AN ANALYSIS OF THE MALAYSIAN SURVEY DEPARTMENT'S CADASTRAL BACKLOG WITH PROPOSALS FOR ITS MINIMISATION

by

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BSc(Hons), Dip.(L.S), AMInstCES, MISM.

Thesis submitted to the Council for National Academic Awards, in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

This programme of work has been undertaken at the Department of Civil and Structural Engineering, Trent Polytechnic, Nottingham in collaboration with the Department of Survey and Mapping, Malaysia.

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ABSTRACT

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The progress of the Malaysian cadastral survey system is a slow and time consuming process. Smooth operation of the country's development projects were hampered or unable to be carried out systematically as a result of work being delayed at various stages. One of the consequences is the failure to have an up-to-date record of land alienation in the country. This led to the existence of an unacceptable cadastral survey backlog at the Survey Department and the Land Office. The three cadastral survey processes at the Survey Department are the field work, the checking and examination of surveys and the preparation of certified plans. The backlog of these three processes were examined and the several identified areas which formed the root to the backlog problem were then analysed. The first was the examination of the existing working procedures at the Survey Department and the associated processes involving the Land Office. The second was the examination of the legal basis upon which the execution of cadastral survey is based. The third involved the land surveying education and training of land surveyors in Malaysia which is of two parts; tertiary level and employment stage. The fourth was the management aspects at the Survey Department and the Land Office. The extent of the problem of each area was thoroughly examined, and proposals and recommendations were made in an attempt to minimise the existing cadastral survey backlog.

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DECLARATION

I declare that while registered as a candidate for the degree of Doctor of Philosophy, I was not a registered candidate or enrolled student for any academic or professional institution.

Related studies undertaken in connection with this programme of research in partial fulfilment of the requirements of the degree have included the following: Five months data and information gathering at the Survey Department, Land Office and various survey companies in Malaysia. Visits were also made to various survey companies in the United Kingdom. Surveying field courses were attended at Llanfairfechan and Ferryside in Wales. Lectures on current survey practices as well as seminars and conferences related to the research study were also attended.

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ABBREVIATIONS

CC	Chief Clerk
CP	Certified Plan
DO	District Officer
DS	District Surveyor
DSMM	Department of Survey and Mapping Malaysia
EDM	Electronic Distance Measurement
EDP	Electronic Data Processing System
FELCRA	Federal Land Consolidation and Rehabilitation Authority
FELDA	Federal Land Development Authority
FT	Final Title
ISM	Institution of Surveyors Malaysia
ITM	MARA Institute of Technology
LIS	Land Information System
MBO	Management by Objective
MBR	Management by Reaction
MCE	Malaysian Certificate of Education
NLC	National Land Code (Act 56 of 1965)
PSD	Public Services Department
PUO	Ungku Omar Polytechnic
PWD	Public Works Department
QT	Qualified Title
RS	Requisition for Survey
RSO	Rectified Skew Orthomorphic Projection
SO	Settlement Officer
SPM	Sijil Peperiksaan Malaysia
UTM	University of Technology Malaysia

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CHAPTER 1: DESCRIPTION OF THE RESEARCH STUDY

1.1. Introduction

Cadastral mapping in Malaysia was initially based on theodolite control traverses and the demarcation of individual holdings was carried out using plane-table surveys. By the early 1920's, legislation had been introduced in the various states throughout the country for the establishment of a system of fully registered title.

One implication of such a system was that the Government should be able to re-establish with certainty boundaries which may have become ill-defined or which may have come under dispute. It was realised that the form of plane-table survey in use since early 1910 did not provide a sufficiently rigid definition of boundaries. So, from 1920 onwards, no further plane-table surveys were carried out and all new work was undertaken by theodolite traverses along the fully-marked boundaries of holdings. Such traverses originated from and closed on to the higher order cadastral control stations which themselves are tied to the state triangulation. Thus, all property boundary points have reliable cartesian coordinates which are based on the state Cassini-Soldner projection system.

All bearings and coordinates in each state are referred to the adopted meridian and origin.[1]

Due to the weaknesses of the original surveys which were based on plane-table work, it was decided that land parcels had to be re-surveyed using theodolite traverses. The Cadastral Division of the Survey Department was entrusted with the task of carrying out such surveys and was faced with an enormous amount of work from the early part of the 1950's. There is no simple short-term solution to dealing with such a workload. All that can be done is to set about the methodical process of the re-surveying and the re-settlement of all land parcels. Due to the limited resources in terms of trained staff and instrumentation available at that time to ensure the smooth operation of the re-survey project, actual field work did not start until 1955.

Until now, although much effort had been undertaken by the State Survey Departments to reduce the amount of re-survey work at an acceptable rate, the problem of the huge workload remains unsolved. After the attainment of independence in 1957, the country has been experiencing a fast rate of development and this has added to the amount of the cadastral workload. The Torrens System of land registration, as introduced a short time before independence and practiced by the

British Colonial Administration, accomplished the limited objectives of revenue collection and the maintenance of law and order. However, the larger system of land administration in Malaysia, within which the Torrens System operates, should be re-organised on a rational basis before the system as a whole can operate effectively. Unfortunately, the system of land administration and other surveying procedures has continued to operate along traditional lines, with no significant improvement as far as facilities, resources and productivity are concerned.[2,3]

It has been established that surveying and mapping in general always represents the first phase of any development project. A number of administrative and financial procedures are then modified and adopted as a result of findings made by the specialists. Recommendations were made to the Cabinet Committee to formulate measures to accelerate the implementation of programmes and projects throughout the country.[4] Today, such initiatives are, to a large extent, being hampered by the slow progress of survey operation and other associated administrative tasks.

1.2. Objectives of the Research Study

Present investigations into the Malaysian cadastral survey system indicate that there is an urgent need to improve and update the techniques and organisation thereof so that the cadastral survey backlog at the Survey Department (at the Federal level) and the Land Office (at the State level) can be reduced. Smooth operation of the country's development projects are hampered or unable to be carried out systematically as a result of work being delayed at various stages, one of which is the failure to have an up-to-date record of land alienation. With the adoption of the Torrens System of registration of title to land, the importance of having a Final Title to land is emphasized in Section 78 of the National Land Code (NLC) (Act 56 of 1965).[5] Under this section, land is still considered as state land until a title is registered, notwithstanding that its alienation has been approved. It also emphasizes the importance of the cadastral survey whereby a piece of land cannot be exactly identified until it has been surveyed in accordance with the provisions as set out in the NLC.[6]

The principal objectives of this research study are to identify and examine the vast amount of cadastral survey backlog existing at the Survey Department and the Land Office, and to develop some realistic package of administrative and technical reforms in order to reduce such a problem to an acceptable level. The cadastral survey backlog is of two types; the visible backlog and the invisible backlog. The visible survey backlog consists of the new cadastral survey projects laid down in a prioritised queue, often stretching for several years, and seems to be only the tip of the backlog iceberg. The invisible survey backlog is the informal queue of hidden arrears of cadastral survey workload which have accumulated since the early 1950's but for which the extent is never realised by the general public (not even the majority of survey personnel and politicians).

In identifying the nature of the cadastral surveying problem in Malaysia, it has been considered necessary

a) to analyse the history of cadastral mapping and its evolution;
b) to examine the existing cadastral survey system at the Survey Department in terms of the cadastral procedures and the working systems, the deficiencies facing each section, the practical requirements, the manpower and the instrumentation involved, and the general administrative aspects;
c) to examine the present system of registration of title to land at the Land Office, the technical and administrative procedures adopted, and the deficiencies facing each section involved in the execution of cadastral surveying;
d) to examine the legal basis upon which the execution of cadastral survey is based;
e) to examine the land surveying education and the

course modules at tertiary level in Malaysia; and

f) to develop an ordered and efficient cadastral operation by means of some realistic package of administrative and technical reform.

This research study involves a thorough investigation of the backlog of the following six cadastral processes involving the Survey Department and the Land Office:-

a) cadastral (or title) survey;

b) the checking and examination of cadastral surveys (including the surveys carried out by licensed land surveyors);

c) the preparation of certified plan (CP);

d) arrears of land applications;

e) application of final document of title; and

f) arrears of application for requisition for surveys (RS).

The first three areas (a, b, and c) fall under the jurisdiction of the Survey Department whilst the other three (d, e, and f) involve the Land Office.

The annual backlog of title survey at the Survey Department during the years 1953 to 1965 showed an increase of about 16,500 lots per year. In 1953, the recorded backlog figure was 148,196 but in 1965, it increased to 346,118. Since 1965, although the general situation has shown a slight improvement, the rate of improvement was very slow and the Survey Department has not only failed to reduce the existing backlog but also failed to cope with the bulk of new survey work received every year. Field work carried out by the government, as well as licensed surveyors, also takes too long to be finalised than anticipated. About 40 per cent of the surveys have some form of query and re-surveys have to be carried out; this has doubled the costs of the surveys.

The backlog of checking and examination of survey work also posed a great problem. In 1983, the backlog figure was 58,235 but since then, the figures have shown a sharp increase on the one hand and poor overall progress on the other.

The backlog of the preparation of the certified plan (CP) which is the end product of the cadastral survey process at the Survey Department also posed a great problem. The annual backlog figure in 1975 was only 8,295 but in 1987, the figure rose sharply by almost five times to 43,295. The overall annual progress in 1975 to 1983 has shown some improvement but since then, the progress has shown a decreasing trend.

At the Land Office in Kota Bharu, the backlog of the preparation of the document of title also posed an alarming problem. In 1955, the backlog figure was 183,870 but in 1981, the figure increased by more than two fold to 444,262. Land application also takes too long to be finalised. As an example, a typical application for a piece of state land took 564 days to be approved and finalised. On another occasion, an application for a change in express condition from paddy to coffee took on average 300 days (or even 400 days in some districts) to be finalised.

Between all the Land Offices throughout the country, the backlog of requisition for surveys (RS) also posed an alarming problem. In general, the annual progress figure since 1955 was about 35,000. However, the backlog in 1955 was 89,797 and in 1981, the situation has increased by almost two fold to 162,669. This has shown that while the annual backlog is always increasing every year, the adopted working procedures since 1955 have continued to be traditional as explained by the fairly constant annual rate of progress.

1.3. Work Undertaken

Due to the nature of the research study which involved various government departments in the public sector and the survey companies in the private sector, a data collection programme was designed in such a way as to cover, as much as possible, various aspects which are inter-related to the execution of cadastral surveys in Malaysia. Data collection was carried out in two phases; the first phase took place in Peninsular (West) Malaysia and the second phase took place in the United Kingdom (Appendix 1A).

In Malaysia, the following have been carried out:-

a) data and information gathering, involving intensive searches into land surveying journals, working papers and annual reports of the Survey Department;
b) the study of the departmental machinery of the Survey Department, the cadastral survey processes involved, the identification and data gathering of the various areas of backlog and its extent, and discussions and interviews with various survey personnel;
c) discussions with senior lecturers and course leaders in land surveying at the two higher educational institutions that run courses in land surveying;
d) the study of the department machinery and working procedures at the Land Office and the Survey Department, and information gathering on the extent of backlog at state level; and
e) visits to survey companies in order to study the adopted working procedures and the role of the licensed surveyors.

Where visits could not be made, questionnaires were sent out to licensed surveyors (or the Branch Manager) in order to seek information on various aspects of cadastral surveying (Appendix 1B).

In the United Kingdom, the following have been carried out:-

a) information gathering involving intensive searches into professional land surveying journals and working papers;
b) visits to several survey companies in order to study the working methodology adopted, and the organisation of human and instrumentation resources;
c) attending field courses in order to study the application of automated instrumentation to land surveying; and
d) attending various seminars, conferences and short courses which are relevant to the modern survey practice.

CHAPTER 2: PAST AND PRESENT SURVEY AND MAPPING IN MALAYSIA

2.1. History of Survey and Mapping in Malaysia

The assessment of the existing performance of the cadastral mapping has to be related to a thorough understanding of the past history and its evolution brought about over the years. Such understanding must be related to the present achievement, all identified weaknesses, the necessary practical requirements, methodology, and the legal basis upon which the whole system is based so that such system can be put into practice to fit the local circumstances, both social and physical.

The historical development of cadastral surveying and mapping in Malaysia is best discussed in terms of the evolution brought about at the Department of Survey and Mapping, (excluding the States of Sabah and Sarawak in East Malaysia) from its early beginnings to the present situation. The existence of the department depended primarily on the requirements of the fiscal cadastre under the various land tenure systems and the present day system of registration of title which is based on the Australian Torrens System. Fiscal cadastre is an instrument for administering land tax policy. Although primarily a support for land value and property taxes, the data that it records can be used in the determination of other forms of tax, such as those imposed on personal wealth or income derived from real estate. The data also provides fiscal information on the expropriation of land for government purposes and for revenue transfer between different government departments.

During the colonial days, the country was divided into regional areas and cadastral surveying and mapping activities were concentrated under regional basis. As time went on, the need to break up such large regional areas into that of state administrative level was mounting due to various land tenure systems adopted by each state and the fiscal requirements. Today, under the Federal Constitution, land is a state matter whereas survey and mapping becomes the responsibility of the Federal Government. The early regional areas mentioned above are:-

a) The British Straits Settlements comprising Penang, Province Wellesley, Malacca and Singapore;
b) The Federated Malay States of Perak, Selangor, Negri Sembilan and Pahang; and
c) The Unfederated Malay States of Johor, Kedah, Perlis, Kelantan and Trengganu.

2.1.1. <u>The British Straits Settlements</u> (Penang, Province Wellesley, Malacca and Singapore)

The early history of Malaya is very obscure. In Penang and Province Wellesley, there was extremely little historical writing before the arrival of the Europeans in the sixteenth century. Only history after 1786 was traced for this marked the beginning of the British intervention in Malaya when Captain Francis Light took possession of the island of Penang. Before the occupation, Penang was virtually uninhabited with no settled laws.

In 1787, Captain Light granted land to the inhabitants of the island for settlement purposes. There was no clear record of the method Captain Light adopted for distributing the grants of land. It is believed that verbal permission for clearing and possession of land was given. It was only after 1837 that proof of written grants were issued. The land laws attached to the distribution of grants were naturally the English Law of Real Property and Conveyancing. The tenures granted were either in the form of verbal licenses or permission to clear land, cutting papers (i.e. certificates of permission to clear land), measurement papers with heritable and alienable rights which contained measurements being carried out by local land surveyors but no provision being made with regards to quit rent, official deeds and grants in fee simple, or long occupation of land without any regular permission.

In 1851, J. O. Moniot under the order of Colonel A. Anson, the Lieutenant-Governor of Penang, started using plane table and chain. This form of survey was found to be very unreliable due to its low technical value and land administration continued in a state of confusion. The first effort of re-survey was initiated by F.W. Kelby in 1890 to 1894. His methods survived until 1920 when the Penang Survey Department was integrated with the Federated Malay States Survey Departments.

The first attempt of triangulation was made in Penang in 1832 by Lieutenant Peter Woore of the Royal Navy and the earliest determination of geographical position was at Port Cornwallis in Penang by Captain Home Popham in 1861. This was followed by a primary and secondary triangulation in 1885 and completed in 1887.

Malacca, unlike Penang, was inhabited and had a recognised land system. The earliest form of tenure recognised by the Government at that time was the ancient Malay Customary Law. Problems existed when the Government passed the Regulation IX of 1830. Under this code, all grants and leases should be issued in accordance with English Law. Problems arose as a result of combining these two different systems of land tenure. There was confusion as to what land was held under the old and new Malay tenure. Thus Regulation IX of 1830 was a complete failure.

It was in 1860 that R. Quinton started re-survey work with his plane table covering most of the town and coastal areas and areca palms were planted to mark boundaries. After he left Malacca in 1867, the records remained obscure until 1884 when Major M. McCallum started the compilation of series of sheets at a scale of 16 chains to an inch. Under McCallum, boundary marks were emplaced and a trigonometrical survey was carried out in 1886 and completed in 1888. However, the Survey Department of Malacca was taken over by the Federated Malay States Survey Departments in May 1920 and its own standards and accuracy were adopted. All previous records were so chaotic and a complete resurvey was again carried out in 1923 and completed in 1936.

Singapore on the other hand now has its own Survey Department after separating from Malaysia in August 1965. Before that, whilst being part of Malaya, Singapore was also under the same administration under the charge of the Surveyor-General of Malaya.

2.1.2. <u>The Federated Malay States</u> (Perak, Selangor, Negri Sembilan and Pahang)

The states of Perak, Selangor, Negri Sembilan and Pahang formed themselves into a loose federation in

1895, known as the Federated Malay States, with a system of centralised government. These states had an administrative link with the British Straits Settlements of Penang, Province Wellesley, Malacca and Singapore through the High Commissioner (of the Federated Malay States) who was also the Governor of the Straits Settlements.[1]

In Perak, the earliest survey work dates back to the 1880's. These were carried out by local land surveyors using plane table, prismatic compass and theodolite. In 1889, after the Survey Department of Perak became a separate entity, the first batch of qualified land surveyors were recruited from Europe and Asia, together with a few local draughtsmen. However, in 1899 the Government took over the management and contract work was then discontinued in 1907.

In Selangor, the first Land Surveyor to be employed was D.D. Daly in 1875. Later, in 1889, four Australian Licensed Land Surveyors namely A.J. Welford, P.A. Raymond, J.W. Irby and G.M. Stafford were recruited by the State Government. With the establishment of the State Survey Department in 1891, survey work was carried out under the control of the Chief Surveyor of the State. Negri Sembilan and Pahang had its own Survey Department in 1897 and 1889 respectively. Each state established a small nucleus of staff and limited survey work was carried out on early land enactments.

2.1.3. The Unfederated Malay States (Johor, Kedah, Perlis, Kelantan and Trengganu)

The five states of Johor, Kedah, Perlis, Kelantan and Trengganu formed themselves in 1896, known as the Unfederated Malay States and had an administrative link with the states of the British Straits Settlements. In 1910, independent survey departments were established in Johor, Kedah, Perlis and Kelantan with officers seconded from the Survey Departments of the Federated Malay States. In Trengganu, another independent survey was established in 1926. Today, the states of Kedah and Perlis fall under one administrative rule under the overall charge of the State Director of Survey for Kedah/Perlis.

2.2. The Malay Customary Land Tenure

Long before the British occupation of Penang and Malacca, the Malay States had already an indigenous form of land tenure, governed by Malay Customary Law (Regulation IX, 1830). Under this law, no restrictions were placed upon the inhabitants to select forest lands and followed by a continuous occupation without any regular permission being made. Later, with the arrival of the British, grants and leases were issued in accordance with the English Law of Real Property and Conveyancing. Such combination of two sets of laws brought about confusion and Regulation IX failed to serve its purpose.

Sir W. E. Maxwell, Commissioner of Land Titles then introduced a monarchial government in collaboration with Hindu rulers from India. The right of disposal of derelict land was defined as the rights of the *Raja* or chief. The share of the produce that could be claimed was fixed by custom at one-tenth. The right of the *rakyat* or peasantry was absolute so long as he continued to pay the tithe and continue to work on his land. Today, this doctrine of ultimate rights is still in force in most Malay States throughout the country.

2.3. <u>The Trigonometrical Survey Department</u>

The 1880's marked an important phase in Malaysia with the start of trigonometrical survey work carried out in various parts of the country. The first triangulation was carried out in Penang in 1832 and later in 1885 to 1887, and in Malacca from 1886 to 1888. In Perak, the first baseline was established at Larut in 1887 and astronomical determinations for latitude and azimuth were carried out.

