 1973 decree no 73-207 until the decree of 1993 nos 93-1268, 1269 and 1270 which replaced the original legislation but , at the same time, retained many of its original elements.

For the purposes of the contract it is important that the contractor is aware of the type of mission being conferred on the designer by the client as it greatly affects the design responsibilities and consequently the risks, which might be placed on the contractor. The type of mission is set out in the contract documents which sets out the specific conditions appertaining to a contract, ie. the (Cahier des Clauses Particulières or CCAP).
Davenport (1993) and Pearson (1994) outline the main characteristics of the missions as set out in the publication by Le Moniteur (1992). In order to promote competition within the construction design sector, the French Law which made these missions and fee scales compulsory has now been revoked for the *Collectivités Locales.* There are thirteen elements of a standard mission (see Table 1) and twelve separate missions each composed of a combination of the elements and one of which will be selected by the client. The first six missions are used where the designer has responsibility for both design and project supervision. The second six are used where the designer has responsibility for design only.

Table 1

ELEMENTS OF THE STANDARD MISSION

Project Stages	Reference		Designer Function
e1	APS	Avant-project sommaire	Brief
e2	APD	Avant-project detailles	Detailed feasibility
e3	STD	Specification techniques detailles	Detailed technical specification
e4	PEO	Plans d'executions des ouvrages	Working drawings
e5	DCE	Dossiers de consultation des entrepreneurs	Tender documents and procedures advised to client
e6	AMT	Assistance marches de travaux	Tender report and constractor selection
e7	CGT	Controle generale des travaux	Supervision of works
e8	RDT	Reception et decompte de travaux	Handover, final account and feedback
e9	DOE	Dossier des ouvrages executes	As completed drawings etc
e10	DCC	Dossier de consultation des concepteurs	Design details submitted for competition
e11	AME	Assistance - Marche des Etudes	Design recommendation to client
e12	CGE	Controle Generale des Etudes	Supervision of design
e13	RDE	Reception et Decompte des Etudes	Completed specialist design & design fee submission

The following missions are the most significant to the contractor in terms of defining responsibilities :

M1 - the designer is responsible for APS, APD, STD, PEO. The contractor is responsible for providing site plans and methodology details

M2 - the designer is responsible for APS & APD. The contractor is responsible for working drawings and specifications

M3 - the designer is responsible for APS only the contractor is responsible for APD, working drawings and specifications

5 Procurement System Model for *Lots Separés*

The amalgamation of the three frameworks as delineated in item 2 will produce a PSM illustrating the nature of the procurement system in terms of functional responsibilities and risks. Figures 1-3 show the group system in which the designer is responsible for preparing the schematic design (APS) and the constructors are responsible for the detailed and specialist design (APD & STD). This indicates that this particular model is an M3 mission but the same generic classifications are as appropriate for a procurement system from any other country which may operate a similar system but, at the same time, not utilise standard missions in order to define responsibilities. The PSM indicates levels of high risk to designers from the Designer or Constructor categories, high risks to the Initiator/Promoter in terms of cost and operation and high risks to the Funder in the provision of finance. These indications inform participators at feasibility stage of the levels of risk associated with the procurement path selection (see appendix 1).

6 French Client Categories and Procurement Selection

Setting up the PSM model to define systems and functional risks and responsibilities is the first stage in the promotion of appropriate construction procurement selection of the client. The second logical stage in the achievement of the optimum procurement route objective is to establish the type of client and their priorities. A fundamental requirement is to define the classification of the client/user in terms of whether they are public or private, expert in construction or inexpert and the type of building they require. Based on earlier work by Higgin & Jessop (1965), Nahapiet & Nahapiet (1985), Masterman (1992) and Masterman & Gameson (1994), Davenport (1995) has examined classifications of client which can be expressed in generic terms and divides clients into primary and secondary groupings - primary denotes the client who are involved with construction output as their primary business objective eg the property developer; secondary denotes the client who require construction in order to improve or expand their primary business objective eg retailers, manufacturers etc. The classifications are as follows :

- A1 Secondary inexperienced
- A2 Secondary experienced
- A3 Primary inexperienced
- A4 Primary experienced

Further categories may be produced by designation of the client as public or private and sub-grouping according to the building type required. A client such as PILKINGTON'S GLASS requiring a new factory, would be classified as an A2 Private Industrial Sector client. Most clients from whatever country are likely to fall into distinct identifiable categories and have a range of similar needs and objectives which transgress national boundaries. However this hypothesis requires further study before the client classifications set out above can be established as the main generic groupings.

A further component of this second stage of the development of the PSM is concerned with the level of participation required by the client in the construction process. Masterman (1994), in a detailed study of the basis upon which clients select a procurement system, found that the need of the client to be involved and informed was, with final cost and certainty of completion, among the first three in their list of priorities, when selecting a procurement route. A detailed review of client participation in construction projects (Davenport & Smith 1995) puts forward the proposal that greater levels of participation of clients within the procurement and project management processes, will achieve corresponding

higher levels of satisfaction with construction investment. An international survey which establishes the performance criteria required by the client and measures how far they are being met, set against existing levels of client participation, would form a basis for examination of the relationship between client participation and client satisfaction with performance.

7 Conclusions

The functional approach to the modelling of procurement systems which defines roles and responsibilities in generic terms, will promote and facilitate international understanding of indigenous project management methodology. Increased international competition and globalisation of the construction industry sector makes it of critical importance for clients to compare systems and select the most appropriate procurement routes for each individual situation. This is a route to harmonisation and collaboration which obviates the need for overturning or altering the legal, cultural, social and economic frameworks already in place.

The achievement of higher levels of satisfaction with construction investment on an international scale, will be facilitated by the extension of the PSM in the appraisal and evaluation of client performance criteria and the interrelationship with client levels of participation in the construction process.

Developing construction industries will be able to utilise the PSM assessing their individual range of client objectives and existing construction management resources in order to select the most appropriate procurement and project management systems.

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THE ROYAL
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STRATEGIES FOR PROCUREMENT; DEVELOPMENT OF CHOICE AND IMPLEMENTATION METHODOLOGY

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Abstract

This paper addresses the need for building procurement strategy to match client type, project characteristics and procurement system. The proposed methodology to achieve this match is also discussed.

The paper is prepared in parallel with the development of a procurement guide for the RICS and explores the issues researched in the preparation of the guide including the client's role, the role of the principle advisor and the development of an appropriate implementation strategy.

In addition the paper considers the selection process developed for the Procurement Guide in the context of previous work developed in this field (ELSIE, NEDO et al). The developed system emphasises judgement rather than any mathematical approach to process subsequent to the results of research undertaken by Kirby (1994) in this discipline.

Implementation is considered in the context of the attitude of the client towards risk and the current availability of systems which distribute or allocate risk in procurement.

Key Words: Procurement, Implementation, Risk, Risk Allocation.

1. Introduction

The different needs and satisfaction criteria associated with varying types of construction client have been addressed by a number of authors (Nahapiet and Nahapiet (1985), Turner (1990), Masterman and Gameson (1994)). It is probable that the distribution of client types is a reflection of the political and economic climate in any country at any point in time. It is therefore likely that client satisfaction criteria will vary both with client category and as a consequence of the changing market which has influenced the need to build.

In order to maximise client satisfaction the response of the construction industry must be timely, efficient, relevant and in most cases a bespoke organisational response. Masterman and Gameson (1994) have identified this issue, which had previously been addressed by NEDO (1985).

Systems were developed to attempt to offer methods of matching client needs with appropriate bespoke procurement strategies. In some cases these included expert systems and in others they were based upon algorithmic processes (Brandon et al 1988, Morledge 1987).

The research conducted by Kirby (1994) examined the reliability of such systems and concluded that although they were useful they regularly under-performed against professional judgement.

Against this background, the review of UK procurement systems by Latham (1994) identified the need for a 'Code of Procedure' to be developed to enable clients and their advisors to explore needs and processes and to select an appropriate strategy. At this time the Royal Institution of Chartered Surveyors were already committed to the development of such a document and had created a working party for this purpose under the chairmanship of Geoff Quaife. The working party identified policy and parameters, and nominated the authors (of this paper) to prepare a draft document. In progressing this development work the authors had the benefit of the published works previously identified (amongst others) and were also able to review the published work of the Central Unit on Procurement (H M Treasury 1992) which was particularly constructive and helpful.

The authors were, however, conscious of the limited amount of evidence of the application of the principles included in the published works available to them and sought to develop the document in parallel with appropriate case studies. The work of Kirby (1994) proved to be helpful in this context but was insufficiently comprehensive.

2. Case Study Approach to Development of Methodology

Approaches were made to major clients and fortuitously a timely request from such a client to carry out research into their own procurement strategies facilitated a case study approach. Consequently, a research methodology was developed which related to this client, however it is considered to be sufficiently robust to be applicable to client types over a broad spectrum.

The client in this case would fall predominantly into the 'primary' category (Nahapiet & Nahapiet 1985) and could be described as experienced within that category (Masterman 1992). By description, the client could be characterised as a major developer client who retained much of their development work as investment, thereby displaying many characteristics of clients categorised as investors or owner occupiers (Turner 1990).
This client thus displayed a range of characteristics which were sufficiently wide-ranging to be particularly helpful to the research process.

The approach to researching the needs and client satisfaction criteria for the case study client involved the following processes;

- Interviews with key personnel to establish company characteristics, organisational structure, the nature of current projects and the client's attitude towards risk.
- Examination of company literature and standard contract documentation to enhance information provided by key personnel and to identify any anomalies.
- Case studies of a number of projects completed or in progress.

The information obtained was analysed and synthesised to confirm company characteristics and usual project.

The company displayed the characteristics of;

> *an experienced research based and risk evaluative client concentrating on retail developments for investment.*

Given the extant market conditions, the client was able to amend standard contracts in such a way that risk was significantly shifted to the appointed contractors.

The nature of the projects carried out were mostly city centre, multi use, retail projects. The client established time certainty as the highest priority and economy as the lowest priority. In this sense, the company frequently, but not always mathematically modelled the trade off between time and economy (cost) in the context of risk.

An overall impression of the company as a client was established and entitled 'company typology'. For this client the typology was as follows;

> *The company is risk adverse in fact but does not acknowledge this. (An anomaly existed between published literature and interviews). Time certainty is established as of highest priority whilst economy is stated to be of lowest priority. (These two factors are compatible as certainty of time inevitably carries a price). The company's stated overall aim is profit from development and the early completion of projects is often, but not always, evaluated against potential for higher risk.*

Paradoxically, the company's relatively risk adverse nature has restricted the potential realisation of enhanced profits and has resulted in the development of procurement strategies which are relatively low risk in nature but do not deliver relative speed. Fast track solutions are seen as compromising cost certainty.