The trigonometrical surveys carried out in Perak, Penang and Malacca laid the foundations for the existing control framework. The surveys were then carried out in Selangor and Negri Sembilan in 1899 to 1901. In 1902, the Trigonometrical Survey of Perak was renamed the Trigonometrical Survey of the Federated Malay States and trigonometrical survey was carried out in Penang in the north in 1909, to Singapore in the south in 1911 and then to Perlis in the north in 1912.

In 1913 triangulation survey work was re-started because it was found that the quality of the early work was so varied. The principle triangles of the general triangulation network were re-observed with the object of bringing the work up to reasonable standards. In 1916, the primary or Repsold Triangulation together with a secondary network covering the states of Kelantan and Penang was completed. The triangulation for Trengganu was completed in 1924. Precise levelling started in 1912 based on the tide gauge determination of mean sea level at Port Swettenham (now known as Port Klang), but interrupted by the war. The work continued intermittently and was finally completed 25 years later in 1967 covering the whole of Peninsular Malaysia.

2.4. The Federal Survey Department (Survey Headquarters)

The setting up of a Federal Survey Department started in 1909 under Colonel H.M. Jackson who was appointed the first Surveyor-General of Malaya. His first task was to create a federal organisation out of the four Survey Departments of the Federated Malay States of Perak, Selangor, Negri Sembilan and Pahang.

The British Straits Settlements Survey Departments of Penang, Malacca and Singapore which were formerly under the direction of the Governor of the Straits Settlements, later joined the Federal Survey Department in 1920. After the formation of the Federal Survey Department, several branches (or sections) of various disciplines were created. They were the Topographical Survey Branch and Map Production, and Instrument Repair Branches in 1910, the Meteorological Branch, the Survey Training School, and the Trigonometrical Survey Branch in 1928. The Topographical Survey Branch was set up because there was a need to improve the map sheets covering the country at that time. The initial task was entirely concentrated on plane table survey work. The Map Production and Instrument Repair Branches were amalgamated in 1910 and the first photo-lithographic apparatus and other machinery were installed in 1911. Among the first maps to be produced were the coloured editions of Selangor and Kinta (in Perak) where the tin mining industry was variously concentrated.

The first Surveying Training School was instituted in 1928 at Port Dickson. This was later moved to Kuala Lumpur in the same year to be called the Technical School where apprentices from both the Survey Department and the Public Works Department were trained. After the war, the school then became the Technical College and was later moved to its permanent premises at Gurney Road in Kuala Lumpur. Today, it is the University of Technology Malaysia (UTM) which is one of two institutions that offer diploma, degree and masters courses in land surveying. In 1985 the Faculty for Surveying moved to its new campus at Skudai in Johor.

2.5. Introduction of Torrens System of Land Registration of Title to Land

The Torrens System is a system of registration of title to land which is based on that of Fiji, which is in its turn, was a local adoption of the then incompletely developed Australian system. The Torrens System, named after Sir Robert Torrens who first successfully introduced it in South Australia in 1858, was essentially a statutory system of registration designed to simplify and facilitate the transfer of land.

Maxwell was sent to Australia in 1882 to study the suitability of the Torrens Act which was passed by the South Australian Legislature on June 27, 1858. Unfortunately, the former Straits Settlements of Penang and Malacca did not accept the recommendation of the Torrens System but continued to practice the English Law of Real Property and Conveyancing until 1963 when a system of Registration of Title under the Land Code (Penang and Malacca) Act was introduced. There were not many differences between the two systems of laws; the

English system and the Customary tenure. The former was a system of registration of title similar to the Torrens System, and the latter was no more than the recording of occupation in a registry of customary land. Development of the land tenure system was unsettled until a system based completely on Torrens was finally adopted in 1965. The Torrens System guarantees maximum security of titles and boundaries and ensures maximum formality in establishing and transferring rightful ownership. The system will not operate successfully unless it is based and maintained on a survey, sufficiently accurate to permit re-identification of property boundaries. Arising from these needs, Maxwell initiated the various tasks and formed survey departments throughout the country.

The system was soon adopted and superimposed on the various native systems in the states of Peninsular Malaysia. Since 1965, the land administrative system has been in the process of converting to the Torrens System, the principles of which are the basis of the Malaysian National Land Code (NLC) (Act 56 of 1965). Under this system, the State Government gives maximum security of tenure and guarantees the indefeasibility of land ownership after alienation. Land Grants and Leases are issued and registered either in a District or a State Registry Office. The Registry concerned will then continue to register all subsequent dealings of every land holding. Under the Malaysian Torrens System of Registration of Title to land, land must be surveyed and the boundary marks emplaced on it before a Final Title can be registered and issued to the land owner. These provisions were laid down in section 396(1) of the NLC.[2]

2.6. The Present Cadastral System

The two essential elements of the Malaysian Torrens system of land administration are the cadastral survey on one hand and the registration of title on the other. These two elements support one another and together they form the basic foundation block on which land registration stands. The land survey element falls under the jurisdiction of the Federal Government and is carried out by the State Survey Departments throughout the country. The registration of title is a function of the State Government and is carried out by the Land Offices in the respective states. It is clear that any weakness occurring in one element will directly affect the other, and consequently, the efficiency of the overall land administration will be impaired. It must be understood that the federal land administration operates within the framework of the state and the national administrative systems with a great deal of inter-relationship and inter-dependency. The location of the State Survey Departments and District Offices is shown in Appendix 2A.

The framework of land administration together with the cadastral survey system adopted in the country is best seen in the following sections where both elements mentioned above are concentrated (i.e. the Survey Department and the Land Office).

2.6.1. Land Office

Land administration at the state falls under the overall jurisdiction of the State Authority and is based on a formal organisation under the State Director of Lands and Mines (formerly known as the State Commissioner of Lands and Mines) which is an extension of the State Secretariat. At the district level, this comprises the District Land Office which is an extension of the State District and Land Office under the charge of the District Officer who in turn is directly responsible to the State Secretariat. An example of the organisational chart of the Land and District Office of Kota Bharu in the state of Kelantan is presented in Appendix 2B.

It is the responsibility of the State Director of Lands and Mines to implement an effective and efficient land administration in each state with the necessary formal organisation and authority to exercise effective leadership in the administrative areas concerned. The State Director is mainly a coordinator and acts largely as a transmitting agent in respect of all land matters between the State Authority and the various districts in the state concerned. At the district level, the District Land Office is under the charge of the District Land Administrator (formerly known as the District Collector of Land Revenue) who is accountable to the State Director of Lands and Mines, the State Financial Officer, the State Secretary as well as the state political leadership. It is clear from the organisational chart (Appendix 2B) that the District Land Administrator is in fact the District Officer (DO) who is responsible for all administrative as well as technical matters at district level. Findings have revealed that no single District Officer in the country has any form of qualification in land surveying; the majority of them are either graduates in arts and social sciences (such as economics, history, public administration, etc.) with only a few graduated in geography who may have learnt some basic surveying in the course of their tertiary education. This has led to a situation whereby DO's and other personnel at the Land Office do not understand fully the technical problems and requirements of the Survey Department and *inter alia*, the survey personnel at the Survey Department do not understand the administrative problems and requirements of the Land Office.

Directly related to the research work is the workflow the two main areas of which relate directly to the execution of cadastral surveying in the country.

The first is the Requisition for Survey (RS) which deals with the application for requisition for cadastral (title) survey made by the general public and to be carried out by the Survey Department. The second is the preparation of document of title to be issued to the respective proprietors, for registration purposes after the survey has been carried out and approved by the State Director of Survey. What happens in between Requisition for Survey and Registration forms the responsibility of the Cadastral Division of the Survey Department. The stages of cadastral survey process involving the Land Office and the Survey Department is explained in section 2.10.

2.6.2. The Present System and Procedure of Workflow at the Land Office

The system of land administration usually involves the use of forms for work simplification, particularly in preparing routine reports and correspondence purposes. Nowadays, all the old forms have been revised to accommodate new additional administrative changes and requirements. In the past, a number of old forms in use were found to be inefficient with insufficient emphasis being made on some minor but useful piece of information. In many instances, these instruments are not only lacking in clarity, but they are often inadequately furnished with the required particulars and omissions are sometimes overlooked by senior personnel. As a result of these deficiencies, many Land Offices have been compelled, either to write to the applicant, or to send a member of staff to acquire the required additional information. In this process, a great deal of expenditure and time have been wasted.

Work flow process at the Land Office is generally based on the Serial System (or specialisation by task) whereby each member of staff has a specific task to perform according to pre-set methods (or steps) to be followed as listed in the *Manual of Office Procedure.* It is a *bible* which all personnel have to study when sitting for their departmental examinations, which on failure would jeopardize promotion. Such a manual could hardly be expected to inspire government personnel into acquiring any interest in the broader field of management; a field so vital for the development of management skill and capabilities upon which effective administration depends. Such a general situation has brought about the general belief among many senior personnel that management is a subject for businessmen only. Office management is often left to the equally non-management oriented Chief Clerk (CC). It can be said in fairness that such antiquated approach towards office management in Malaysia does exist, not only at the Land Office and the Survey Department, but also at some other departments. Much of the present system and procedures for dealing with in-coming and out-going mail and the flow of office files, for example, remain unmodified. This system which is based on the manual was initially introduced by the colonial administration and was aimed at preserving law and order and to have a systematic work flow.

As a result of delegating a specific task to a specific member of staff, productivity was often impaired when a particular staff takes sick leave or annual holiday with no staff replacement being made (even those with less workload). The existing procedure and method for dealing with an application for a Prospecting Permit is a good example to describe the Serial System of workflow. The application is received by the *District Land Administrator* (who is also the *District Officer*) who vets and initials it before passing it to the *Chief Clerk (CC)*. The *CC* will again vet the application, initial it and pass it on to the *Corresponding Clerk* who will open a file and carry out the necessary registration. The file is then passed to the *Mining Clerk* whose job is merely to note the file movement. Henceforth, the file must always go through the *Movement Clerk* before it goes on to any individual or division (or department). If the *Movement Clerk* is sick or on leave and nobody is free to cover for him, his table would be a great accumulation of files!

Another example is when an application for a piece of state land is being made which may require an investigation to be carried out by a *Settlement Officer*

A who happens to be on annual leave for a month. Such application will only be attended after he turns up a month later at the earliest, although there may be some other personnel sitting next to him (*Settlement Officer B*) whose duty involves the follow-up action but perhaps with less workload. In that particular month, *Settlement Officer B* may be doing less work until *Settlement Officer A* returns. That particular job could well take another month to be attended to because *Settlement Officer A* may have to cope with many other accumulated tasks sitting on his desk in his absence. At this juncture, it can be said that a fall in the productivity of each staff obviously affects the overall productivity. Such an attitude must certainly be eradicated in its totality, accepting that the workload is a joint responsibility.

The Land Office undoubtedly deals with enormous number of land titles with limited staff resources and the present administrative system is seen as inefficient and fails to cope with the needs of time. At the Land Office in Kota Bharu, for example, the Survey and Technical Section which is responsible for technical aspects of surveying is manned by one Senior Settlement Officer, eight Settlement Officers and only one Draughtsman. Settlement Officers do not have any formal qualification in land surveying except attending short courses during the training stage of employment. The Registration Section which is responsible for the recording and issuing of document of title is only manned by five Clerks and one Office Assistant (whose task is merely involved in moving files from one table to another). The approximate number of land titles dealt with by the States District and Land Offices throughout the country is presented in Table 2.1. (Appendix 2C).[3]

In Kelantan, for example, there are nine District Offices and ten Land Offices (including Land Offices at sub-districts) dealing with 546,340 titles [the third highest number of titles; the first being in Perak (612,970) and the second in Johor (594,000)]. Accordingly, the amount of workload facing the State Survey Department and the State District and Land Offices is reflected by the number of titles to be dealt with in each state. In 1988, the cadastral survey backlog figures in Perak, Johor and Kelantan were 19,899, 17,512 and 17,575 respectively (making a combined total of 31 per cent of the national backlog figure of 175,687). In 1986, the backlog figures in the three states were 16,069, 30,783 and 26,879 respectively; 41 per cent of the total national backlog figure of 182,039.

2.6.3. Survey Department

The Department of Survey and Mapping, under the overall charge of the Director General of Survey and

Mapping, consists of two main divisions; the Cadastral Division and the Mapping Division. The Cadastral Survey Division and the Mapping Division is under the charge of the Director of Cadastral Survey and Director of Mapping respectively. Under the Cadastral Survey Division, there are various other sections such as the Computer and Electronic Services, Training and Research, and Instrument Workshop. At state level, there is the State Survey Department under the charge of the State Director of Survey which in turn is responsible directly to the Director General of Survey and Mapping. The organisational charts of the Department of Survey and Mapping, and the Cadastral Division are presented in Appendices 2D and 2E respectively.

Cadastral (title) survey, on one hand, is carried out by the Cadastral Division of the Survey Department in each state (as shown in Appendix 2E) under the direction of the headquarters in Kuala Lumpur. The private survey companies on the other hand also carry out cadastral survey under the general supervision of the Survey Department. Initially, the survey companies were only authorised to carry out sub-division survey (after its first alienation was carried out by the Survey Department) as well as other minor jobs such as fragmentation of rubber estates and small housing estates. Then, from 1974 onwards, due to the pace of development taking place in the country, survey companies were allocated engineering survey works such as road surveys for the Public Works Department and other surveys involving land development schemes. Since then, the role of the survey companies in the national development has become increasing apparent.

The Survey Department and the survey companies together with the Land Office have a key role to play in the cadastral survey and the system of registration of title to land in the country. The stringent regulations imposed and the restricted categories of persons permitted to undertake cadastral surveying reflects the importance attached to the certified plan which is the end product of cadastral survey. The plan which forms part of the document of title should unambiguously identify a particular piece of land for the purposes of proprietorship and registration. Furthermore, the survey should be of such technical standards as required by the provisions governing the execution of survey, registration of title to land, and other associated transactions dealing in land. The Survey Department thus ensures that the certified plan produced complies with all the requirements of the provisions laid down in the National Land Code (Act 56 of 1965), the Licensed Land Surveyors Ordinance, 1959, and its own Survey Regulations. In carrying out proper and systematic cadastral surveys, two main objectives must be considered. They are:-

a) to prepare the most comprehensive information to be presented on the document of title; and

b) to compile and prepare all necessary records regarding the issuing of document of title.

2.7. Definition of Cadastral Surveying

Cadastre, a French word meaning a public register of the quantity, value and ownership of the immovable property in a country, compiled to serve as a basis for taxation.[4] Cadastral surveying (also called title surveying) is carried out in the country under the provision of Section 396 of the National Land Code (Act 56 of 1965) for the purpose of delineating a piece of land, whereby the boundaries are determined on the surface of the land by boundary marks. A Certified Plan (CP) is produced to show the situation of the land, the position of its boundaries as defined by the boundary marks and identified by some kind of survey reference. An example is PUKN 221-82/125B where PUKN 221-82 is the State Survey Department File (serial) number, 125 is the type of survey (125 is for land scheme surveys), and B is the class of surveys (B is for second class and A for first class). Malaysia, like most other Commonwealth countries has statutory control over cadastral surveying. Cadastral surveying in the country has long been the prerogative of the Survey Department because of the Government guarantee of title in land tenure.

2.8. Fixed Boundary System

Under the fixed boundary system, a piece of land cannot be exactly identified until it is surveyed. The manner in which survey is to be carried out is set out in Section 396(1) of the NLC which states that[5] -

For the purpose of this Act, land shall not be taken to have been surveyed until -
a) its boundaries have been determined by right-lines;
b) its boundaries as so determined have been demarcated on the surface of the land by boundary marks or, if by reason of the configuration thereof or for any other cause the placing of boundary marks on the actual line of the boundary is to any extent impossible or impracticable, boundary marks have been so placed as to enable that line to be ascertained;
c) the area enclosed by its boundaries as so determined has been calculated;
d) a lot number has been assigned by the Director of Survey; and
e) a Certified Plan, showing the situation of the land, the position of its boundaries as so determined and of the boundary marks placed thereon and the area and lot number thereof, has been approved by the Director of Survey.

Compare this with that in England, where the general boundary system was adopted in the Land Transfer Act 1875. A general boundary means that the exact line of the boundary has been left undetermined - as for instance, whether it includes a hedge or wall and ditch, or runs along the centre of the wall or fence, or its inner or outer face, or how far it runs within or beyond it, or whether or not the land registered includes the whole or any portion of an adjoining road or stream. The English system, however, makes it clear where the parcel is situated in relation to clearly visible physical features, though it does not require the precise relationship between these physical features and the exact boundary lines to be defined.

It has been established that no survey other than the one carried out using theodolites, chain and other approved electronic distance measuring equipment (EDM), properly controlled and checked by computation, can satisfy all the conditions for the creation of public confidence in the land system and land administration. In order to achieve the above conditions, the Survey Department ensures the following:-

a) the elimination of any possibility of the existence of more than one document of field title to any lot of land;
b) proper agreement between boundaries of possession (occupation) and of ownership;
c) permanency of survey, in the sense that surveys are of such quality technically that there is no probability of a future demand for re-surveys of higher order of accuracy; and
d) certainty in the definition of each lot of land not only on the ground but also in the sense that any boundary disputes can be accurately reconstituted or determined, on the ground at any time.

It has been found essential that when adopting the fixed boundary system, every boundary shall be described by a length expressed in numerical figures and bearings and that its position relative to control points whose geographical position has been determined, shall be expressed in grid coordinates. It is worth mentioning at this stage that the manner in which land is subdivided into a hierarchy of administrative responsibility can be seen in Figure 2.1.

2.9. Classes of cadastral surveying

Cadastral surveys carried out in Malaysia are controlled by the NLC. Under this Act, only two groups of land surveyors are authorised by law to carry out cadastral surveys. The first group are the employees of the Survey Department working under the supervision of the State Director of Survey who is then responsible to the Director General of Surveying and Mapping.

The second group are the articled pupils and field assistants working under the immediate personal direction and field supervision of licensed surveyors. A land surveyor of this group is issued with a license to practice under Section 13 of the Licensed Land Surveyors Ordinance, 1958 (F.M. Ordinance 11 of 1959)[6] and is responsible for carrying out cadastral survey work under the general supervision of the Survey Department. He or she must also be a registered member of the Licensed Land Surveyors Board of Malaysia. All cadastral work and documentation (including survey data, relevant field books and calculation sheets) are finally deposited at the Survey Department as required

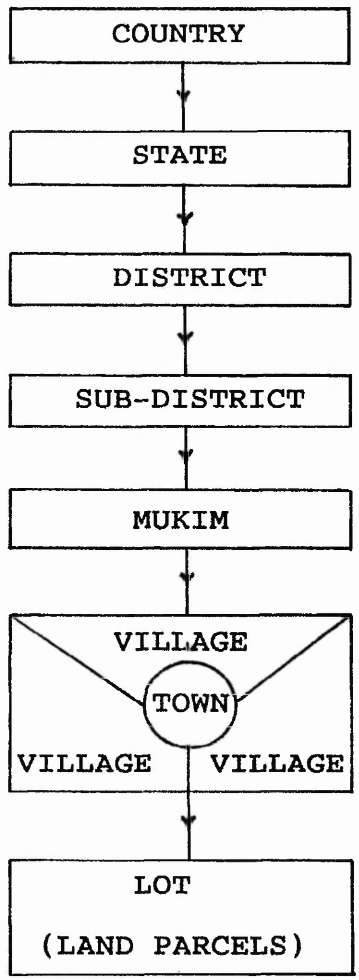


Figure 2.1. The hierarchy of land administration in Malaysia.

by Section 14 of the Licensed Land Surveyors Ordinance.[7] Such survey records will become the property of the Government and will be filed and kept as permanent survey records.