Having established a company typology a detailed review was carried out of a range of procurement strategies which may be appropriate for this client and for each of the projects for which case studies had been established. In this context procurement strategies considered likely to meet the criteria included those identified by Masterman (1992 p4);

- separate and co-operative procurement systems
- integrated procurement systems
- management orientated procurement systems.

Having established company typology and the range of existing procurement systems which may be suitable to meet the requirements of the client generally, an analysis of the specific case study information was recorded to provide the range of data identified above as appropriate in the development of an appropriate bespoke procurement strategy.

At this point and given the conclusion of Kirby's (1994) work, the authors acknowledged the potential for subjectivity in the process of selection and the potential for influence in this selectivity resulting from close relationships with the company.

3. Objective Application of Data

It was therefore decided, notwithstanding the conclusions from Kirby (1994) to use the established systems to attempt to develop appropriate procurement strategies. The collected data was input into the following systems by an independent consultant (thus further attempting to avoid subjectivity);

1 System developed by Skitmore and Marsden (1988)
2 System developed by Surinder Singh (1990)
3 System developed by Bennett and Grice (1990)
4 System included in 'Thinking about Building' (1985)
5 the ELSIE Expert System. (Brandon et al (1988)

The outcome of this process was that there was no consistency of results from applying the data to each of the systems. Figure 1 illustrates the outcomes across 4 case study projects. Consequently, an alternative approach had to be developed.

System	Project 1	Project 2	Project 3	Project 4
Skitmore & Marsden (1988)	Negotiated D & B	Competitive D & B	Competitive D & B	Competitive D & B
Surinder Singh (1990)	Negotiated D & B	Negotiated D & B	Negotiated D & B	Negotiated D & B
Bennet & Grice (1990)	Competitive D & B	Direct D & B	Design & Manage (Contractor)	Design & Manage (Contractor)
Thinking About Building (1985)	(1) D & B Develop & Construct (2) Management Contracting (3) Design & Manage (Contractor Project Manager)	Management Contracting	(1) Management Contracting (2) Design & Manage (Contractor Project Manager)	Management Contracting
ELSIE (Brandon et al 1988)	Accelerated Traditional	Accelerated Traditional	Traditional	Accelerated Traditional

Figure 1: Procurement Recommendations using Selection Systems.

The alternative approach developed and subsequently imported into "The Procurement Guide" stemmed from the algorithm developed by Morledge (1987) and tested by Kirby (1994).

This process depended upon the collection of particular information about the client and projects and was designed to inform judgement rather than to be prescriptive or to replace judgement. (Judgement having being found by Kirby (1994) as significantly more reliable than established systems).

The process was designed to evaluate the data and to propose either design-led or production (constructor)-led strategies given client priority and ability to manage and/or distribute risk.

In applying the process in the context of the company and its projects, different solutions resulted to those actually selected. The strategies actually selected had proved to be insufficiently robust where client demands were inconsistent with procurement characteristics. This was highlighted by the 'Process' and was particularly the case where low-risk traditional strategies had proven to be unable to retain their low-risk character (particularly in relation to cost and time) where the pace of the pre-construction process was either delayed or accelerated. The different solutions offered included management-led strategies which reduced pre-construction time and whilst at the same time increased risk did so in a known and largely predictable way rather than insidiously or by default. At the same time the client was advised to consider the time needed to develop the design and the time consequence of that design on the construction process.

Consequently, the authors were able to evaluate client characteristics and project typology, examine potential strategies and focus upon the most appropriate solutions whilst enabling the client and advisors to benefit from a heightened awareness of particular issues relevant to the client and the project which should affect strategy selection.

The 'Process' developed from this research has been tested by Kirby (1994) as indicated above, but has been adapted subsequently to be less prescriptive (choosing only design-led or production-led solutions). Further testing may be necessary but it is felt that the framework itself is sufficiently robust to be published in "The Procurement Guide" as an informant to judgement but not as a replacement for judgement.

The 'Process' has been imported below from "The Procurement Guide" and is offered as a primary outcome of this paper.

4. Process for the Selection of Most Appropriate Procurement Strategy

This process has been designed to establish a range of information about client needs and about the particular project being considered, and to develop this information in parallel with the characteristics of procurement strategies and associated risk.

It is intended to inform judgement not to replace judgement.

The relative importance of time, cost and performance (design) form key criteria in the selection mechanism as does inherent risk and apportionment.

5. Method

Sections 1, 2 and 3 should be carefully completed in consultation with the client.

The resultant information should then be transferred to Section 4 which will enable the information to be analysed and evaluated. The analysis can then be compared with the characteristics of each procurement method and the associated risk and an informed decision can then be made

Section 1 - Time

The following should be considered:

1.1 Is completion needed by a specific date?

1.2 Is completion needed in the shortest possible time?

1.3 Is the client prepared to pay more for earlier completion?

2. Does the answer to question 1.1 suggest a faster than 'normal' total project time in the judgement of the Adviser?

3. In months from the date of completion of this Protocol how long until desired the 'move in' date?

4. Define the reason for the identified completion or 'move in' date

- *4.1 end of lease*
- *4.2 sale of premises*
- *4.3 new business opportunities*
- *4.4 unsuitability of present premises*
- *4.5 company restructuring*
- *4.6 other*

5.1 Is the need for completion by a specific date or within a specific time more important than certainty of construction cost before work starts?

5.2 Is need the for completion by a specific date or within a specific time more important than spending an extended time on design?

6. What is the approximate £ value to the client of the building or facility in terms of contribution, rental or cost savings per month?

7 If the building is completed later than the specified or desired time will the client

- *7.1 stay in his existing premises?*
- *7.2 find temporary accommodation?*
- *7.3 close down?*
- *7.4 don't know?*

Upon the completion of this part the following information should have been established and should be transferred to section 4.

- *a) specified completion time*
- *b) reason for completion time*
- *c) whether required completion time is relatively fast*
- *d) whether time is seen as the predominant client need*
- *e) what is the potential financial implication of earlier or later completion*
- *f) what action the client may take if the dates aren't achieved*

Section 2 - Design/Performance

1. *has the client clear ideas about building functionality and its desired design?*
2. *does the site (if selected) pose any particular problems for the designer in respect of*
   - *shape or topography?*
   - *access?*
   - *storage space?*
3. *does the building type suggest relative design complexity?*
4. *does the building type suggest emphasis upon functionality?*
5. *does the building type suggest highly complex mechanical, electrical or engineering installations?*
6. *is it anticipated that extensive changes to design may be required during the construction phase?*
7. *does the client wish to particularly emphasise low running costs?*
8. *does the client wish to particularly emphasise low maintenance cost?*
9. *does the client wish to particularly emphasise product quality at a higher potential cost?*

Upon the completion of this part of the Protocol the following information should have been established and should be transferred to Section 4.

- *a) whether the client has clear ideas about his needs*
- *b) whether the site poses complex design problems*
- *c) whether the building design is complex*
- *d) whether functionality is particularly important*
- *e) whether the client has a long term view about the cost of the building*

Section 3 - Cost

1. *what is the client's maximum budget?*
2. *can the budget be allocated as below?*
   - *land purchase and fees*
   - *construction including fees*
   - *fittings and plant*
   - *contingencies*
   - *other (define)*
3. *will the client need to have a fixed contract prices for the construction element of his budget or will a reasonably accurate budget be adequate*
   - *fixed price?*
   - *budget price?*

Upon the completion of this part of the Protocol the following information should have been established and should be transferred to Section 4.

- *a) total maximum spending capacity*
- *b) total construction spending capacity*
- *c) need for pre-construction cost certainty*

Section 4 - Analysis

As an overview is the project feasible in terms of time and viable in terms of cost on the basis of the information in 1a, 2a, 2b, 2c, 3a, 3b, 3c.

*If **yes** proceed*
*If **no** advise client and see other solutions*

Is the reason identified for completion by the specified date vital to the project's success in terms of client needs or can slippage be coped with if cost is considered.

See 1b, 1d, 2a, 2b, 2c, 3c.

If vital the project has to be carefully planned from a reasonably advanced design. Design and construction must be planned. Where design is completed the completion date can be contractually fixed. Where design cannot be completed fast track systems can achieve relative speed by overlapping design and construction.

If relative speed is required can the client accept less cost certainty.

See 1c, 3c.

If yes this may mean that fast track approaches may be suitable.
If no a method of achieving cost certainty relatively quickly may be through negotiation

Does the information provided indicate that the project is complex in terms of design or in terms of site-related problems.

See 2b, 2c, 2d.

If so adequate time must be allowed for a design process to occur which will provide the client with an acceptable design solution.

Some fast track solutions will enable the design process to be extended into the contraction phase where pre-construction time is not available. This will reduce cost certainty.

Is the need to ensure that the project can be built within a budget a priority

See 3c.

In this event design must be complete before construction is commenced or a sufficiently large contingency must be allowed. The latter will not give cost certainty and may result in a less balanced project in financial terms.

6. Summary

Having established whether the project is both feasible and viable the importance of time, cost and design has now been reviewed.

There is always a tension between these three primary criteria and procurement systems selected should reflect a consideration of this tension.

Projects can probably be broadly categorised into those which will be design -led and those which will be production-led. Design-led projects usually reflect the characteristics of procurement systems where the client appoints his own design team; whereas product-led projects enable the constructor to take on some or all of the design function.

Design-led projects have the greater capacity for cost and time overrun whereas the potential capacity for design shortcomings may rest with product-led systems.

System selection must consider whether the project is design or - product-led but must also consider the client's need to manage and/or distribute risk.

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PROCUREMENT STRATEGIES AND NATIONAL ORGANISATIONS: THE DEPENDENCY LINKAGE

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Abstract

This paper addresses the relationship between the ability to procure buildings using identified procurement strategies and the existence of certain national organisations. The argument is developed that procurement strategies can only operate effectively if specific competencies exist indigenously, and that the existence of those competencies depends upon the existence within a country of certain types of organisations. In this context it is recognised that competencies may be imported in the absence of organisations but that the sustainability of the competence will only be achieved by technology transfer through the development of organisational frameworks.

This concept is addressed in the context of two countries, one of which is a major exporter of construction services and the other which is a major importer. Specifically, the United Kingdom and the Indian subcontinent have been selected for this purpose.