The Survey Department has classified all cadastral surveys into three classes according to the degree of accuracy and the methods used; the three classes being

a) first class surveys;

b) second class surveys; and

c) third class surveys.

2.9.1. First Class Surveys

First class surveys comprise standard and other traverses which are required or may be used in extension of the triangulation for the control of second class or other surveys and include surveys for title within towns and villages. Basically, first class surveys may be divided into four groups:-

a) Standard traverses;

b) Traverses for the control of town surveys;

c) Traverses along administrative boundaries, roads, railways and rivers, which can be used to control surveys for title; and

d) Surveys for title within towns and villages including all building and industrial land that may fall outside town or village boundaries.

The permissible closing errors for first class surveys are:

a) Angular: 00′ 10″ per station with a maximum difference of 01′ 15″ between the traverse bearing and that derived from trigonometrical data, from another first class survey, solar azimuth or on closing a circuit.

b) Linear: 1 in 8000 or a difference of 1 in 8000 between the length derived from the traverse and that derived from previously adopted coordinates, or on closing a circuit.

For standard traverses, one-second theodolites are to be used for observing horizontal angles. The primary settings are to be about 0° and about 90°, and on each zero observations are to be taken on both faces, i.e. face left (F.L.)and face right (F.R.). The observation procedure is as follows:-

Select first zero reading on F.L., bisect back point. Swing the telescope clockwise and bisect forward point. Transit the telescope to F.R. and bisect the back point. Swing anti-clockwise and bisect forward point. Repeat the operation with zero 90° bisecting the forward point first.

Vertical angles are to be read on both faces for each instrument position and booked to the nearest second. The method prescribed above has been designed to give average linear closing errors of 1 in 25,000 and 00′ 01.5" per station for standard traverses, and 1 in 15,000 and 00′ 03" per station for other first surveys. Due to the atmospheric conditions in the country, the Survey Regulations, 1976 state that it is essential for angle observations to be done in the early morning and late afternoon. EDM may be used, or a continuous band of invar or steel 10 chains/200 metres long to which is attached a suitably graduated tape is to be used in catenary. When measuring bands are used, tension is to be applied. Temperature is to be recorded using only cased thermometers by suspending in the horizontal position at the same height of the measuring band. New EDM instruments or bands should be recalibrated before the completion of 25 miles/40 km. of traverse. After some months′ use, calibration after each 50 miles/80 km. should suffice.

2.9.2. Second Class Surveys

Second class surveys comprise circuit traverses, minor control and connections, and all other surveys for title in country areas not surveyed by third class methods. The permissible closing errors for second class surveys are:-

a) Angular: 00′ 20" per station with a maximum accumulation of 02′ 30".

b) Linear: 1 in 4,000 provided that this may be increased to 1 in 3,000 if measurements from previous surveys are included. In practice, standard traverses close to 1 in 15,000 or better.

The bearing method is to be used where only one face left and face right reading is sufficient. Vertical angles are to be booked to the nearest 00′ 10″ for slopes of more than 15°; to the nearest 01′ 00″ for smaller slopes. The first vertical angle of each day must be read on both faces. Subsequently, only angles over 3° need to be read on both faces. Linear measurements are to be recorded to the nearest 0.01 link/0.001 metre. No temperature reading is required.

2.9.3. Third Class Surveys

Third class surveys comprise surveys of the internal boundaries of group surveys in country areas, the circuit being controlled by second class surveys. They also include surveys for rights-of-way in country areas and, in some cases, subdivisional surveys of lots previously surveyed by third class methods. The bearing method is to be used but only one circle left reading is sufficient. Linear measurement readings are to be recorded to the nearest 0.1 link/0.01 metre. Vertical angles of 5° or more shall be observed and recorded as for second class work. Slopes of less than 5° shall be read on one face of the theodolite only and to be recorded to the nearest 01′. Slopes of less than 1° 30′ are ignored.

2.10. Cadastral Survey Procedures

In general, any survey work carried out for the purpose of producing the final document of title involves five main stages. The first stage is the requisition for survey and the preparation of settlement tracing at the Land Office. The second stage (at the Survey Department) involves the preparation of field tracing and the field work as defined in Section 396(1) of the NLC (see section 2.8). The third stage involves all the necessary computations attached to the survey work. The fourth stage is the preparation and the issuing of the Certified Plan (CP) to the Land Office. The fifth stage is the preparation of the document of title to be issued to the land owner. The two departments responsible for the above four stages of work are the Survey Department (Cadastral Survey Office) and the Land Office. At the Land Office, three sections are involved; the Registration and the General Administrative, the Surveying and Technical, and the Revenue Collection sections. At the Survey Department, the four sections are involved; the Field Tracing, District Survey Office, Computing, and Drafting.

A cadastral survey work is initiated from an application for Requisition for Survey (RS) which is made at the Land Office; thus the potential for the creation of a backlog (at the Land Office) exists. When the RS is found to be in order a file is opened and the

RS is recorded in the Survey Register. The file is then sent to the Field Diagram Section for the preparation of field diagram (called the Settlement Tracing).

The RS is then submitted to the Survey Department for the survey to be carried out. Other processes involved at the Survey Department are the preparation of Field Tracings to be used on the survey site by the field surveyors, the actual field survey, the processing and computation of surveyed data, and the drawing of the Certified Plan, which are all done manually. Thus, survey backlog at the Cadastral Division in the Survey Department may involve any process of work being held up from the moment the requisition for survey (which was made at the Land office) is received to the drawing of the certified plan for approval by the State Director of Survey. Table 2.2 (Appendix 2F) shows the various transactions involved at the Land Office and the Survey Department (Cadastral Division). Any processes held up in between the requisition for survey and the drawing of the certified plan (Stages 4 to 8) will fall under the jurisdiction of the Cadastral Division of the Survey Department; others fall under the jurisdiction of the Land Office.

It must be emphasized that any process being held up after the settlement approval *(Tindakan Penempatan)* is not considered as the backlog of the Survey Department.

This is because such an action falls under the jurisdiction of the Land Office and outside the responsibility of the Survey Department. Further processes such as the preparation of the final document of title and the subsequent issue to the land owner cannot be carried out until an agreement on the settlement work is reached between the Land Office and the proprietor.

One great demand of the National Development Policy is to eliminate the arrears of cadastral survey works so that the standard sheets in the Survey Department can be up-dated and charted to show the extent of land alienated. This will give rise to the existence of up-to-date survey information. Another is to ensure that all survey works carried out comply with the standards set out by the Survey Department and the Land Surveyors Board of Malaysia. Greater involvement by the private sector to reduce the survey backlog as well as to carry out surveys systematically using appropriate and up-to-date instrumentation is therefore very important. The manner in which the cadastral survey backlog is categorised as that of the Land Office and the Survey Department should be taken only as a way of identifying the arrears of work at departmental level. At the national level, the cadastral survey backlog should be considered as a joint problem which has to be solved by both departments concerned. This necessitates a good communication system and demands a great deal of inter-relationship, co-operation and inter-dependency for the smooth inter flow of materials and resources to exist. For any system (of registration of title to land) to operate systematically, the smooth work flow at both the Land Office and the Survey Department must be emphasised and any problem must be identified and regarded as a joint responsibility.

CHAPTER 3: DESCRIPTION OF THE VARIOUS AREAS OF CADASTRAL SURVEY BACKLOG

3.1. Introduction

The six identifiable areas of backlog are the cadastral (title) survey, the checking and examination of survey, the preparation of certified plans, arrears in land application, the arrears of preparation of document of title and the arrears in the application of requisition for surveys. The first three areas fall under the jurisdiction of the Survey Department whilst the other three fall under the jurisdiction of the Land Office.

It was also mentioned in Chapter 2 (section 2.10) that the reduction of the national cadastral survey problem should be taken as a joint onus between the Survey Department and the Land Office rather than identifying the problem categorically depending on where the problem is situated. Thus, the Malaysian cadastral system is seen as a set of connected parts which relates to the collection, processing and presentation of land information. Under the system of registration of title to land as adopted in Malaysia, two main pillars govern the machinery of records. The first is the certified plan (CP) which is prepared by the Survey Department, and the second is the registration of title and its maintenance which is carried out by the States Land Offices. Together, they form the twin pillars of the machinery of records.

There are however other government departments involved in cadastral survey work but on a much smaller scale. Examples of such departments are the Federal Land Development Authority (FELDA) and the Federal Land Consolidation and Rehabilitation Authority (FELCRA) which involves the execution of cadastral surveys for the development of agricultural areas, rehabilitation of settlers and various other land schemes, the Public Works Department (PWD) which involves surveys for roads, highways and other public utilities, and the Drainage and Irrigation Department (DID) which involves surveys for sewage, drainage and irrigation works. Due to the existence of the cadastral survey backlog and the unavailability of up-to-date survey information, communication and data transfer between various departments has, to some extent, been adversely affected. Supply and transfer of survey information often takes much longer than anticipated and such information is often based on existing records which are often out-of-date and unreliable. In this Chapter, a brief explanation of the procedures that are being adopted at both the Land Office and the Survey Department, and also a detailed illustration of the extent of the problem in each area will be made.

3.2. Definition of Cadastral Survey Backlog

Cadastral survey backlog may then be defined as any process of cadastral survey work which is held up at any stage and thereby prevents other subsequent processes from taking place. Survey processes in this case may either be that of the office, field or a combination of both. This kind of delay plus any other cadastral survey work already in hand still to be completed combine to form the cadastral survey backlog. Thus, any survey work which is hindered, or any steps or processes which are held up or waiting for action or approval will eventually create a backlog and lead to the failure to produce the final product of a cadastral survey process; the final document of title.

Cadastral survey backlog may be classified as either visible or invisible. The visible cadastral survey backlog consists of the new cadastral survey projects laid down in a prioritised queue often stretching over several years and seems to be only the *tip of the backlog iceberg*. Even more disturbing is the extent of the invisible backlog, an informal queue of arrears of cadastral workload since the early 1950's but the extent of which is never realised by the general public, not even the majority of the survey personnel and politicians. Since it is generally acknowledged that the systems departments (i.e. Land Office and Survey Department) are always too busy - a realisation exists that the various cadastral survey processes will be unable to clear the backlog. What is not realised is the extent of the problem. However, it is this invisible backlog that seems to be the principal drive to the use of more expedient processes of surveying and management, emphasising the needs to modernise the means by which such processes can be managed. The primary aim of this research study is to identify the various areas of backlog and its extent, and to develop a working procedure that will reduce the cadastral survey backlog to a manageable and reasonable level.

Today, the trend in Malaysia is to categorise the cadastral survey backlog as either that of *the Survey Department's backlog* or *the Land Office's backlog*, depending on where the work is held up. Such an attitude of identifying the backlog categorically and adopting the situation as *your department's problem and not mine* is irresponsible, unprofessional and damaging. Any attempt to minimise the survey backlog at both departments will never meet the target set unless the workload and the backlog are taken as a national burden, borne jointly by both departments concerned rather than identifying the backlog problem categorically. From this point, the national survey backlog is taken as that which comprises the arrears at both the Land Office and the Survey Department.

Cadastral survey process in the country involve both the Survey Department and the Land Office. The main function of the Survey Department on one hand is to carry out cadastral surveys systematically. The Land Office on the other hand is responsible for issuing the final document of title to the land owners in a timely manner. Even if the progress rate at the Survey Department exceeds that of the Land Office, the final product of the whole cadastral survey process will not be attained until the whole process is completed. From this standpoint, the cadastral survey backlog is used to define the backlog at the national level irrespective of where the work is held up; and if used categorically, it is for the purpose of easy identification and clarification at departmental level only. The progress of cadastral survey is thus measured in terms of the whole process rather than any selected process involved in either department. The extent of the various areas of backlog is dealt with in detail in the following sections.

3.3. Type 1: Cadastral (Title) Survey

3.3.1. Purpose of Cadastral (Title) Survey

The primary object of a cadastral survey (also called title survey) is to determine for each land parcel, its location, the extent of its boundaries and surface area and to indicate its separate identity both graphically on a map or plan and physically on the ground with survey marks or monuments. Typically, reinforced concrete posts of 0.6 metre long and 75 mm. in diameter are used. In practice, these marks are buried such that the top protrudes about 75 mm. above the ground. A secondary objective is to provide information for a multi-purpose cadastre to satisfy the overall information requirements of land administration.

All survey works are carried out on payment of fees in advance according to scheduled rates. Fees for title surveys carried out by the Survey Department are prescribed in the Surveyor General Circulars 13/30 and L.N. 486 of 1965. For surveys carried out by licensed surveyors, fees are prescribed in the Thirteenth Schedule (Regulation 99) of the Licensed Land Surveyor Regulations, 1959 (amendment) which became effective on 1st. February, 1980 and adopted by the Institution of Surveyors Malaysia on 30th. November, 1980.

3.3.2. Extent of Backlog

The first is the arrears of cadastral (title) survey at the Survey Department. Thirty-six years (1953 - 1988) of data[1] was compiled for the purpose of examining the trend of backlog in relation to the annual progress and the number of jobs received from the Land Office (i.e. requisition for survey) (see Table 3.1 - Appendix 3A).

In 1953, the recorded cadastral survey backlog was 148,196 lots and the situation deteriorated in 1965 as can be seen in Figure 3.1. when the backlog reached its peak of 346,118 lots. From that twelve year period, the backlog, increased by about 16,500 lots annually. Over the same period, the recorded amount of work received from the Land Office (i.e. requisition for surveys) increased steadily at about 2,500 lots per year. In 1953, the recorded amount of work received was 31,704 lots and in 1965, the recorded figure rose to 57,347. However, the amount of surveys completed in the year 1953 was 16,392 and in 1965 it increased to 54,204. Over that twelve year period the annual increase in the amount of work completed was just under 2,000 lots, compared with an annual increase of work received of 2,500 lots. Clearly, the backlog was not being reduced.

From 1965 to 1980, the overall situation changed considerably. Over that fifteen year period, cadastral survey backlog decreased at about 4,300 lots per year while the amount of work received annually showed a decline of about 1,500 lots. In the year 1980, the recorded number of requisition for surveys were 36,392 lots while the backlog figure was 281,194. However, the progress of cadastral survey remained fairly constant at about 43,500 lots per year. The declining trend in the number of requisition for surveys over the fifteen year period was partly due to the freezing of application for state land in 1960 although it was claimed that the step was an attempt to mobilize government survey personnel to undertake urgent rural development projects, particularly land schemes, rather than an attempt to clear the enormous amount of backlog.[2]

From 1980 to 1988, the cadastral survey backlog continued to decrease at about 13,200 lots per year. In 1988, the backlog figure was 175,687. This was offset with an increase in the amount of requisition for surveys (about 3,000 lots per year) and an increase in the annual progress of cadastral survey (about 3,200 lots per year) although the graph in Figure 3.1. shows the decreasing trend, the annual progress deteriorates again during the period 1984 - 1988. If the cadastral survey backlog continues to decrease, following the current trend based on compiled figures for the year 1965 to 1988, it is estimated that such *zero backlog* at the Survey Department will only be achieved in fifteen years' time (i.e. year 2003). Although, in reality, there is no such thing as *zero backlog*, such an estimate was used only to explain the future occurrence of backlog quantitatively. In so doing a much more *realistic* and *acceptable* figure will be *near zero backlog*, a situation where the backlog is minimum and does not affect the overall progress.

From the investigation carried out at the Survey Department in Kota Bharu (in the state of Kelantan), it was found that about 40 per cent of cadastral surveys carried out by Government surveyors were the subject of queries in one form or another. Surveyors often had to return to the site to carry out re-surveys thus almost doubling the actual overhead costs. It was also found that the progress of survey carried out by the licensed surveyors practicing in Kelantan was unsatisfactory as shown in Table 3.2. (Appendix 3B)[3]. As can be seen in Figure 3.2. and 3.3., a hundred per cent annual progress was achieved during the year 1960 - 1975. From 1976 onwards, evidence has shown that the overall progress deteriorated very badly. In 1976, the annual progress was 98.7 per cent. In 1983, the progress fell to 73.1 per cent. In 1986, the worst situation was recorded with an annual progress of only 8.7 per cent.

In every state, the Survey Department prepares a quarterly progress report for every licensed surveyor practicing in the state. Such a report describes the extent of queries, the number of backlog that has to be accounted for and the progress achieved. Table 3.3. (Appendix 3C) shows the extent of queries facing five licensed surveyors practicing in the state of Kelantan in 1987. (The names of the licensed surveyors are not shown). The number of backlog for every quarterly period was derived from the lot numbers issued to the surveyor by the State Survey Department before the execution of survey is made. It has to be understood that licensed surveyors in Malaysia do not go out to the field to carry out cadastral surveys. Surveys are normally carried out by field officers working under the supervision of the licensed surveyors who are responsible for all surveys carried out in the name of his survey company, and who will certify the survey drawings.