The paper concludes that procurement strategies are dependent upon competencies and that those competencies do depend upon organisations. If the organisations do not exist the operation of a procurement strategy can be effected through the importation of competencies, but unless technology transfer occurs and/or organisations are developed nationally the strategy is not sustainable.

This work forms part of a wider portfolio of research being conducted by the International Procurement Research Group (IPRG).

Key Words: Procurement, Strategies, Competencies, Organisations, India, Dependency.

PROCUREMENT STRATEGIES AND NATIONAL ORGANISATIONS: THE DEPENDENCY LINKAGE

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Introduction

Differences exist in the structure, participants and technology within the construction industries of the UK and India, but similar procurement systems have been identified.

The focus of this paper concentrates on the competencies and organisations which are required to be in place before such procurement systems may operate effectively. The research underpinning this paper indicates that in order for a particular system to operate effectively, specific competencies must exist. These competencies are contested to depend upon the development of organisations which are not system specific, and which facilitate, allow or encourage the competencies to exist.

Great attention is being focused upon the selection of appropriate procurement systems for construction projects (Skitmore & Marsden (1988) and Davenport (1994)). System selection has become of increasing importance as it becomes apparent to practitioners and clients of the industry that by selecting the most appropriate procurement system results in effective project delivery and client satisfaction in terms of the acceptable parameters of cost, time and quality (NEDO 1985).

CIB (1991) working commission W92 Procurement Systems, defines building procurement as:-

> **"...the framework within which construction is brought about, acquired or obtained."**

Functional Approach to Procurement

Sharif and Morledge (1994) have developed a method of modelling procurement systems by generic functions. This analysis has been developed by isolating all of the primary roles operations and activities in the construction process, and redefining them as generic functions thus making them readily comprehensible to construction professionals internationally irrespective of traditional roles or language barriers. The authors have isolated five generic functions of procurement as:-

1) Initiation/Promotion: (the role of the client, employer or developer)
2) Fund: (the process of securing finance for the project)
3) Design: (the translation of verbal requirements of the initiator promoter into drawings and specifications by an architect, engineer or designer).
4) Construct: Management (management of the construction process)
   Production (physical construction of the building).
5) Risk allocation amongst the above functions.

Such organisations will include corporate client groups, banks and funding agencies, licensing or registration councils, trade organisations, educational institutions, and representative bodies. By analysing the competencies the type of organisation needed may be established and a detailed examination can follow to establish the existence of such organisations. Table 1 indicates the types of organisations which are contended to be needed to enable generic and specific competencies to exist for a sample of procurement strategies. The sample selected are those which relate to the procurement strategies commonly adopted in the UK and the Indian subcontinent.

Function	National Organisations
Initiation/Promotion	Government, corporate, group, or individual promoters or promoting agencies.
Funding	Banks, government funding agencies, or other financial agencies able to obtain indigenous or imported finance.
Designing Concept	Licensed, approved or accepted individual designers or corporate design groups, including registering councils, boards and institutions. Recognised education and training institutions and qualifications.
Detailed Specialist	Licensed, approved or accepted individual designers or corporate design groups, including registering councils, boards and institutions.
	Specialist design institutions, trade organisations, educational/training institutions.
Construction Managment	Trade Associations, registering boards, training/educational institutions.
Production	Individuals, bodies or corporate groups possessing the skilled labour, and having the ability to obtain the appropriate materials and/or appropriate machinery. Training institutions, guilds, recognised skills/ national qualifications.
Risk Management	Recognised forms of contract, Standard forms of Contract, verbal agreements, Insurance systems.

Table 1: Generic National Organisations

The organisations which are required to be in place to facilitate or allow these identified system specific competencies to exist have been subsequently established. This process has been conducted by reviewing each system specific competency and examining what organisations must be in existence or imported in order for that competency to exist.

It is anticipated that the functional approach to the modelling of procurement systems could promote and facilitate the international understanding of procurement systems. Increased international competition coupled with globalisation of the construction industry makes it critically important for clients and practitioners to compare systems and select the most appropriate procurement route for each individual situation.

Procurement Competencies

Sharif and Morledge (1994*) have suggested that there are minimum competencies which are necessary in order for any particular procurement system to operate. The authors propose that the existence of these minimum specific competencies relies upon certain organisations being in place indigenously (Fig 2). The specific competencies which are associated with a procurement system are suggested therefore to depend upon various organisations, which facilitate, allow or encourage the competencies to mature. It is argued that without such competencies, and their associated organisations, a particular procurement system will not operate effectively or will only operate at an ineffective level.

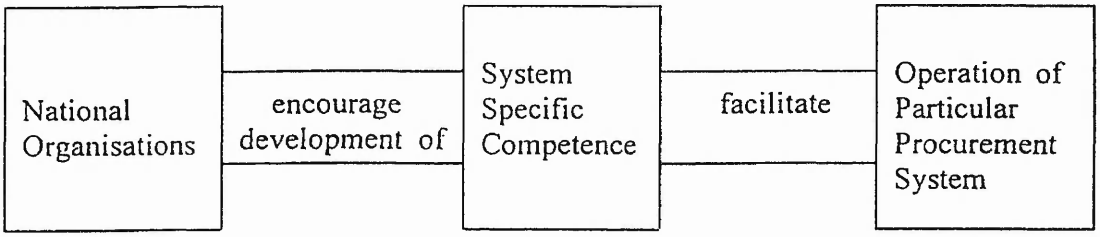

Fig 2; The Dependency Linkage

Each of the functions has been examined to establish what competencies are necessary. It is contended that there are minimum competencies which are required to operate any procurement system. These minimum competencies have been established by reviewing literature relating to the building procurement process in the countries in this investigation and in a range of other countries which are the subject of the broader research of which this is a part. This investigation forms part of the framework of international procurement research within the International Procurement Research Group (IPRG).

A further set of system specific competencies have been established which are required in order to operate a particular identified procurement system. These specific competencies have been confirmed by analysing literature and through informed opinion.

National Organisations

If procurement strategies can be analysed by function and if functions are dependent upon competencies then it is contended that organisations must exist indigenously to sustain the competencies required for any procurement strategy.

In terms of the major exporters of construction services (such as the UK), the existence and maturity of organisations is often a consequence of the level of the country's industrial, economic and/or cultural development which itself may depend upon political or socio-economic stability. When compared with the organisational structures of major importers of construction services (such as India), it should be recognised that such countries will contain various support structures which have been influenced by the nations industrial, cultural, socio-economical development.

The analysis of procurement systems by this approach has enabled the following conclusions to be drawn;

a) Generic functions are common across procurement systems
b) Competencies are considered to be system specific
c) The development of Organisations is a consequence of external factors, and therefore not system specific.

UK Procurement systems

The UK construction industry exhibits a range of procurement systems which may be used in the process of obtaining a building. The evolution and existence of such options has been the area of discussion for many authors. The works of Turner (1990), HMSO (1992), Masterman (1992) and Huru (1992) comprehensively outline the dominant UK procurement methods and their development within the UK context.

Masterman (1992 p4), from an adaption of the work of Perry (1985), illustrates the dominant array of procurement systems which exist in the UK, and provides a systems approach to their analysis (fig 1).

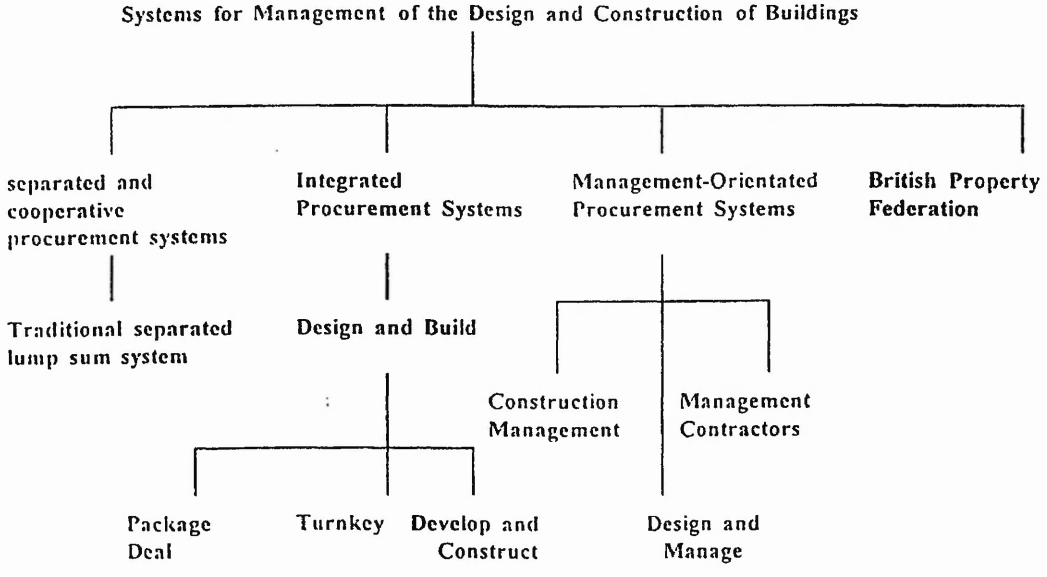

Fig 1; Systems for management of the design and construction of buildings.

Each dominant procurement system has been functionally modelled to establish the relationship which exists between the participants in terms of operational features, risk distribution and contractual characteristics.

Development of Procurement Systems and Organisations

It is evident that in the UK various procurement systems exist and have evolved as the indigenous construction industry has developed and matured. Hillebrandt (1984) and Turner (1990) discuss how the UK industry as result of its organisational structures and consultants developed various dominant forms of procurement. Turner (1990 p27) points to the industrial revolution in the UK as a major catalyst which led to the rapid development of the industry and its associated professionals. As a result of such industrialisation, a variety of dominant procurement systems began to emerge in the UK.

When this pattern of evolution is contrasted with that of the pattern in less technologically sophisticated industries such as India, there are stark differences.

Indian Procurement Systems

India is a nation with a rich heritage of majestic buildings. She is a country of great size, vast population, diverse climatic and geographical conditions, and her built environment reflects her history of various cataclysms, including numerous invasions, famines and religious and political upheaval. Chandara (1990 p212) provides a scenario of the traditional Indian excellence in construction and Hussain (1988 p3) further discusses the ancient achievements of Indian builders and craftsman.

The Indian building industry for many years however has been plagued with huge cost overrun, large construction cycles and poor quality buildings. The Government of India (1985) and Chandara (1990 p215) confirm that these symptoms are endemic of the construction industries in many developing countries.