Out of the 5 surveyors chosen, it can be said that *Surveyor D* has shown a *better* progress in 1987 with no more than 30 surveyed lots subjected to queries of one form or another. Such queries were finalised in no more than six months. However, such progress rate is still unreasonable. Surveys of about 55 lots which had been carried out by *Surveyor E* more than five years ago were faced with queries and had not been finalised at the end of 1987. Out of the five licensed surveyors chosen, *Surveyor B* is seen as the most problematic as far as work progress as well as query settlement are concerned. During the first quarter of 1987, 253 lots were found to have queries. It also took about two years to finalise the survey of 102 lots. During the final quarter, 88 lots being surveyed four years ago were still waiting to be finalised. Discussions with a few survey personnel at the Computing Section of the Survey Department in Kota Bharu has also revealed that many were a bit reluctant to check and examine the survey works carried out by some licensed surveyors practicing in the state who were known to have made numerous mistakes and queries in the past. On the other hand, many personnel confessed their willingness to check and examine survey work which has been carried out by licensed surveyors known to produce good quality surveys. Based on the above experience and the previous quarterly progress reports, computing personnel sometime classify licensed surveyors practicing in Kelantan, based on the quality of survey work carried out in the past, as *a good, an average*, or *a poor surveyor.*

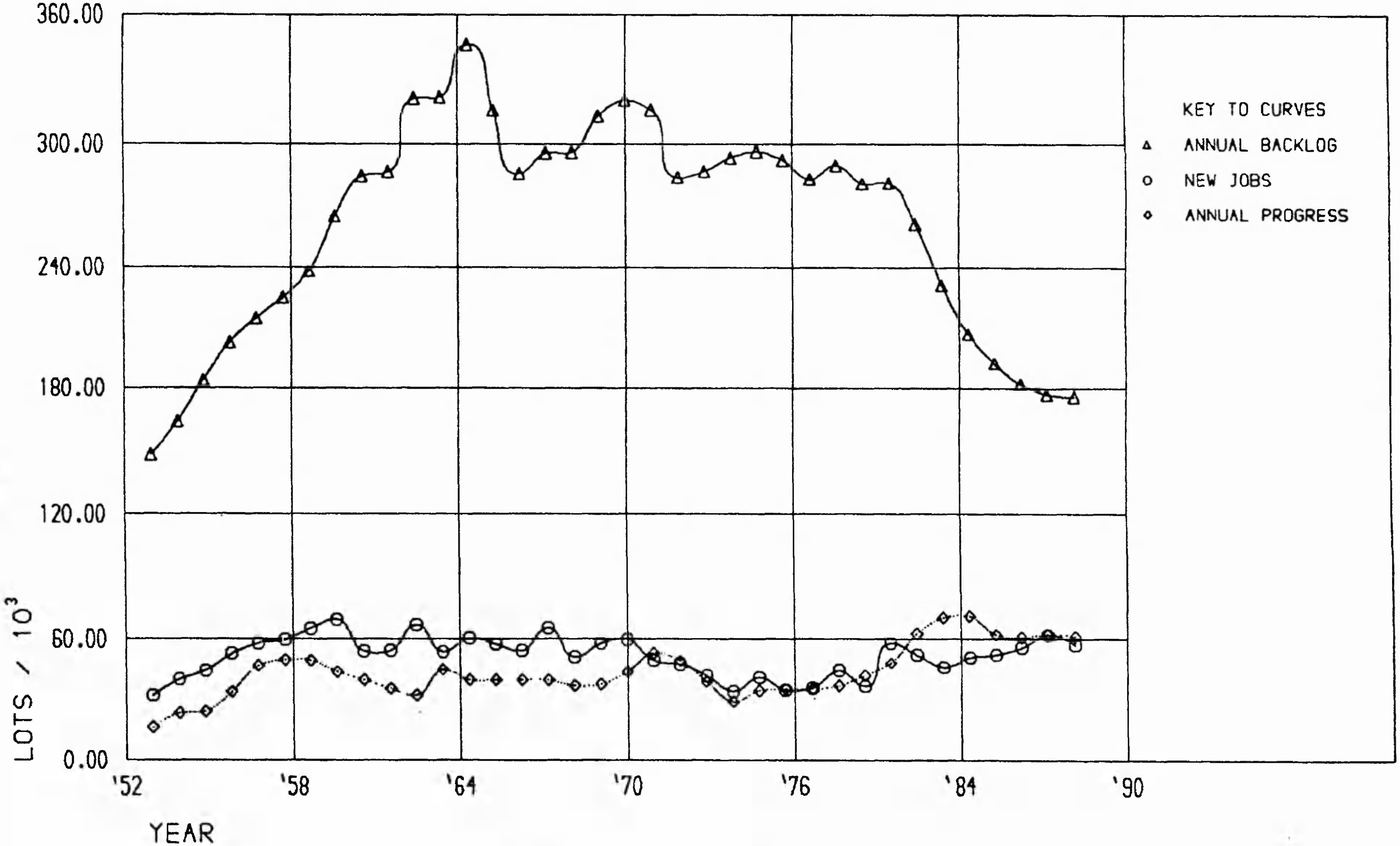


FIG. 3.1. ANNUAL BACKLOG OF CADASTRAL (TITLE) SURVEY
SURVEY DEPARTMENT MALAYSIA (1953 - 1988)

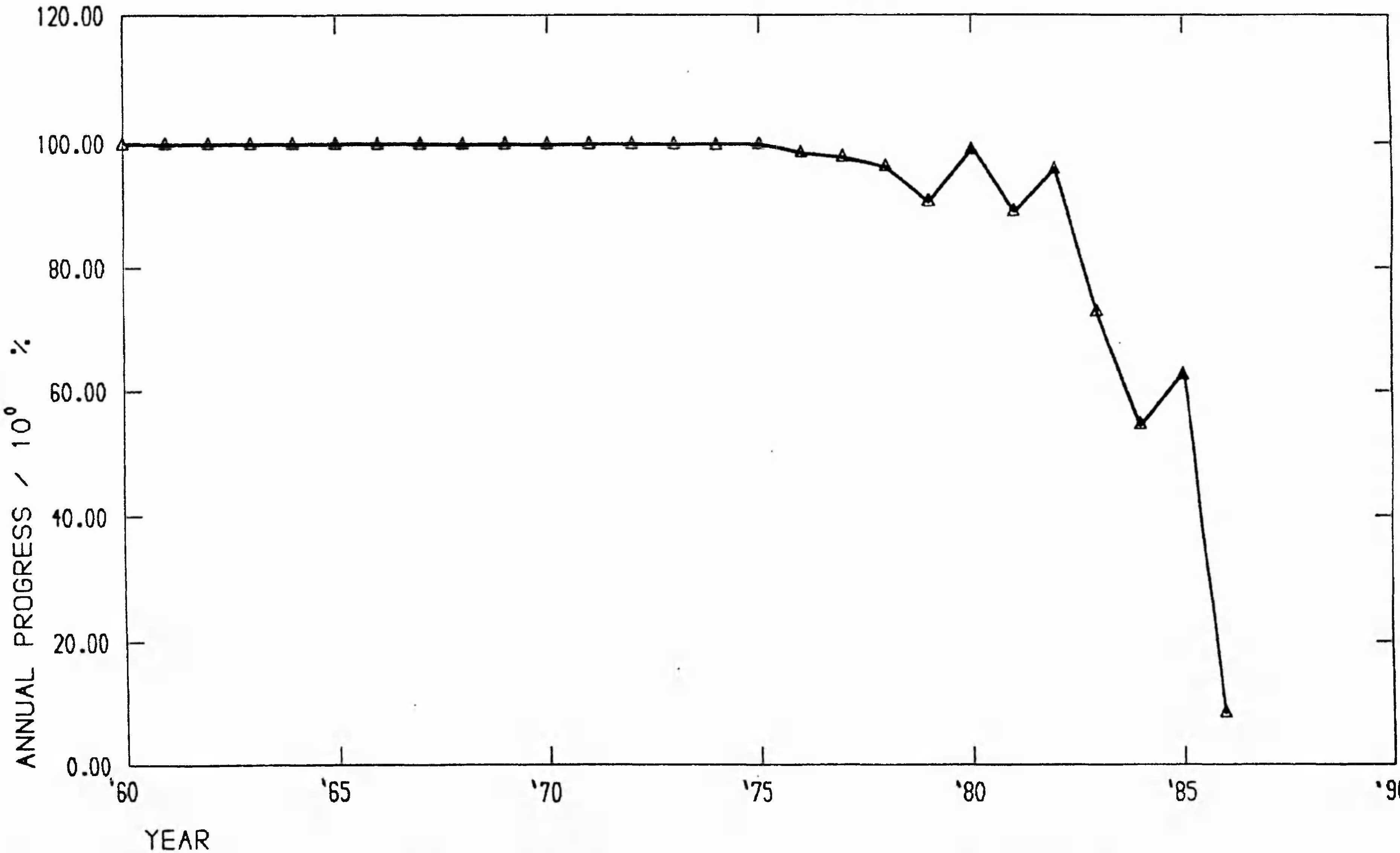


FIG. 3.2. ANNUAL PROGRESS (%) OF TITLE SURVEY CARRIED OUT BY LICENSED LAND SURVEYORS PRACTICING IN KELANTAN (1960 - 1987)

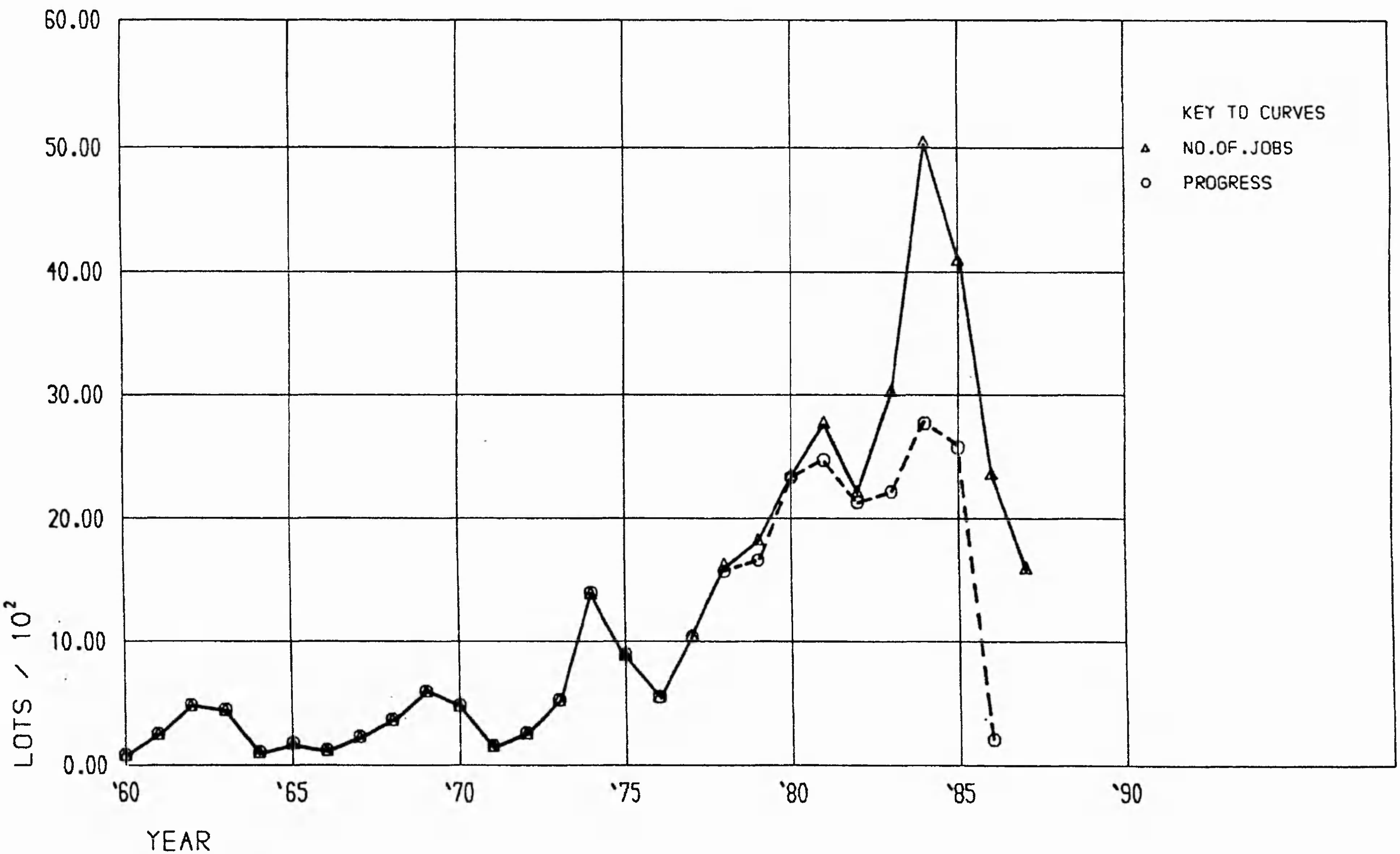


FIG. 3.3 ANNUAL PROGRESS OF TITLE SURVEYS (LOTS) CARRIED OUT BY LICENSED LAND SURVEYORS PRACTICING IN KELANTAN (1960 - 1987)

3.4. Type 2: Checking and Examination of Cadastral Surveys

3.4.1. Reasons for Checking and Examination of Cadastral Surveys

The need for checking and examination of surveys arises from an acceptance by the state of a responsibility to protect the interests of the general public. Such checks are carried out to test the accuracy and the adequacy of field operations, to determine the coordinates of all boundary marks and the area of the lot surveyed. In general, it is also confirmed that such surveys carried out fully meet the requirements of the requisition for survey. At every State Survey Department, a special unit called the Computing Section was created to check and examine surveys carried out by the Government surveyors as well as the licensed surveyors.

The computation of a cadastral survey comprises four main operations:-

a) checking the surveyor's reduction of bearings and distances; correct entries are ticked and any corrections must not obliterate the surveyor's entries in the field books;
b) checking the azimuth datum and adjusting bearings after the computation of any solar observations taken as well as writing up the field diagrams;

c) adjustments for closing errors; such closing errors should be proportional to the magnitude of the latitudes and departures to which they are applied, i.e. Transit method of adjustment; and

d) computation of area using double longitudes method and checked by double latitudes method; triangular areas should be checked trigonometrically, rectangular areas are to be computed by multiplication and checked by division, calculated areas for building and industrial lots are to be shown in square feet/ metres, for other lots, areas are to be shown to the nearest 0.1 of a square metre but entered in calculation sheets and all records to five decimal places of an acre/hectare as stated in the Surveyor General's Circular No. 24/31.

3.4.2. Extent of the Backlog

Observations were made on the progress of the Computing Section (which is responsible for the checking and examination of cadastral surveys) from 1976 to 1986 (See Table 3.4. - Appendix 3D). Over that eleven year period, the backlog increased alarmingly at a rate of about 5,500 lots per year as shown in Figure 3.4. In 1976, the backlog figure stood at 34,002 but in 1987 it increased almost three times to 90,693. Such an increase in backlog is due to the fact that there is no special unit to carry out the checking of survey work carried out by the licensed surveyors and the increase in the workload facing the Computing Section. As can be seen in Figure 3.4., the work received in 1976 involved 13,965 lots but in 1986 it increased almost seven fold to 90,802.

On the other hand, the annual progress of checking was very poor. Although the annual progress of checking in the year 1976 to 1983 increased slightly, such an improvement was insufficient to cope with the existing backlog and the amount of work received annually. In 1976 the annual progress was 11,978 lots and in 1983 it increased significantly to 49,088. However, from 1983 to 1985, the annual progress fell sharply. If the decreasing trend continues, the annual backlog at the Computing Section will obviously increase to an unmanageable extent where not only such backlog will be unrealistic and beyond control but the section will also fail to cope with the annual workload.

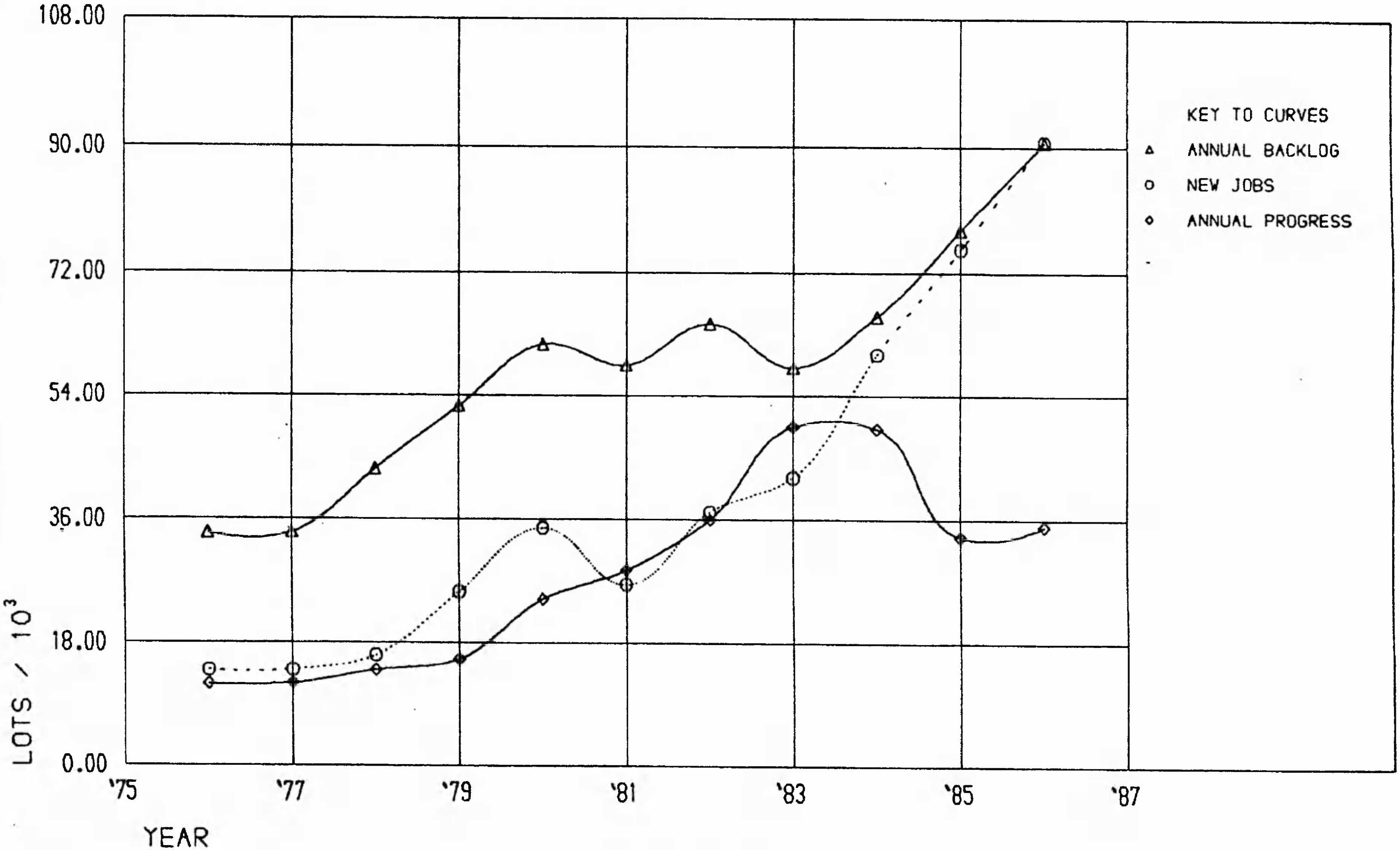


FIG. 3.4. ANNUAL BACKLOG AT COMPUTING SECTION - SURVEY DEPARTMENT MALAYSIA (1976 - 1986)

3.5. Type 3: Preparation of Certified Plan (CP)

3.5.1. Purpose of the Certified Plan (CP)

The last process of cadastral surveying at the Survey Department involves the preparation of the certified plan (CP) at the Drafting Section. Document of title serves three basic functions. It tells the proprietor the extent of his property, helps the land administrators and those involved in the planning and development to identify what is on the ground, and also helps the surveyor to re-establish any missing boundaries with certainty. The numerical data and other essential references on certified plan include:[4]

a) the certified plan number, standard sheet number(s), field book number(s), calculation volume number(s) and pages, survey class, and the coordinates of two extreme points;

b) heading such as district, mukim and lot number, or district, town or village section and lot number, scale, the number of the previous certified plan in the case of re-survey and for a subdivision, the original lot number;

c) the clockwise bearing with reference to the initial meridian from zero as north and distance of each boundary, connection or controlling traverse line - calculated bearings and distances which should be distinguished from direct measurements by the addition of the letters *Cal*, computed bearings and distances by the letters *Comp*, scaled distances by the letters *Sc*, and derived distances from the subtraction of one measured distance from another by the letters *ded*;

d) the length of the every boundary of building and industrial lots to the nearest 0.1 link/0.001 metre;

e) details and additional information such as topographic details, administrative boundaries, adjacent lot and certified plan numbers, and their abuttals, north point, field officer's name and date of completion of survey; and

f) names and signatures of the following officers - draftsman, plan checker, and the State Director of Survey implying that the plan is correct and that all action required by the Survey Regulations (1976) has been taken.

After the authentication of the CP by the State Director of Survey, it is then sent to the Land Office and copies will be produced for the preparation of document of title. A copy of such document will then be issued to the respective proprietor; the other being kept at the Land Office for registration purposes.

3.5.2. Extent of the Backlog

Data compiled from annual reports (1975 - 1987) produced by the Department of Survey and Mapping Headquarters in Kuala Lumpur as presented in Table 3.5.

(Appendix 3E) have shown that the overall backlog in the preparation of CP's increased tremendously over that thirteen year period and this had caused a great deal of concern, not only to the general public, but also to land administrators and politicians alike.

As shown in Figure 3.5., the annual backlog figure in 1975 was 8,295 lots but in 1987, the figure rose significantly to 43,259. From 1975 to 1983, the overall increase in the backlog figure was just under 1,000 per year. The recorded figure for the year 1983 was 15,988. From 1984 to 1987, the situation got even worse with an annual increase involving more than 8,000 lots. The increase in the overall backlog arose as a result of an increase in the amount of work received on one hand and the slow progress in processing on the other. The Drafting Division was overwhelmed with the preparation of certified plans involving 19,897 lots in 1975 and the figure continued to rise over the years. In 1987, the recorded figure was 72,437. From the compiled figures, it can be said that the amount of workload increased at about 2,900 per year.

Figure 3.5., also show the increasing trend in the annual progress of preparation of certified plans from 1975 to 1983. In 1975, the recorded annual progress was 33,927 but in 1983 it increased to 69,146. The highest recorded figure was in 1983 when certified plans were prepared involving 69,146 lots. From 1983 to 1987, the

annual progress however showed a declining trend again. In 1987, the progress figure was 46,009 and this has led to an annual decrease of about 5,800. If such a decreasing trend continues, then the division will not only fail to reduce the overall backlog to a realistic figure but will also fail to cope with the annual workload.

Under the present national economic situation on the verge of its recovery after the recession, it is anticipated that the Survey Department will be inundated with an increase in the number of requisitions for cadastral surveys. From this standpoint, it is also anticipated that the Computing Section as well as the Drafting Section will be subjected to an increasing workload.

An investigation carried out in Kelantan has also revealed that the licensed surveyors practicing in the state are also slow in producing survey plans. Table 3.6. (Appendix 3F) shows the delays of eighteen surveyors as at 31.12.1986. In 1986, a total of 1,377 lot numbers were issued to licensed surveyors but the surveys were not submitted to the State Survey Department; this may be due to several reasons such as incomplete or defective surveys which are subjected to queries and may need re-surveys.

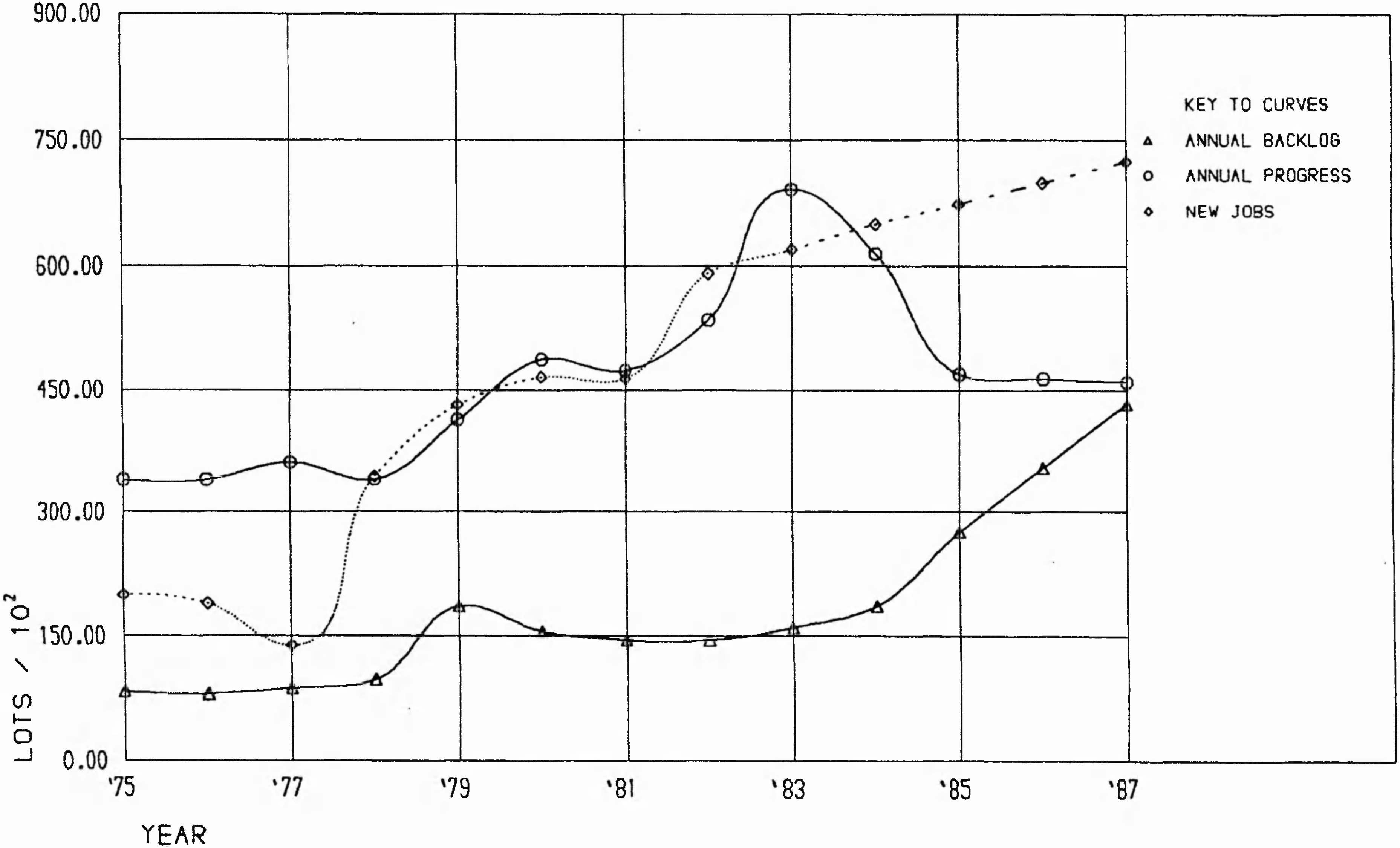


FIG. 3.5. PROGRESS OF PREPARATION OF CERTIFIED PLAN (C.P.)
SURVEY DEPARTMENT MALAYSIA (1975 - 1987)

3.6. Type 4: Arrears in Land Application at the Land Office

3.6.1. Purpose of Land Application

Applications are made for several reasons, some of which are as follows:-

a) alienation of state land; the State Authority may alienate state land for a term not exceeding ninety-nine years or in perpetuity, or in consideration of the payment of an annual quit rent;[5]

b) prospecting permit of extraction and removal of any rock material from state land, alienated land, mining land, or reserved land; such permits are issued on behalf of the State Authority by the State Land Administrator - in the case of state land by the State Land Administrator, in the case of alienated land, by the proprietor of the land or body, in the case of mining land, by the person or body for the time being entitled to the benefit of the mining lease or certificate, and in the case of reserved land, by the Land Administrator acting with the approval of the officer for the time being having the control;[6]

c) change of express condition to any category of land use - the application for the alteration of any category of land use to which the land is for the time being subject to;[7] and

d) temporary occupation license of state land, mining land not for the time being used for the purposes of mining, and reserved land not for the time being used for the purposes for which it was reserved.[8]

3.6.2. Extent of the Backlog

This is a long outstanding problem facing the Land Offices throughout the country. Whenever an application is made at the Land Office, a file is opened and reports are prepared (which often involves three to four other government departments). An applicant is considered fortunate if his application can reach this stage within six months.[9] The major cause for such a delay is due to the conflicting and overlapping nature of the application. In one particular case, the Land Office received 40 conflicting and overlapping Prospective Permit applications within a week for a piece of leased land, the renewal of which the applicants claimed had been refused by the Executive Council.[10] At the Land Office in Kuala Kubu Bharu (in the state of Selangor), 40 applications per month were received for one type of land application, 90 per cent of which either conflicted or overlapped with one another.[11]

Investigations carried out at the Land Office in Kota Bharu has also revealed that land applications made by the public (either for mining lease, state land, renewal of mining lease, change of conditions, etc.) often takes longer than anticipated before a decision can be made. This delay is best counted in months rather than weeks. Findings by Kamarudin Rani[12] as presented in Table 3.7. (Appendix 3G) has revealed an incidence whereby an application for a small piece of state land took 564 days to be finalised. An application for a prospecting permit took 429 days to finalise. Similarly, applications for a change in express condition (from paddy to coffee) took typically 300 days (or even 400 days in some other districts). There are many cases where applications have taken more than three years to be finalised.[13] Various confusions over decision making, bottle-necks, unnecessary delays, and duplication of work processes could be avoided by developing a realistic, clearly outlined working procedure. This should include the re-organising of work distribution, improve delegation of authority and specialisation at the Land Office.

3.7. Type 5: Arrears in the Preparation of Document of Title

3.7.1. Purpose of Document of Title

After any land has been surveyed for the purpose of its alienation under Final Title in accordance with the provisions of section 396 of the National Land Code (NLC) (Act 56 of 1965), all items of land revenue which is computed on the basis of the area of the land established by the survey shall become payable to the State Authority. For this purpose of alienation under Final Title, two forms of document of title are prepared. The first is the *register document of title* (for grant or state lease), and the second is the *issue document of title* (for Mukim grant or Mukim lease).

The register document of title of a grant or state lease consists of its authentication under the hand and seal of the Registrar; in the case of a Mukim grant or Mukim lease, its authentication is to be made under the hand and seal of the Land Administrator (formerly known as Collector).[14] For land to be alienated under Registry title, the document of title is to be prepared by the Registrar; for land to be alienated under Land Office Title, the document of title is to be prepared by the Land Administrator. Both the register and the issue documents of title should include a copy of the Certified Plan (CP) which has been certified as correct by or on behalf of the State Director of Survey. At this juncture, it can be said that the progress of preparation of document of title (register or issue) at the Land Office depends on the progress of the preparation of the CP at the Survey Department. After the CP is completed, it is then submitted to the Land Office whereby copies will be produced to form part of the document of title.

3.7.2. Extent of the Backlog

Findings have revealed that the backlog of the preparation of document of title at all Land Offices throughout the country increased alarmingly (see Table 3.8. - Appendix 3H). In 1955, the backlog figure involved 183,870 lots and the increasing trend has continued ever since. In 1981, the backlog figure increased more than two fold to 444,262. The increasing trend follows two main patterns as can be seen in Figure 3.6.

The first is the sharp increase that took place during the year 1955 to 1970. From the compiled data, an annual increase of backlog of about 16,000 was recorded over the fifteen year period. However, during the year 1971 to 1981 the situation was kept under control; over that ten year period the annual increase was only 700. Although the increasing trend during the latter period tends to slow down, the Land Offices throughout the country still have to face an enormous backlog. What is lacking from the compiled figures is the decreasing trend of the backlog of preparation of document of title; and if such a decreasing trend were to exist during the coming years, the figure must be significantly large so that the Land Offices are in a much better position, not only to be able to decrease the backlog figures but also to cope with the amount of annual workload in the light of economic recovery.

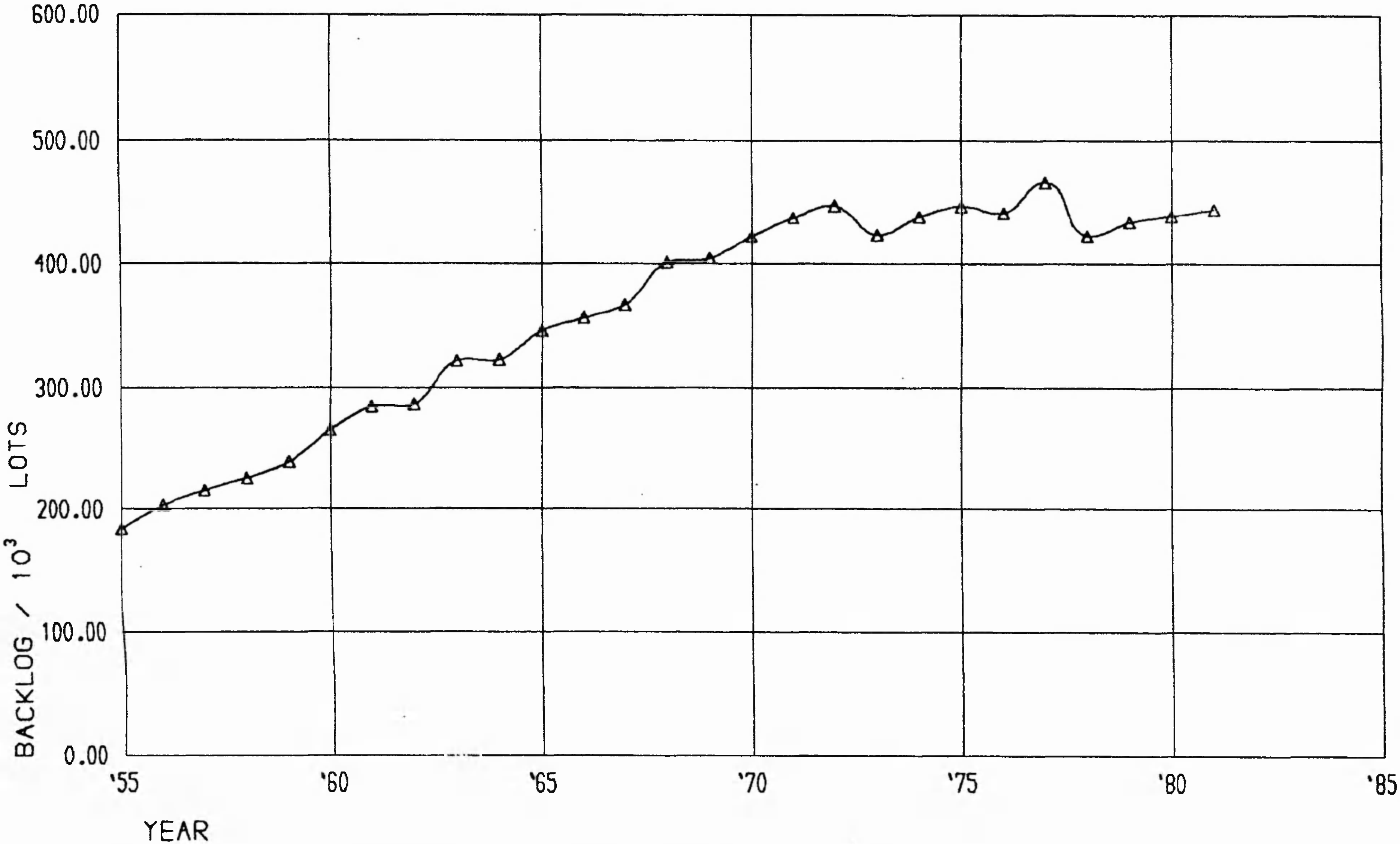


FIG. 3.6 PROGRESS OF PREPARATION OF DOCUMENT OF TITLE
AT LAND OFFICES THROUGHOUT MALAYSIA (1955 - 1981)

3.8. Type 6: Arrears in Applications of Requisition for Survey

3.8.1. Purpose of Requisition for Surveys

Requisition for surveys (RS) are made by the general public and other statutory bodies at the Land Office. There may be several reasons why RS is needed; the common ones are for the purpose of issuing Final Titles, sub-divisions, amalgamations and partitions of land parcels or even in the event of disputes between two (or more) proprietors which share some common boundaries. Normally, applications for RS are made at the Land Office by individual land proprietors and other government agencies. The public can also request for surveys to be carried out by the licensed surveyors who are registered members of the Board of Licensed Land Surveyors, Malaysia. Normally, the survey process takes less time than that being carried out by the Government surveyors from the Survey Department but the cost of survey is more.

When the RS is found to be in order, the Land Office will submit such RS to the Survey Department through the District Surveyor (DS). The DS will chart such a requisition on standard sheets in pencil and forward them to the State Director of Survey. When the State Director of Survey considers investigation of the RS is necessary before accepting it, he will return the requisition to the Land Office.

3.8.2. <u>Extent of the Backlog</u>

Table 3.9. (Appendix 3I) shows the extent of the backlog of RS at the Land Offices throughout Malaysia during the year 1955-1981. As can be seen in Figure 3.7, the backlog figure over fifteen years shows a general increase in trend. In 1955, the backlog involved 89,797 applications and the figure increased two fold in 1981 to 162,669. During the years 1955 to 1965, the overall annual backlog figure was about 85,000. However, during the years 1966 to 1981, the backlog figure showed an enormous increase in the trend of about 4,400 applications per year.

While the compiled figures of backlog of RS show a general increasing trend, the overall progress shows an opposite picture of a decreasing trend. In 1955, the number of RS being finalised at the Land Office and submitted to the Survey Department involved 24,114 applications and the figure continues to rise to 49,688 in 1958. By contrast, the progress in 1959 was 49,330 and retarded at about 4,300 per year to 31,941 in 1963. From then on, the annual progress of RS being finalised seems to fluctuate between increases and decreases. However, a conclusive decreasing trend in the overall progress of RS being finalised at the Land Office of about 500 applications per year may be deduced based on the compiled figures.

It is anticipated that the number of requisition for surveys made at the Land Office will continue to increase considerably in the near future as a result of the national economic recovery. If the overall progress of RS being finalised continue to decrease in the years to come, the Land Offices throughout Malaysia will not only fail to reduce the overall backlog to a much more realistic and acceptable figure but will also fail to cope with the enormous amount of requisitions being made annually. It is firmly believed that this is the likely occurrence in the near future in the light of the enormous development taking place in the country.

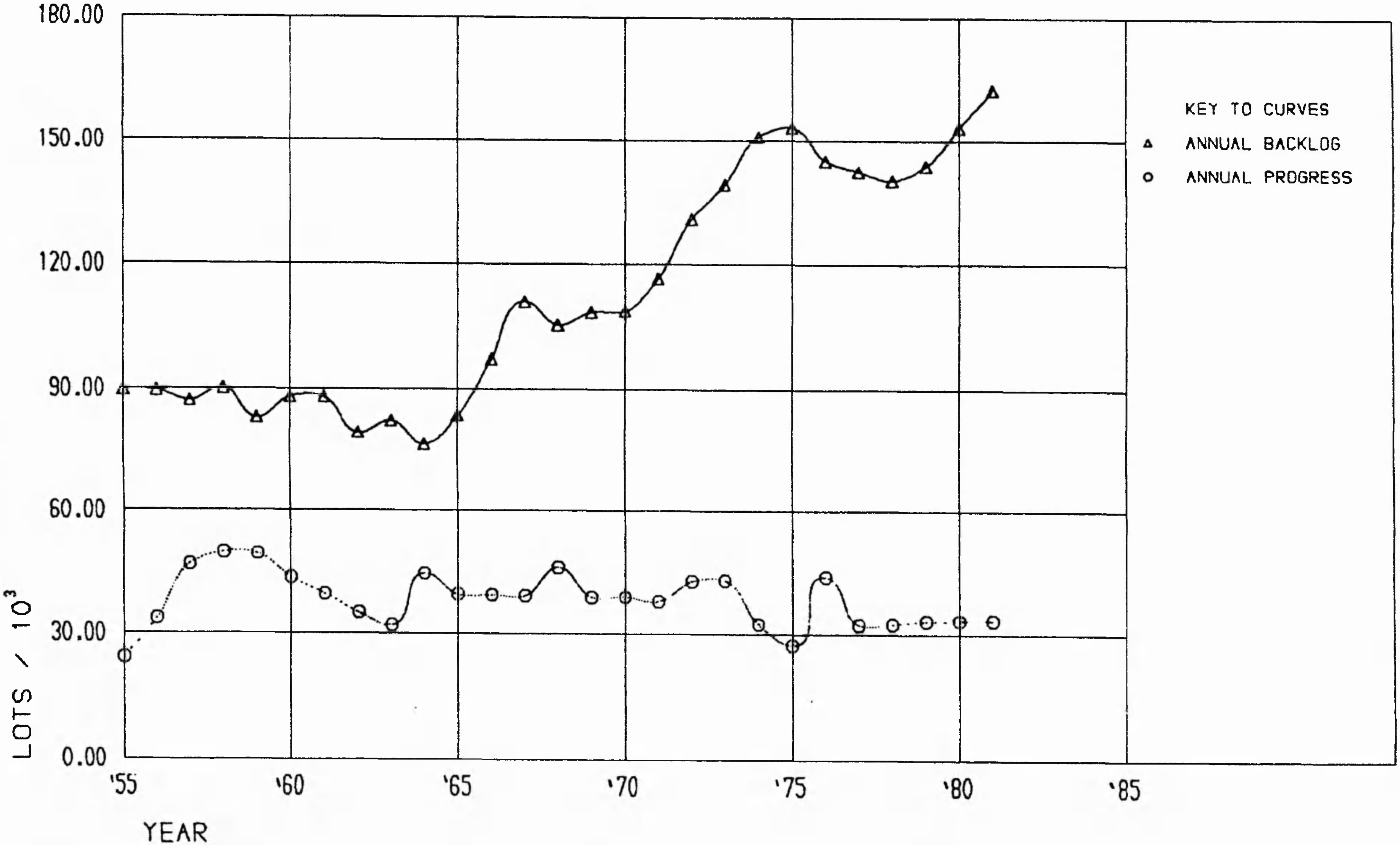


FIG. 3.7 PROGRESS OF REQUISITION FOR SURVEYS (R.S.) AT LAND OFFICES THROUHGHOUT MALAYSIA (1955 - 1981)

CHAPTER 4: PROBLEMS WITH THE PRESENT CADASTRAL SURVEY METHODOLOGY

4.1. Introduction

The present cadastral survey methodology lacks four basic principles, controls (or working from the whole to the part), consistency, independent check and economy (i.e. time, money and effort). Under the first of these, the principle of control, a network of primary points is established throughout an area and may be supplemented with secondary points. These in turn can be broken down with tertiary and fourth order control points. Individual parts of any survey may then be connected to nearby control points so that any accumulation of error will not adversely affect any other part. Most of the primary control points in the country were established during the 1950's. These control points, though appearing on record, are in reality non-existent. Investigations have revealed that about 80 per cent of the standard traverse control points are lost or destroyed, especially in the course of development.