Mohan and Sofat (1987 p89) have observed that projects in India are seldom completed within the estimated project time and costs. The authors make reference to the earlier work of Singh & Sofat (1977 p331-316) which analysed the degree of time and cost overruns on projects with different procurement routes. Singh & Sofat (1977) and Mohan & Sofat (1987 p83) recognised that for the successful completion of building projects in India, the correct contracting philosophy, appropriate contract documentation and suitable tendering procedures are a prerequisite. The authors confirmed that the dominant building procurement systems in India include

a)	Lump Sum contracts	(Separate and cooperative
b)	Measurement contracts	procurement systems)
c)	Design and Build/ Turnkey	(Integrated procurement system)
d)	Piece work contracts	(primitive management orientated system)

Increased attention has been given to the evaluation of such time and cost overruns on construction projects. Kohli (1986) suggests that the cause of such project cost and time increases may be categorised as being due to;

i) inadequate project information
ii) insufficient project planning
iii) deficient management and coordination or projects.

The research by Sharif (1995) has enabled the dominant procurement systems to be modelled, using the functional approach, confirming that certain procurement systems exist in both India and the UK. This research was conducted by an initial questionnaire survey to establish the dominant procurement systems that exist in India. A series of structured interviews were also conducted in each country to establish the competencies required in order to operate each system, and the form of organisations which exist indigenously. The questionnaire survey and interviews were administered to a range of academics and practitioners including clients, designers, financiers, and constructors who have experience of the Indian construction industry.

During this investigation it was recognised that although management orientated procurement systems (such as construction management and management contracting) are only beginning to be used in India, there is growing interest in implementation of such systems. Where such procurement systems are being used in India, either the indigenous consultants and companies with limited experience are sought after, or the skills and experience is imported. The interviews conducted confirmed that although such 'management-oriented' procurement approaches are being to be implemented in India, there are organisational constraints which are affecting their usage.

It is contended that for the effective operation of management-orientated procurement approaches, consideration must first be given to the existence of organisations, which promote, encourage or develop the specific competencies required for the particular procurement system to operate (see Table 1). If the competencies do not exist indigenously they may be imported. The national development of organisations is however, required on a long term basis if the procurement systems are to be sustained.

The results of the interviews confirmed that major organisational constraints in India include;

1) Lack of financial agencies willing to loan finance to the construction industry
2) Inappropriate contract documentation
3) Insufficient 'management' expertise in the industry.

Each is discussed below.

1) Lack of willing Financial Agencies

Nagabushana Rau (1982) and the Asian Productivity Organisation (APO) (1983) identified that a major reason for the continual construction problems in India is because the construction sector is not recognised or organised as an "industry". The APO (1983) further identified the common constraints facing the construction industries of its member countries and revealed that because the construction is not considered to be an "industry" in that same way as manufacturing, obtaining finance for construction activity is often difficult. The study confirmed that in many of its member countries, including India, banks an other financial institutions are reluctant to fund construction projects, as its considered to be a "risky" business. The APO (1983 p82) argue that due to limited financial agencies and difficulty in obtaining loans, projects are often abandoned during construction due to lack of funds.

In the survey by Vaid (1990 p55) on the Indian Governments 8th Five Year Plan, he concludes the views of the key practitioners of the construction industry, and suggests that a major obstacle within the industry is the limited access to finance and the high interest rates which are charged on construction loans. Vaid (1990) and Chandara (1990 p221) confirm that separate banks or more willing finance agencies must be developed in India, in order for the industry to develop further. Until the financial sector is modified to allow easier access to project finance, continual problems will be encountered. Raj (1994 p208) further addresses the difficulties associated with agencies willing to provide finance in the private sector.

The questionnaire surveys and interviews conducted indicated that there are limited agencies which are willing to provide construction finance. The major sources include Government sources, foreign loans, banks, raising capital through share offers, private money lenders and private savings. However, the main source of finance for private clients is thorough banks, and private money lenders who charge high interest on loans.

The interviews confirmed that as well as finance agencies considering construction to be "risky", most are even more reluctant to loan finance to projects based on management-orientated procurement systems as they are considered to carry greater risk.

2) Inappropriate Contract Documentation

The work of Turin (1973) highlights that forms of contract which are often used in the 'developing' nations are frequently adopted from 'developed' nations. Ofori (1980) explored this argument and stated that in the context of the 'developed' (industrialised) nations, the construction industry has matured at a gradual pace, growing with a nation's economy and being structured by the nation's organisational forms and sophistication. He contrasts this with the pattern of growth with that of 'developing' countries. With particular reference to nations with a legacy of colonial rule, he states that these countries witnessed the introduction and imposition of construction materials, techniques, and contractual systems which evolved in 'developed' colonising nations, and implemented into 'developing' countries.

The APO (1983 p16) recommended that there is urgent need for the revision and updating of contract documentation used in 'developing' nations, concluding that such documents should be made "fair and equitable".

Edmonds & Mills (1984) in their study of aspects of the construction industry in developing countries identified the particular generic characteristics of the industry and further argue that although there is no reason to suggest that the *pattern* of the construction industry in industrialised countries is suited to the developing nations, this *pattern* has been reproduced internationally.