Due to the lack of control points, the absolute location of alienated land parcels is often uncertain. Land parcels have been surveyed on what spatially is a random basis, building up to the total picture working from various parts towards the whole. This has led to the lack of composite standard sheets to show the extent of alienated land and other surveyed areas, and much expenditure is needed to remedy the situation. Due to the inadequate survey controls, other survey activities have also been adversely affected. Standard traverses control points exist only in major towns and cities. In Penang, Ipoh and Kuala Lumpur, most of the primary and secondary control points were established alongside roads when they were much narrower. In the event of any development taking place whereby existing roads were widened, these control points were damaged although according to the records such points do exist. In agricultural areas, secondary control points were established alongside roads when they were 15 feet wide. Nowadays, most roads in such areas are 24 feet wide and this caused the control points to disappear. Control points were never replaced because there was no pressing need to do so.

For any requisition for surveys from the Land Office, the Survey Department is obliged to carry out the survey without the knowledge of how long the survey is going to take, or whether there exists any nearby control points on the ground or not (even though the records might suggest that such points exist in the area). In areas where there are no existing control points, the Survey Department is left with no choice but to carry out the survey without linking to any primary or secondary control points. It has to connect its surveys to other coordinated boundary marks established before, whose coordinates were assumed to be true. In reality, surveys of such land parcels were not linked to control points but attached by running surveys and adjusted to inferior control, established in the days when standards were not as high as they are today. Although the survey was carefully executed, the absolute location of such a patchwork of land parcel is often uncertain.

What is also evident is the poor communication between the Land Office and the Survey Department. The Land Office should seek advice from the Survey Department on all matters relating to the execution of surveys, especially with regards to the alienation of State land. Land should only be alienated in areas where proper control points are established; if no control points exists, then such points must be established prior to alienation. By doing so, the alienation of State land and the execution of surveys can be carried out systematically, and all parcels can be linked to the control points. It can be said that the majority of title surveys did not meet the primary requirements of a cadastral survey system; that there should not be gross errors or mistakes and that the cadastral surveyor should be more concerned with the absolute positions of boundary marks than with their relative location. As a result, the present cadastral survey system suffers from the following deficiencies:-

a) propagation of errors as a result of the running survey approach and the failure to contain errors by working from the whole to the part;

b) low accuracy and reliability of survey data in the absence of an efficient survey control system;

c) absence of a common reference system to enable cadastral surveys to be linked together to form an integrated survey system;

d) lack of control and checks that are expected in coordinated cadastral systems which result in a vast amount of queried survey works;

e) isolated surveys that are difficult to connect to adjoining surveys;

f) lack of integration with other categories of surveys such as engineering, topographic, geodetic, etc;

g) unreliable accuracy standards; and

h) duplication of traversing and survey work carried out in preceding surveys.

4.2. Improving the Control Network

In order to speed up the process of title surveys, one of the tasks is to establish a dense network of standard traverse control points throughout the country. The backlog of title surveys stems from the fact that about 40 per cent of surveys were subjected to queries. The general scheme of computation of coordinates of land parcels is based ultimately on the coordinates of trigonometrical stations and that the purpose of the standard traverses control points is to confine errors and to prevent their accumulation. Because most surveys are linked and adjusted to inferior controls, gross errors accumulate. This forms the main reason why surveys are rejected at the Computing Section. There is therefore a general need to work from the whole to the part and to connect all individual surveys to the state coordinate system which is properly established and maintained, and in turn linked to the national framework.

The regulations currently in force relating to the execution of cadastral surveys must be revised so that efficiency and productivity can be improved. The introduction of EDM in the country was long delayed because the regulations that have been laid down stated categorically that all distances were to be measured using steel bands and chains. Such restrictive regulations have been repealed in 1986 as stated in the Surveyor General Circular (No: 3/1986). Even photogrammetric methods fall outside the list of permitted survey techniques. The upgrading of the present system is left with no choice but to amend the existing regulations to accommodate such survey techniques and instrumentation in the process of improving the control network.

The use of photogrammetric methods for establishing control points has not be fully realised. Unlike in cadastral survey where there are narrow alleyways as in small townships, narrow footpaths and fire-breakers as in forests and other areas of thick undergrowth which make stereoscopic interpretation very difficult, establishment of controls by photogrammetric methods have many advantages. The use of air survey is eminently suitable and can provide the necessary accuracy, while the estimated saving over ground methods may be as much as 60 per cent. It must be based on the social, economic environment, the nature of the terrain and its coverage. Photogrammetric methods may be used for establishing control in areas where land units are for the most part large agricultural blocks.

In other areas, the Doppler Satellite measurements are to be introduced into the existing network. By doing so, new values for the coordinates of the old control points can be computed. New control points can also be established at the selected areas using EDM and theodolite traverses between the Doppler controls. This method of up-grading would be substantially cheaper than fully re-observing all the old angles and distances. A large number of control points can be fixed in a relatively short time and at relatively low costs.

4.2.1. Costs and Potential Savings

a) Costs

The costs of improving the existing control network include the costs of survey, costs of new monuments and markers, and monument replacements and maintenance. Control monument consists of a concrete pier which has a bronze plate inserted in the top with the necessary identification and information engraved. A monument marker which is visible from a distance should also be established in order to aid monument location and to reduce monument destruction. The cost of monument construction varies from \$250 to \$300. Each monument marker costs approximately \$30 to \$35. About 2 to 4 per cent of the monuments will, on average, be destroyed each year (primarily due to construction works). At present, the destruction frequency is very high, however, as the public become very familiar with markers, and as the penalty scheme for destruction is enforced, the destruction frequency is likely to drop to less than 3 per cent per year. Future title surveys will be required by law to be tied to these control points. Thus, all surveys will be related to a common identification standard and to each other. The corners of all land parcels when connected to the coordinated control points will therefore have an indefeasible location. In addition, the monumentation will supply about 70 per cent of the ground control required for large scale mapping programmes.

Attention must be given to several considerations when attempting to define the required density of monumentation within a coordinated control system. These include the desired monument spacing within a traverse and the required number of traverses within an area. The monument spacing within a traverse is dependent upon measurement capability and user requirements. Measurement capability is limited by geography (sight-distance), type of instrumentation and time of measurement (day/night). The most effective type of distance measuring instruments used in control surveying are EDM instruments. Those using radio waves as their medium of transmission such as the tellurometer are capable of measuring up to 60 kms. Those using light waves such as the geodimeter are capable of measuring 2 to 3 kms during the day and up to 10 kms at night. Instruments such as the geodimeter compensate for their shorter range by being much more accurate (they have considerably smaller constant errors and slightly small relative errors). In second order control points, light wave instruments are used because of their greater accuracy and most measurements are made at night. This places a lower limit on monument spacing of 10 kms.

It should also be noted that as accuracy and cost considerations are related to the value of land, this is often reflected in the monument spacing requirements. Ideally, control points should be so distributed throughout the country as to permit their ready use in the collection of both cadastral and earth-science data. In urban areas, the standard traverse control points should be established at an interval of 0.3 to 0.8 km. In rural areas, the ideal interval is between 1.5 to 3.5 kms. High order stations should be spaced at about 10 to 15 km intervals. Such establishment of control points must be carried out in collaboration with the Public Works Department, the National Electricity Board, the Highway Authority, the Drainage and Irrigation Department, and other major users of survey data. Traverse layouts are governed largely by geography. Surveys are run along highways, railways, power lines, open fields, etc. Where absolutely necessary, towers may be constructed, but these can increase the cost of survey from $150 to $250 to over $1,000 per station.

b) Potential saving

Control network forms the logical starting point for all forms of cadastral and engineering surveys. If all surveys have a common basis, the information from each survey can be used for alternative purposes. Without this, it is impossible to use coordinated land parcels derived from cadastral surveys for topographic mapping or for engineering surveys. It was reported by Dale[1] that cadastral surveys based on a proper coordinate system do not cost the surveyor more to carry out, and there could be a 25 per cent saving of the total costs. Savings in subsequent surveys will exceed the extra costs of establishing the control network after 15 to 20 years. The expense of survey control is as much an investment for the future as in the present. Although there are a number of short-term advantages, the substantial benefits only accrue in the longer term. It provides the execution of accurate mapping of all land survey information and a reference system for locating all spatial data. An up-to-date system will provide a simple method for the restoration of boundary marks and for checking of surveys.

The time lag between the moment at which the costs of introducing a control network occur and the point at which subsequent savings exceed the costs is difficult to ascertain, for it depends upon the frequency of the use of the control points. In urban areas, the benefits will exceed the cost in 10 years or so, whilst in rural areas the time span may be much longer. In the metropolitan area of Toronto, about $6 million a year were spent on title surveys during the 1970's, and a saving of up to $2.5 million would be made if there were a control network, with a further saving of $2.5 million on engineering surveys and related functions.[2] In introducing the control network, the cost must be set against these figures and an expected annual benefit would exceed the total costs only after 16 years.

It was found that the states facing the worst problem of survey backlog are Pahang, Kedah/Perlis, Negri Sembilan and Perak. In 1988, the annual backlog figures for the above states were 32,011, 28,037, 21,669 and 19,899 respectively. Together, they constitute about 60 per cent of the total national figure (Table 4.1. - Appendix 4A). Based on the above figures, it is proposed that the establishment of control points to provide the basic cadastral survey framework is to be started in the developed zones of the above states and to be followed later by the other remaining states. It is difficult to ascertain the exact costs required for the above task but, as mentioned earlier, cadastral survey which is based on a proper coordinated system could result in 25 per cent saving of the total costs. Saving in subsequent surveys will exceed the extra cost of establishing the control network after 15 to 20 years.[3]

The total survey demand from 1989 to 2005 are estimated on a set of assumptions and on a sample information. Assuming that the average cost of survey (measured in 1988 prices) amounts to $2,500 (excluding overheads), the total estimated national cost of survey is shown in Table 4.2. And assuming a 1.0% to 25% cost reduction due to the improvement of the first and second order control points throughout the country, the programme induced savings can therefore be derived (Table 4.2). Eventually, when the programme has reached full capacity, the savings percentage should reach approximately 25 per cent in 25 years.

Table 4.2. Total number of surveys, total costs, and potential savings, Peninsular Malaysia, 1980-2005.

Year	Total no. of surveys[1]	Total costs[2] (Ave. cost= $2,500)	Assumed % cost reduction	Estimated savings[3] $
1980	41,783	104,457,500	1	1,044,575
81	47,908	119,770,000	2	2,395,400
82	62,485	156,212,500	3	4,686,375
83	70,551	176,377,500	4	7,055,100
84	71,177	177,942,500	5	8,897,125
1985	62,019	155,047,500	6	9,302,850
86	60,752	151,880,000	7	10,631,600
87	62,320	155,800,000	8	12,464,000
88	60,957	152,392,500	9	13,715,325
89	60,500	151,250,000	10	15,125,000
1990	61,000	152,500,000	11	16,775,000
91	61,500	153,750,000	12	18,450,000
92	62,000	155,000,000	13	20,150,000
93	62,500	156,250,000	14	21,875,000
94	63,000	157,500,000	15	23,625,000
1995	63,500	158,750,000	16	25,400,000
96	64,000	160,000,000	17	27,200,000
97	64,500	161,250,000	18	29,025,000
98	65,000	162,500,000	19	30,875,000
99	65,500	163,750,000	20	32,750,000
2000	66,000	165,000,000	21	34,650,000
01	66,500	166,250,000	22	36,575,000
02	67,000	167,500,000	23	38,525,000
03	67,500	168,750,000	24	40,500,000
04	68,000	170,000,000	25	42,500,000
2005	68,500	171,250,000	25	42,812,500

Notes:- [1] Given continuation of present demand pattern. Figures from 1980 to 1989 are exact figures supplied by the Survey Dept. Figures from 1990 onwards are estimates.

[2] Measured in 1988 prices. Cost excludes overheads.

[3] Assuming that the control network improvement programme started in 1980.

When an area in the state has been chosen and the required density of control established and properly catalogued, it must be declared a *Coordinated Zone*. Henceforth, all work done in that zone must be executed in accordance with the prescribed rules as set out in the Survey Regulations and the National Land Code, and up to a standard which assures each boundary mark a fixation commensurate with land values in that area. Every boundary mark so surveyed must be tied in to and become part of an integrated coordinated system. With the introduction of an orderly system, cadastral surveys will gradually become less expensive, less costly and less time consuming. Furthermore, a proper cadastral map will at last be built up in the areas concerned, areas where it is most needed by all administrative agencies.

4.2.2. Benefits of Control Points

The identification and quantification of benefits was severely hampered by the lack of data and information as well as by the multi-dimensionality and the irratic behaviour of the demand process. The following benefits were identified:-

a) Direct, quantifiable benefits

Greater surveying efficiency

Future surveys of land parcels and other higher order surveys will reap the full programme benefits; cost saving is expected to lie in the range of 30 to 40 per cent. At 40 per cent limit, the costs of survey per lot (including overheads) will be reduced by $3,000 to $4,500 (in 1988 prices). Another direct benefit is the elimination (or reduction) of field surveys. An elimination of one-day field work per survey party can save at least $800 (in 1988 prices). Costs of other surveys will also be reduced. For example, the cost of surveys associated with engineering and topographical can be reduced by at least 30 to 40 per cent because the linking survey work between coordinated points reduces survey time and provides checks.

b) Indirect, non-quantifiable benefits

Due to the lack of data and information related to other areas, the following benefits (otherwise quantifiable), are classified as non-quantifiable:-

Greater mapping efficiency

Incremental gains will be accrued to a wide range of map users as more control of greater accuracy and other relevant information of interest are available. These gains will take the elimination of field trips, better preliminary work done at the office, etc. Mapping duplication will be nearly eliminated (e.g. several public agencies like FELDA, FELCRA, etc. should no longer find it necessary to map identical areas, and specific projects can utilize maps produced by the Survey Department in a great number of cases). The number of special purpose mapping projects will be substantially reduced.

Greater land administration efficiency

The great majority of disputes over land boundaries, ownership, etc. (handled outside as well as inside the court system) will be eliminated or greatly reduced. With the eventual implementation of the computerised land title programme (see Chapter 6), time spent on request for surveys, land transfer, etc. will be reduced. It is expected that the total time requirement per case will be reduced by about 3 to 6 hours on average (including travel, checking, signing, etc). Further reduction in total time taken will also be reduced provided that unnecessary bureaucratic processes are eliminated and applications are attended instantaneously or at the earliest time possible. Legal profession's time and capabilities will also be used efficiently. Only special cases will require any legal assistance. Thousands of professional hours per year could be devoted to professional activities, rather than be allocated to tasks which appropriately trained Land Office clerks can handle far more efficiently. System users will pay far less for title search and registration if such a pattern emerges.

Greater construction and development efficiency

The implementation of those projects under the Five Year Malaysia Plans such as the construction of new roads, highways, irrigation system, and other infrastructure could be speeded up.

To conclude, the foreseeable benefits of having a dense network of control points include the following:-

a) improved accuracy and reliability of survey and survey data;
b) elimination of the uncertainty and survey problems associated with differences between the survey marks and the survey data, and a significant reduction in error propagation;
c) improvement in the efficiency of cadastral re-surveys in case of queries by simplifying procedures and reducing the time and costs associated with searching for boundary marks, and the reduction in the duplication of survey work;
d) a more reliable system of defining land parcels;
e) potential for extending the basic principles of the Torrens System of Land Registration to cadastral boundaries and thus providing indefeasibility for the position and extent of land parcels; and
f) the eventual reduction in the title survey backlog, survey computing and the preparation of CP's.

4.3. Costs of Cadastral Surveys

The cost of a survey depends upon the time, labour and equipment used. Although there is no such thing as an average survey, the survey costs, as a general rule, can be estimated from the labour rates and the time spent on the survey. It was suggested that the basic field and office costs can be multiplied by three to give a fair approximation of the true overall cost of a survey.[4,5]

As a result of the enormous queries, re-surveys of more than 40 per cent of the surveyed land parcels have to be made. This has led to the total costs of surveys being almost doubled, or even tripled in some cases. Tables 4.3, 4.4 and 4.5 (Appendix 4B) show the extent of such queries, the survey costs and the time taken for three jobs selected at random at the Survey Department in Kota Bharu. It was also found in certain states that about half of the total number of jobs carried out by the Government surveyors were found to have queries. It has to be made clear that it is not 50 per cent of the total number of surveyed land parcels that were subjected to queries. This figure is determined in terms of the number of job files opened. For example, one job file of a land scheme survey could consist of 50 land parcels or so. The number of queries in terms of the total number of land parcels is slightly lower, in the order of about 40 per cent. As a result, re-surveys and re-checking have to be carried out and the final survey costs tend to be almost doubled. The findings are summarised in Table 4.6.

Table 4.6. Summary of costs of three land scheme surveys in Kelantan.

Survey Department File No.	Area/ No. of lots	Survey costs before query $	Survey costs after query $
a) PUKN 105-82	81 hectares 45 lots	7,919.64	23,926.03 (+202%)
b) PUKN 221-82	39 hectares 19 lots	11,335.49	15,199.67 (+34%)
c) PUKN 218-82	56 hectares 37 lots	8,598.74	10,018.04 (+17%)

From the above results, the worst case can be seen in (a) when the costs were increased by more than 200 per cent after mistakes were found. A re-survey had to be made, followed by another stage of computation and plotting. The number of working days spent for the first phase of field work was 19 days but the second phase of field work (re-survey) increased by almost two fold to 36 days. While the initial costs of such survey was $7,919.64, unnecessary wastage in terms of human effort and funding was created due to the failure to get the survey right the first time. The final costs stood at $23,926.03, an increase of $16,009.39. In the second case (b), the costs of survey stood at $11,335.49. Due to the queries, re-survey had to be made, followed by re-computing and re-plotting being necessary. It cost an extra $3,864.18 and the final costs for such survey stood at $15,199.67, an increase of 34 per cent.

In 1954, it cost, typically, about $1,200 a month to maintain a survey party in the field.[6] This is a high figure and accounted for by the fact that wages and salaries of the survey party have increased six fold compared with pre-war figures. The average output of a survey party was about 230 lots per annum so the average field cost of surveying an average lot of 1.5 acres was about $36, excluding the overhead costs. One interesting feature is the decrease in the size of an average lot. In 1939, the average lot was 4.5 acres, and in 1954 it was 1.5 acres; an indication of the trend of economic development and a reflection of the growing urbanisation of that time.[7] In 1988, it cost about $800 a day to maintain a survey party.

It is quite difficult to assess the exact cost figures of surveys for there would appear to be no such thing as an average survey. However, Schermerhorn[8] suggested that a figure of around one per cent of the land value should be set as a target. The average cost figures for surveys in Malaysia in the 1970's was in the order of 5 to 10 per cent of the land value[9]. In Switzerland, it is common to find the costs of cadastral surveys between 0.9 and 1.5 per cent of the land value.[10] Today, due to re-survey the average cost figure in Malaysia increased to about 10 to 15 per cent of the land value.

Recently, a target was set at every State Survey Department to monitor the progress of all personnel but it was a complete failure. At the Survey Department in Kelantan, the minimum progress of the checker who is responsible for the checking and examination of title surveys is expected to complete 4 lots per day. In the Drafting Section, it is envisaged to complete about 100 certified plans per month. For the 34 field parties carrying out land scheme surveys in Kelantan, an overall achievement of 1,000 lots per month is expected. It is also expected that each party can complete at least 35 lots per month without any query, with an average size of 6-8 acres per lot. Under an ideal condition, a title survey in an urban area of 15 lots is expected to take two weeks of field work, one week of checking, one week of plan drawing, and one week for the preparation of the document of title.

However, findings have revealed that the set target was never achieved. The progress of work is so poor and thus increased the various aspects of annual backlog. For example, the best checker only manages to check 4 lots/day, but evidence has shown that the progress of the majority of the checkers is about 3.1 lots/day. On the field side, although the set target is 35 lots/month, it was found that hardly a single survey team can complete one lot per day. One of the contributing factors is that most of the surveys for the alienation of State land involve working in rough terrain, thick undergrowth and severe working conditions. At the Drafting Section, the average monthly progress of preparation of certified plans is about 40, well below the set target of 100 per month.

The costs of survey of a land parcel surveyed separately is even more. It was found that the systematic survey of group alienation of State land involving 40 to 50 contiguous land parcels cost 10 to 20 per cent less per parcel when compared to a separate survey of a single land parcel. When dealing with more than 50 contiguous land parcels in a survey scheme, there is no significant economy of scale and the cost per land parcel remains the same. For group surveys involving less than 50 contiguous land parcels, the costs increase steadily as the number of land parcels decrease. For this reason, the Survey Department in collaboration with the Land Office must consider carrying out the survey of all alienated State land before the adjudication process takes place. By doing so, the State as well as the Federal Governments can save a considerable amount of money, as well as possibly allocating available resources to other areas.

It was identified that under the present cadastral system, the ratio between the times taken for field survey, computing and plotting is $2:1^{1}/_{4}:1$. For any survey work with queries which needs a re-survey, it will eventually require the same proportion of time for the subsequent checking and plotting. The assessment of the survey costs must be evaluated in terms of the gross costs rather than the ratio derived costs. For example, the survey costs would be almost doubled as demonstrated in Appendix 4B if there were queries which necessitated a re-survey. One of the reasons why about 40 per cent of the work is rejected is because most of the field checks were not carried out in the field. Interviews with many surveyors acknowledged this fact; this is discussed in section 4.3.4.

The following is an example to demonstrate the manner in which survey fees are charged for a survey of new alienation of agricultural land, carried out by a licensed surveyor (in private practice) and the Government surveyor (from the Survey Department). The lots concerned are 6231 and 6232 as shown in Figure 4.1. These two contiguous lots are assumed to belong to one owner, surveyed at the same time and as such counted as one job.

4.3.1. <u>Licensed Land Surveyor's Rate</u>

According to the Thirteenth Schedule (Regulation 99) of the Licensed Land Surveyors Regulation, 1959, the survey fees for agricultural purposes, whether for new alienation or for sub-division surveys, is charged in accordance with the number of chains surveyed. This includes chainages of the perimeter of the lots under survey, and other connecting lines required for proving old marks, azimuth, controls, datum and refixations.

Total chainage of perimeter for lots 6231 and 6232

= (408.70 + 453.50 + 314.50 + 486.20 + 499.50 + 220.00 + 790.60 + 466.00 + 429.30 + 818.79) links

= 4827.09 links

= 48.27 chains

Total area of lots 6231 and 6232

= (3.826 + 4.749) acres

= 8.575 acres

Assuming that the total chainages of connecting lines required for proving old marks, azimuth, controls and refixations is 20 chains, the total survey fees chargeable will be

Basic charge	$ 600.00
Total chainages of 48.27 chains at $25.00 per chain or part thereof	1,225.00
Total chainage of 20 chains for refixations, datum, etc. at $25.00	

per chain or part thereof	500.00
Total	$2,325.00

The above charges include refixations, replacement of missing marks of lots under survey, computation and the preparation of certified plans.

4.3.2. Survey Department's Rate

a) Chainage

According to the Schedule of Survey Fees (Survey Department), the survey fees for agricultural lots of 8.575 acres

= $70.00 (for the first 6 acres) + $7.00 for each additional acre or part thereof up to 10 acres

= $70.00 + (3 x $7.00)

= $91.00

However, the above fees exclude the costs of survey plans and boundary marks.

b) Refixation and replacement of missing boundary marks

Assuming that 3 connections are necessary in order to effect the refixations or replacement of boundary marks, involving a total of 6 chains, the cost will be

= 6 chains x $5.00 for each chain or part thereof

= $30.00

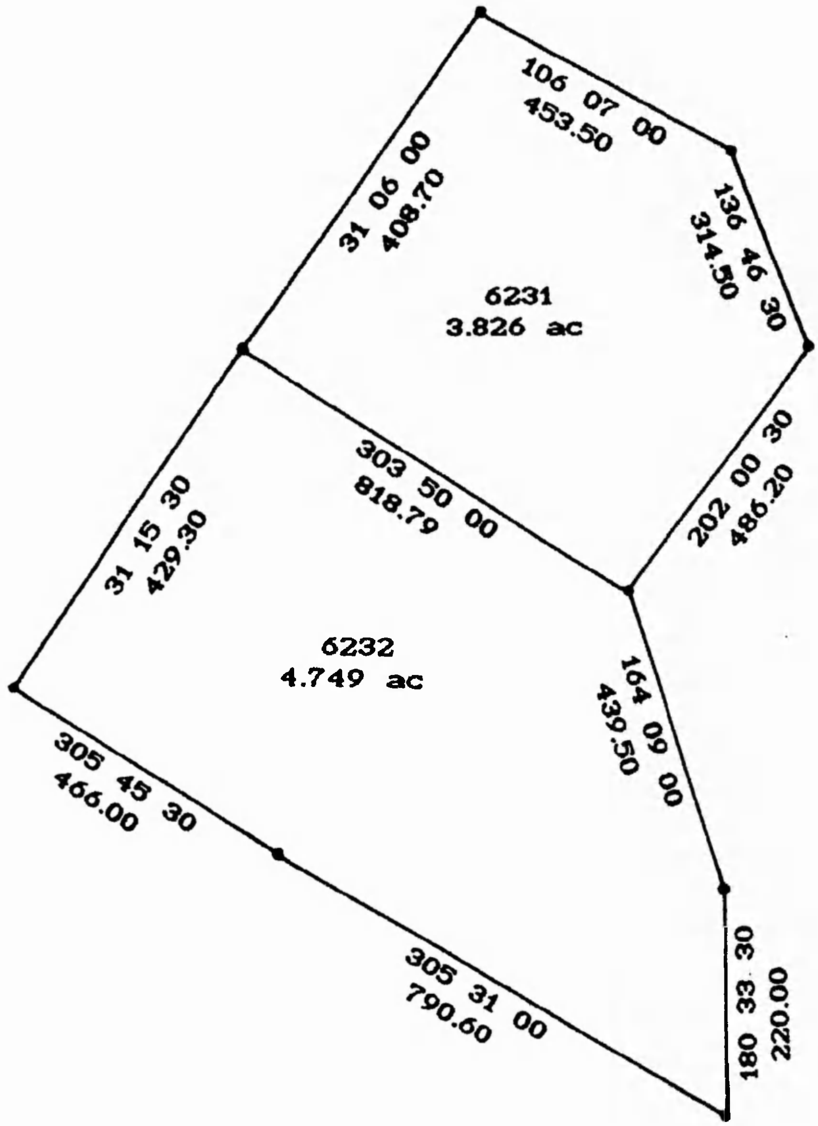


Figure 4.1. Agricultural land - Lots 6231 and 6232.

Assuming that 3 refixations are required to relocate moved or missing boundary marks, the cost will be

= (\$80.00 for the first mark refixed or replaced) +

(\$35.00 for each subsequent mark refixed or replaced in the course of the same survey)

= \$80.00 + (2 x \$35.00)

= \$150.00

c) <u>Preparation of title plans</u>

Assuming that lots 6231 and 6232 are State leases, the cost of preparing the title plans will be

= \$6.00 per lot x 2 lots

= \$12.00

d) <u>Boundary marks</u>

For every mark replaced or emplaced as a boundary mark, or each mark emplaced as a reference mark to identify the boundary corner which cannot be directly marked due to obstruction or other causes, the cost chargeable is

i) for each iron pike \$5.00

ii) for each stone, pike or concrete mark \$2.00

Since lots 6231 and 6232 are agricultural land, it is assumed that only concrete marks are emplaced (or replaced). Out of the 9 boundary marks, it is assumed that 3 are emplaced (or replaced). The cost will be

= 3 x \$2.00 for each concrete mark

= \$6.00

The total amount of survey fees chargeable by the Survey Department will therefore be

= $(91.00 + 30.00 + 150.00 + 12.00 + 6.00)

= $289.00

From the above examples, the total survey fees chargeable for the survey of agricultural lots 6231 and 6232 for agricultural purposes is $2,325 if the survey is carried out by the licensed surveyor, and $289 if carried out by the Survey Department. These calculations are based on the chainages required to provide old marks, azimuth, refixations, etc. and intended to demonstrate the difference of fees chargeable by the two groups of surveyors. The fees charged by the Survey Department is by no means an indication of the actual cost of the survey. The estimated basic costs of carrying out the above surveys is presented in Table 4.7. This is based on a rough estimate using the labour rates of the Survey Department. The estimated actual overall costs (including overheads) for such surveys is about $3900. Under most circumstances, it was found that the fees chargeable by the Survey Department is affordable by the small holders. This is one of the subsidies granted by the Government to small holders under the National Agricultural Policy. Under this policy, the Government decided to alienate agricultural lands to small holders throughout the country. This followed the requirement to survey all alienated land in order to up-date the

Table 4.7. Estimated costs of surveys for lots 6231 and 6232.

Type of Activity	Estimated time taken (hrs)	Estimated cost per hr. $	Estimated Total costs $
1.Field tracing			
a) preparation	5	11.20	56.00
b) checking	1	11.20	11.20
2. Field work	3 days	360.00/day	1,080.00
3. Computation			
a) first	2	9.00	18.00
b) second	1	9.00	9.00
4. Clerical	0.5 day	55.00/day	27.50
5. Drafting			
a) preparation	1 day	55.00/day	55.00
b) checking	0.5 day	55.00/day	27.50
Estimated total costs			$1,284.20

cadastral standard sheets. Thus, it becomes the responsibility of the Survey Department to carry out such surveys and a minimum charge is made. Even without a secure title, it was found that small holders will continue to occupy and work on his land than pay the licensed surveyor to carry out the survey. This is because the Settlement Officer (SO) from the Land Office had already marked (pegged-out) the provisional boundaries for all alienated land and Qualified Title (QT) issued to the proprietors. There is no urgent need to possess a Final Title because the small holders who already own the QT's can continue to work on his land without hindrance.

The main bulk of backlog at the Survey Department consists more of surveys of alienated agricultural lands than any other forms of surveys (such as strata title survey, mining survey, etc.). This is because such surveys become the responsibility of the Survey Department after the small holders were unable to engage licensed surveyors who charge higher fees. For land alienated under a mining lease, the proprietors are always able to employ the licensed surveyors to carry out the survey because of their favourable financial situation. By doing so, the proprietors will be able to get the Final Title much faster once the survey is carried out. The issue of the document of title depends on the completion of the preparation of the certified plan, which in its turn, is prepared after the survey is completed. The sooner the survey is executed, the sooner the proprietor receives the Final Title. This is the main reason why there is no backlog of title surveys for mining leases at the Survey Department. For long term stability of tenure, it is proposed that the State Government should not alienate land for any purpose until it is properly surveyed and the document of title is issued for it.

4.3.3. Overall Cost of Cadastral Survey

The cost of a survey may be estimated from the labour rates, the time, and equipment used and vary considerably. The basic field and office costs of the people at the *sharp end* who carry out the work can be multiplied by three to give a fair approximation to the true overall cost of a survey. Overheads include the salaries of administrative and supervisory staff not directly concerned with the survey process, the costs of maintaining buildings, air conditioning, lighting, telephones, postage, the cost of amortisation of equipment, training, loss through sickness and so on. Government overheads tend to be higher than in private companies because of the extra administrative burden of government activities. Even many overheads are not accounted for. The private sector operate with a profit margin which to an extent offsets the difference. Survey fees laid down by professional institutions often allow companies to work on a basis of labour costs plus 100 or 150 per cent but the labour often includes a percentage of time spent on administration by a senior professional and in general the profit margins of many survey companies are not high.[11]

The following is the calculation for the cost of carrying out a survey of an average land parcel of 1.5 acres by the Survey Department in 1988, based on an average salary for a surveyor and office staff of $1,000 per month. It is intended to give an estimate of the national cost of cadastral surveying.

(i) <u>Annual cost of field work</u>

This consists of the following:-

a) salary of the land surveyor*

b) salary of other field staff* (chainman, instrument man, field labourers, and an overseer)

c) other allowances and transportation costs*

Total annual costs	$8,425,201

(ii) <u>Annual cost of office work per state</u>

This consists of the following:-

a) preparation of field tracing*

b) checking and examination of surveys*

c) production of certified plan*

Total annual costs	$3,769,079

Note:- * The breakdown of these costs are not known.

(iii) <u>Annual administrative costs per state</u>

(Directly concerned with the cadastral survey process)

This consists of the following:-

a) central administrative costs	
Computing and Drafting Sections	$497,177
b) other costs at the State Director's office (excluding the salary of the State Director, Deputy State Director and clerical)	$4,063,262
c) other costs at the District Surveyor's office	$1,342,466
Total annual administrative costs	$5,902,905

(iv) <u>Summary of survey costs per state</u>

a) field work	$8,425,201
b) office work	$3,769,079
c) administrative costs	$5,902,905
Total annual survey costs	$18,097,185

(v) <u>Estimated overall survey costs per state</u>

To give a fair approximation of the overall survey costs, overheads (such as salaries of administrative and supervisory staff not directly concerned with the survey process, building maintenance, air conditioning, lighting, telephones, postage, the cost of amortisation of equipment, training, loss through sickness, etc.) must be taken into account. A multiplication factor of

3 is adopted to give a fair approximation of the true overall cost of cadastral survey.

Estimated overall annual survey costs (including overheads) per state

= $18,097,185 x 3

= $54, 291,555

(vi) <u>Annual national productivity</u>

Number of land parcels surveyed	21,504 lots
Total distances surveyed	12,408,300 metres
Total area surveyed	17,746 hectares

(vii) <u>Daily productivity</u>

Total number of man-days in the year 30,970

Daily productivity:-

a) distance = $\frac{12,408,300}{30,970}$ = 400 metres/day

b) land parcels = $\frac{21,504}{30,970}$ = 0.69 lot/day

(viii) <u>Estimated cost of field work per day per field party</u>

Total costs of field work (including overheads) $25,275,603

Cost of survey per day per survey party (including overheads) = $\frac{25,275,603}{30,970}$

= $816 per day

(ix) Estimated overall cost of field work for every metre

Estimated (annual) overall survey costs $54,291,555

Annual productivity (distance) 12,408,300 metres

Estimated cost for every metre surveyed

$$= \frac{18,097,185}{12,408,300}$$

$$= \$4.40$$

(x) Estimated overall office cost

a) Total man hours in the year = 553,960

b) Estimated overall costs of office work (including overheads) = $11,307,273

c) Estimated cost per man hour (including overheads)

$$= \frac{11,307,273}{553,960}$$

$$= \$20.40$$

(xi) Estimated cost of survey per lot

Estimated overall survey costs per state per month (including field, office, administrative works, and overheads)

$$= \frac{\$54,291,555}{12}$$

$$= \$4,524,296$$

Estimated no. of lots surveyed per state per month

= 600 lots

Estimated cost per lot (including overheads)

$$= \frac{4,524,296}{600}$$

$$= \$7,540$$

(xii) Estimated national costs

On average, it is assumed that there are about 30 field parties in each state and 25 working days per month. If the daily progress of survey is 0.69 lot/day, then the monthly progress per survey party is

= 0.69 lot/day x 25 working days in a month

= 17.25 lots/month (an average lot is 1.5 acres)

The estimated costs of maintaining survey parties (including overheads) per month per state will be

= \$816 per survey party/day x 30 survey parties x 25 working days/month

= \$612,000 per state per month

The estimated national annual survey costs (including overheads) will be

= \$612,000 x 12 months x 11 states (West Malaysia)

= \$80,784,000 per year

(xiii) Conclusion

From the above calculations, it was found that the average cost of survey of a single land parcel (including overheads) with an average size of 1.5 acres is \$7,540. The average production of a single survey party is 17.25 lots/month and 400 metres/day. Thus, the set target of 35 lots/month set by every State Director of Survey for every field party is never achieved. This indicates that there is poor progress in field work. The estimated national overall costs of field survey in each state (including overheads) was found to be $80,784,000 per year. The estimated overall costs of field survey in each state is $612,000 per month. Taking into account the various overheads, the estimated overall annual expenditure at each State Survey Department is about $54 million.

4.3.4. <u>Principle of checks in the field</u>

From the above evidence, it shows that the cadastral survey system and management in Malaysia are too costly and time consuming. The cost of cadastral surveys, excluding the operation of the system of title registration, is out of proportion to the benefits to be derived therefrom, whilst the cost and time required for extending such a system to cover the entire country is beyond the resources of the country. Malaysia inherited the colonial land administration system which long ago lost touch with modern methods of land management and even with the present day realities. The techniques and operations required are too costly and time consuming. To have a systematic cadastral survey system, it does not mean investing millions of dollars can actually achieve the objectives. The present cadastral methodology does not require expensive instrumentation to reduce the cadastral survey backlog. Rather, the working principles have to be understood by all concerned. One of the most important principles of survey is that checks should be carried out in the field and that no mistake is allowed into the system. An extra ten minutes of checking being done in the field could save the next day's work. The most expensive forms of mistakes are those that take place in the field since the surveyor may have to re-observe some of his measurements.