The World Bank (1984 p52) confirmed that contract documents which were used in 'developing' countries were often based on practices generated and associated with industrialised nations. Mohan & Sofat (1987 p84) exemplify that within the Indian construction industry, the contract documentation often used is derived from contracts such as JCT, RIBA, and FIDIC contracts, which are modified to suite individual client needs.

Mohan & Sofat (1987), Bhartikar & Bhorkar (1992 p128) and Verma (1994 p129) further discuss how each public sector works department in India has developed its own unique form of contract (based on the above documents) to suite its own specific requirements. This situation has resulted in the existence of many forms of contract, all usually being one-sided, placing the onus of risk in the agreement firmly with the contractor. The distinct lack of clarity and contradictions in terminology incorporated into such documents has led to clients maintaining unrealistic powers, allowing them to make changes and modifications which culminates in cost and time overruns.

Nagabushana Rau (1990 p399) recognises the importance of appropriate contract documentation and the management skills and states,

> "....it is unfortunate that after 40 years of independence, we do not have a standard contract form to fit the requirements and aspirations of India. What we have today is still a colonially oriented document."

Chandara (1990 p222) further pursues this theme of the adoption of contract documents in India and suggests,

> "....modernisation is continual and ethno-centricity in planning and technological upgrading are a must. What is needed is adaption of technology, and not the adoption of technology evolved in the developed countries.....it could be adapted to suite our culture, social and economic conditions."

Again Nagabushana Rau (1995 p3), reflects on the immediate need for equitable contract documents in India, and discusses the draft standard form of contract proposed by National Institute of Construction Management and Research (NICMAR) and the Builders Association of India (BIA). It is suggested that this document has been prepared over several years, incorporating the requirements of both the client and the contractor, and is currently being reviewed by various public works departments, in the view to establishing this as the first nationally recognised standard form of building contract.

3) Management Expertise

The lack of adequate management expertise needed in the construction process has been the area of much discussion in India. In 1980, Nagabushana Rau identified that the necessity for project management in construction was unappreciated in India. He suggests that even a small improvement in the management of projects would lead to increased development and efficiency of the industry.

The APO (1983 p41-42) study indicated that due to the industry being made up of large number of small firms, the ease with which firms may enter the market, coupled with there being no formal means of regulation, has resulted with the manifestation of problems in the industry. It is suggested these structural characteristics has led to the grave and immediate need for technical and managerial training throughout India.

Moavenzadeh (1988 p72) in his examination of the exporting capabilities of the Indian construction sector concluded that there are excellent contractors operating throughout India in terms of their technical skills, and cheap labour. He identifies their major weaknesses as management capabilities.

This lack of training and developed expertise in the management of the construction process has been recognised by the Government of India (1989 p1) and Chandara (1990 p215), who have analysed the proliferation of projects with time and cost overruns, and attribute them to a number of issues including "poor management".

Nagabushana Rau (1990 p393) comments on the industry's infestation with project delivery problems, and concludes that they are due to outmoded technology, and ineffective managerial and administrative systems.

The interviews conducted highlighted that a major limitation in the development of the Indian industry is the severe lack of management skills and competency. Such skills are being increasingly demanded by projects of a complex nature and the implementation of new procurement systems. The interviews confirmed that industry consists of excellently qualified technical staff, but is deficient of staff with a robust understanding of the management expertise required in construction. Adequate management training has not traditionally been incorporated into the formal training programmes for consultants, such as Architects, Engineers and Surveyors. An interviewee commented that,

> "....The value of good management has not been traditionally understood by our clients. In many ways they look upon a management consultant, who works as part of the clients team, purely as an additional fee. The perception is that this management function aught to be performed by the architect, engineer or contractor. However the reality is that these practitioners have limited formal training in such areas."

However, efforts are being made to address this shortage in management skills, with new education programmes being developed and run at various universities. Such courses pioneered by NICMAR, and other research institutes in India, will assist in establishing the organisations from which the respective competencies may develop. The research confirmed that attempts are being made to implement management orientated systems and are meeting with limited success. This is primarily due to the existence of few consultants who can offer the management services which are necessary for the implementation of such systems. The continued development of management competencies, appropriate forms of contract and more equitable fiance arrangements, is expected to result in increased implementation of management orientated systems and more effective performance.

Conclusions

When comparing the construction industries of two countries such as India and the UK, it must be recognised that these countries are dissimilar in the degree of evolution they have reached in their respective construction industries. Each country has different priorities of what modifications and advancements are required. However, the importance of procurement strategies, and appropriate system selection is increasingly being recognised in both countries.

Although the organisations which support the UK and Indian construction industries are vastly different, dominant procurement systems have been modelled in both countries and particular procurement systems are common.

This paper has established that the functions of procurement are common across the various systems irrespective of traditional roles or language barriers. The research further contends that associated with such functions are competencies, which may be system specific and are required in order to allow a particular procurement system to operate effectively. The existence of such competencies indigenously, relies upon the development and maturing of organisations. These organisations are a consequence of external factors and are not system specific. In addition to such system specific competencies there are a menu of generic competencies which must in place in order for any system to operate.

The aim of this research is not to be 'ethno-centric' by suggesting a model of organisations which have been developed in the UK to be recommended for use in India, but to objectively analyse particular procurement systems in terms of the specific competencies necessary for them to operate.

It is contended that the benefit of this analysis is to inform countries with less technologically sophisticated construction industries, what specific competencies and organisations need to exist before a particular procurement system may be used effectively.

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