One of the most practical and cheapest steps to overcome this problem is to supply each surveyor with a programmable pocket calculator. Most of the present day calculators (with built-in mini printer to provide hard copy output) are capable of *telling* the surveyor whether the survey is acceptable or otherwise, and at a modest price of about $100 each. Surveyors should be encouraged to carry out regular checks in the field. Such an investment is estimated to cost about $35,000. Saving of about 30 to 40 per cent of the overall survey costs can be made if checks are carried out in the field, and methods of survey are sound and self-checking. At 30 per cent level, an annual saving of about $16 million is achievable in each state. At the national level, saving of more than $170 million is possible. Such an investment would bring about an immediate and considerable saving to the Survey Department. In many cases, it is reasonable to assume that the true costs of checking an individual survey are at least $300, often rising to a considerably higher figure.

Programmable pocket calculators are available in various models which can be programmed according to the following methods - internally by keying the program in from the keyboard, by means of programmed magnetic cards, or by plugging in preprogrammed solid-state modules for special routines. All pocket calculators can be run on rechargeable batteries or may be plugged into AC current. These moderately priced calculators are extremely powerful tools for the surveyor in the field and in the office. This will soon offset the cost of such calculators.

4.4. Cost of Survey Backlog

The daily costs of maintaining a survey party (from the Survey Department) in the field is about \$816 per day. Checking and examination of surveys as well as drafting of survey plans cost about \$10 an hour (excluding overhead costs). It was also found that, on average, about 40 per cent of the surveys require re-visiting the site as a result of queries. It has been shown in Appendix 4B (Tables 4.3, 4.4 and 4.5) that because the first surveys were found to have some form of queries, the three surveys were rejected at the Computing Section. As a result, re-surveys were required. In Table 4.4, the cost of the first survey (Job File: PUKN 221-82) which includes clerical works, preparation of field tracings, computation and plan drawing was \$11,335.49. Due to the re-survey, another series of checking and drawing of survey plan were required and these had incurred an extra cost of \$3,864.18, an increase of 34 per cent.

In the second example (Table 4.5), the cost of the first survey (Job File PUKN 218-82) was \$8,598.74. Again, a re-survey was required followed by another process of computation and plan drawing. These had incurred an extra cost of \$1,420.30, an increase of 17 per cent. Random examination of the files at the Survey Department in Kota Bharu involving land scheme surveys have shown that for surveys which are found to be in error and did not satisfy the requirements of the department, the execution of re-surveys have increased the overall survey costs by at least 25 per cent.

Assuming that on average 40 per cent of surveys require re-surveys due to some form of queries, this effectively increases the overall annual national costs of survey at each state (including overheads) by about

$$= \frac{40}{100} \times \$54{,}291{,}555 \times \frac{25}{100}$$

$$= \$5{,}429{,}155$$

It would be difficult to quantify the exact cost of survey for a single piece of land and the time spent for it depends on various factors such as land size, class of survey, nature of terrain, amount of cutting and clearing required, distance of site, its ease of accessibility, etc. Taking into consideration these factors, it has been shown that an extra costs of almost $5.5 million have been spent annually on re-surveys in each state because of the failure to get it right first time. This means that every Survey Department spends about $452,000 more on re-surveys every year.

Even more difficult is to quantify the exact cost of loss of earnings borne by the land proprietors for not having the Final Title in a timely manner due to the delays caused by the failure to finalise surveys. In remote areas, new activities on land may be less likely to take place. Land may, and continue to be used, for grazing or other agricultural produce which is practiced using traditional methods. The area of land under cultivation is expanding to meet the local and growing export demands for all sort of resources. Land parcels are also transferred by private conveyancing or passed on to sons or relatives and go on unregistered. Land occupation goes on without the need for a survey. However, in urban areas and its fringes the situation is almost completely different. In 1988, about 21,500 surveys were executed throughout West Malaysia. If 40 per cent of the surveys were rejected at the Computing Section, then at least 8,500 surveys were subjected to delay. The estimated loss of earning caused by the slow progress of survey is summarised as follows.

Estimated monthly loss of earning per land proprietor	Estimated monthly loss of earning nationwide
$100	$0.85 million
200	1.7
300	2.55
400	3.4
500	4.25
600	5.1
700	5.95
800	6.8
900	7.65
1,000	8.5
1,500	12.75
2,000	17.0
2,500	21.25
3,000	25.5

Most of the expected growth of households and associated development must be accommodated on land not now developed. There are clear signs that competition for land is increasing at a faster rate than expected and will continue to do so in the decade ahead. The notion that gains from the sale of undeveloped land in remote areas are undeserved is traceable to the fact that land is not to be subjected to market forces. No matter how high land is priced, new production on land is seldom possible, the supply of land being relatively fixed. While the amount of land may be fixed in supply, innovation is still possible in its efficient use, as evidenced by both the RISDA Mini Estate Project and the amalgamation and rehabilitation programs carried out by FELCRA in Kelantan, Kedah and Trengganu. Although land may be relatively fixed in supply, development on land is not. Gains from land are often important as a potential source of cross-subsidisation for farmers, builders and other land developers.

It can be expected that the density of future land development as embodied in the Five Year Malaysia Plan will be a key determinant of future increasing needs for cadastral surveys. This will obviously be affected as a result of the slow progress of survey and the failure to issue final document of title in a timely manner. One effect of this is the failure to provide security against loans from financial institutions. These problems have increasingly constrained the development process in many local and federal government projects and will continue to add costs through the next decade.

4.5. Checking and Examination of Cadastral Surveys

The need for checking and examination of surveys arises from an acceptance by the State Authority of the responsibility to protect the interests of the general public. When a survey is completed, a certified plan (CP) is prepared which then form part of the final document of title. The Computing Section is responsible for the checking and examination of all cadastral surveys carried out in the state, not only by the Government surveyors but also by the licensed surveyors in private practice. Instruction to submit all surveys carried out by the Government surveyors to the Computing Section is prescribed in the Survey Regulations, 1976, Part II(66) which states that -

Surveyors should hand in their field books within one week of completion of field work, together with computations for the following:-
- *a) Observations for azimuth.*
- *b) Reductions of bearings, showing angular misclosures and reduction of distances.*
- *c) Direct bearings and distances.*
- *d) Linear misclosures.*
- *e) Area computation or plotting when so instructed. These computations must comply with the directions in Appendix VIII.*
- *f) Print or tracing showing station numbers and other information required for the use of the Electronic Computer.*

It is clear from the outset that all surveys carried out by the Government surveyors have to be submitted to the Computing Section for scrutiny. What is not stated in the Survey Regulations, the National Land Code, the Licensed Land Surveyors Ordinance and the Licensed Land Surveyors Regulations is the requirement to submit to the Survey Department for checking purposes, the surveys carried out by the licensed surveyors. Surveys carried out by licensed surveyors have been traditionally accepted by the Survey Department for checking and finalisation and is seen as the State's responsibility to protect the interests of the general public. Furthermore, checking is carried out free of charge as the general conception is that licensed surveyors are carrying out a duty to relieve some of the Department's work load.

The important point to realise is that a licensed surveyor implies additional time and cost to the Survey Department in the checking of his results. Unfortunately, checks are normally carried out in the office and not in the field. Generally speaking, the time taken in checking the work of a licensed surveyor is some three times as much as that required in the case of a Government surveyor. The latter is subject to direct inspection in the field, whilst his subsequent career depends on the accuracy of his work. It is estimated that the cost of checking licensed surveyors' work by the Survey Department in 1988 is at least $3 million.

Theoretically, all surveys submitted by licensed surveyors to the Survey Department have been checked. It was intended that only light checking is to be done at the Survey Department. Normally, the checker examines the perimeter survey and to determine whether all survey marks (old and new) are in position. Distances are not normally checked. However, findings have revealed that licensed surveyors do not fully check their surveys and in turn expect the checking (and the pointing out of mistakes) to be done by the Survey Department. The reason why this has been the case is that, when surveys are submitted to the Survey Department together with the survey plan, the Licensed Land Surveyors Board will release 75 per cent of the survey fees to the licensed surveyor. For the same reason, any queries arising after the submission will be reluctantly taken into consideration.

Another aspect is the plan drawing by the licensed surveyors. It has been revealed that the quality of the drawing, which is produced manually, is poor and sometimes lacks the inclusion of certain information such as that of the adjoining lots and other survey connections. Calculation sheets were not prepared to the requirement of the Survey Department. There were also cases where survey traverses do not start from and end at some known coordinated control point. There are many other reasons why surveys are returned back to the land surveyors for amendment. The following are two examples:-

a) <u>Solar Observation</u>

The required frequency of making solar observations when carrying out standard traverses and second class surveys, mentioned in Appendix 1A(3) of the Survey

Regulations, states that:-

For adequate control in azimuth it is essential to obtain an angular check by solar observation or otherwise at intervals not exceeding 25 stations - exceptions may be permitted in special cases.

Appendix III(2) of the Survey Regulations also states that:-

Azimuth will be controlled by solar observation or by connections to previous surveys of satisfactory azimuth at intervals of not more than 25 stations under normal circumstances.

There are numerous cases where solar observations were made at the 26th. or the 27th. station because of practical difficulties. When the survey is submitted to the checker, it was sent back to the surveyor because the observation was made at the 26th. or the 27th. station thus contravening the regulation. An extra observation was required at the 25th. station even though no gross error was detected. By the time the computation is checked and the surveyor returns to the working site, most of the survey markers and traverse points may be missing. Virtually, it necessitates re-doing the survey. This arises from the lack of experience and *ground sense*, which is an ability of some of the checkers to appreciate the field working conditions. The majority of the checkers have no experience of working in the field and cannot exercise discretion. This particular problem is not relieved by the rigid nature of the regulations governing the execution of cadastral surveys in the country and will be discussed in detail in Chapter 6.

b) Permissible Closing Errors

Part 1(48.1) of the Survey Regulations states that the permissible closing error for angular measurement in first class surveys is -

........0' 10' per station with a maximum difference of 01' 15' between the traverse bearing and that derived from trigonometrical data, from another first class survey, from a solar azimuth, or on closing a circuit.......

Part 1(49) also states of the permissible closing error for angular measurement in second class surveys -

........00' 20" per station with a maximum accumulation of 02' 30".......

Theoretically, this permissible closing error could be applied to the perimeter surveys, internal as well as the minor traverses. However, there are cases where the internal traverses of a second class survey may slightly exceed the permissible maximum accumulation outlined above, say by 10". Since the closing error exceeds the stated limit of 02′ 30", even for internal traverses, such a survey is sent back for amendment. There are also cases where the first angle measurement of the first station in the second class surveys has a misclosure of 40" but well within the permissible total accumulation of 02′ 30". Again, the survey is sent back for amendment without exercising any form of discretion and consideration such as - the site may be in a village some 15 miles away. Discretion must be exercised in interpreting Regulations 48.1 and 49; these small differences do not materially affect the owner′s interests and have no practical significance, and do not justify expensive re-surveys.

4.5.1. Proposal - The Release of Survey Fees

It was mentioned in Chapter 3 (section 3.4.2.) that the amount of checking and examination of surveys carried out by the Government surveyors and the licensed surveyors stood at 13,965 in 1976 but increased seven fold in 1986 to 90,802. In section 3.3.2., it was also mentioned that the progress of title surveys carried out by the licensed surveyors practicing in Kelantan has deteriorated very badly since 1976. In 1983, the overall progress fell to 73.1 per cent. In 1986, the worst situation was recorded with an overall progress of only 8.7 per cent. The figures have shown that the overall progress of the licensed surveyors is deteriorating and appropriate actions have to be taken urgently. Two possible solutions are as follows.

4.5.1.1. First Alternative

The first alternative is for the Survey Department to stop checking all surveys carried out by the licensed surveyors. All surveys carried out by licensed surveyors are to be checked by themselves and submitted to the State Director of Survey only for approval. By doing so, the licensed surveyors will take full responsibility for the work they carried out. Any queries arise from such surveys will then become a civil matter between the licensed surveyor and the client concerned. An estimated saving of at least $3 million a year is possible if the Survey Department ceases the checking of surveys carried out by licensed surveyors. This proposal necessitates an inclusion of a provision in the National Land Code stating that the State Authority will no longer be responsible for surveys carried out by the licensed surveyors. However, all survey data, field books, calculation sheets, and plan drawing have to be deposited to the Survey Department and continue to become the state property.

The consequences of the deficiencies in the survey work were often not apparent for several years, sometimes generations. Under the Malaysian Torrens System of registration of title to land, the need to ensure that the land parcel referred to in the document of title is reasonably described and necessitates the State control over all the cadastral survey activities. The extent of this control has increasingly come under attack, as Warren[12] has stated -

Even though the law prescribes that all surveys must be carried out by professionally qualified surveyors it also prescribes that every survey must be checked by the Government Agency. This is illogical since, if by law the surveyor must have passed the prescribed examinations before he can be registered to practice as a surveyor, his work should be accepted for the purpose of preparing deed plans. If a surveyor is found to have been negligent, sanctions can be, and indeed are, applied. In no other profession where the obtaining of a professional qualification is prescribed does the State find it necessary to organise a checking system of this nature.

All surveys submitted by the licensed surveyors to the Survey Department are checked by technicians and technical assistants acting in the name of the State Director of Survey; often they simply observe the rules laid down in the Survey Regulations and not the realities of the situation. Some do not even have any experience of working in the field. *Inter alia,* all surveys submitted by the licensed surveyors are carried out by technicians, technical assistants and graduate surveyors working under his supervision. Again, this group of surveyors simply observe the rules without any concern of the local situation. Lack of experience of the surveyors is the main concern that contributes to the increase in the number of surveys being rejected. An interview with a local licensed surveyor, commenting on the lack of experience of surveyors, has stated -

The three years experience the graduate surveyors have gained (while at university) is never considered sufficient to undertake this nature of job, especially in difficult terrain. For technicians and technical assistants, five years experience (gained while at polytechnic/colleges and other training centres) is insufficient. However, this is the reality. The Survey Department considers these surveyors as on-the-job training. Thus, during the 5 or 6 years of his career, he is making all the mess and the result is that about 40 per cent of the surveys are badly executed.

In Malaysia, the process of checking and examination of cadastral surveys carried out, either by the Government surveyors or the licensed surveyors, is seen as a vital component, not only to protect the interests of the public but also to ensure that standards are uniform. In some southern states in Nigeria, the system of checking was abolished at one time in order to reduce the survey backlog. The quality of work deteriorated significantly and the whole system was a complete failure; the whole checking system had to be implemented again. Thus, the idea of sample checking is not practical in Malaysia, even to surveys carried out by the licensed surveyors. Instead, in-depth checking and examination of all cadastral surveys must continue to operate in order to protect the public. Hence, the case for the abolition of checking is seen more as a theoretical dogma than practical because on average, four out of ten surveys submitted to the Survey Department have to be returned to the surveyor for amendment. The figure varies from surveyor to surveyor and although the weaker surveyors are known, there is hesitancy to bring recalcitrant members before the Board and, if necessary, to remove their licenses. This is because of the close nature of the fraternity of surveyors. At every State Survey Departments, licensed surveyors are generally identified, based on the quality of their surveys, as *a good, an average,* or *a poor surveyor*. Although licensed surveyors are technically able, they are commercially oriented and think more of their trading role than their professional role.

4.5.1.2. <u>Second Alternative</u>

The second alternative is to proceed with the present system of checking whereby licensed surveyors continue to submit all surveys to the Survey Department but to charge them for the checking being done. A standard basic charge may be imposed for the checking plus the extra charges based on the number of corrections being made. It is estimated that the Survey Department can generate an income of at least $5 million a year on the checking services offered to licensed surveyors. By doing so, licensed surveyors will then check their surveys thoroughly before submitting to the Survey Department. The survey fees charged by the licensed surveyor to their clients include the cost of checking; logically the licensed surveyor must be responsible for the checking of surveys he carries out, or else pay somebody to do this work for him. Under the present system, the nation as a whole is subsidising the costs of checking the survey, although the survey information later becomes the property of the Government and forms part of integrated bank of survey data which may be used by a number of different people. Dale[13] has stated that the true costs of checking are high and inquiries suggest that they are rarely less than £20 to £30 even for a small survey, and are often much greater.

It was mentioned earlier that under the present system, licensed surveyors will receive 75 per cent of the survey fees deposited at the Licensed Land Surveyors Board upon submission of survey plan of a particular survey work to the Survey Department. As a result, any surveys which are returned for amendment will be of less priority because the work is isolated. It will only be re-surveyed when there is another survey to be carried out nearby or when there is a survey party which is free to take over the work. In the process, these delays are built up. It is proposed that the Licensed Land Surveyors Board will only pay 40 per cent of the survey fees after the plan is submitted to the Survey Department. Should a re-survey is required, the licensed surveyor will certainly take the work seriously for there is another 60 per cent of the survey fees to be collected. After the re-survey is completed and finalised, the remaining 60 per cent of the survey fees can be released. Such a strict control imposed on the execution of the cadastral survey would certainly bring about a much more professional attitude towards the work, for there should be a system of monitoring the progress of every licensed surveyor by the Board.

The above recommendations are based on the findings which are outlined in section 4.3.3. with regards to the costs of survey of a typical land parcel carried out by the licensed surveyors and the government surveyors. In this example, the costs of surveys of two agricultural lots were found to be $289.00 if undertaken by the Government surveyor and $2,325.00 if undertaken by a licensed surveyor. Assuming that the above ratio of fees is true for all cadastral surveys carried out by these two groups of surveyors, then the release of 40 per cent of the survey fees by the Licensed Land Surveyors Board for surveys carried out by licensed surveyors is a justifiable proposition for the reason which follows. In reality, when 40 per cent of the fees was released, it only constitute 50 per cent of the overall survey costs. Thus, any re-survey which is required will certainly motivate the licensed surveyor to attend to the query for there is a substantial amount of money to be collected from the Board when the re-survey is finalised.

The reasons for not attending to the query are manifold as mentioned earlier. When 75 per cent of the fees were released by the Board on submission of the survey plan at the Survey Department, some licensed surveyors are reluctant to carry out the re-survey because the remaining 25 per cent of the fees does not justify the extra expenses incurred in doing the re-survey. Furthermore, income of survey companies from cadastral surveys alone is less when compared to other jobs such as engineering surveys. Out of the 75 per cent of the fees already collected, this constitutes 95 per cent of the overall costs. From the earlier example on the survey of agricultural lots 6231 and 6232, the estimated overall costs of carrying out the survey (including overheads) by a survey company is $1,930. The failure to attend to the query and carrying out the re-survey, and in turn collecting the remaining 25 per cent means the survey company is losing 5 per cent of the fees (about $120). In monetary terms, this may be a small figure if compared to the added expenses incurred on carrying out the re-survey.

At present, there is no tighter legislation to control the practicing surveyor to carry out the re-survey as soon as the mistakes were identified. The present system of releasing 75 per cent of the survey fees on submission of the survey plan seems, indirectly, as an act of inviting the licensed surveyor to ignore the importance of attending to the re-survey as soon as possible, perhaps to be undertaken within a limited time scale, and adopting such re-surveys with less priority. By adopting this approach, it automatically forces the licensed surveyor to take a more responsible and professional approach towards attending such re-surveys in a timely manner. Not only there is a profit to be made, the 40 per cent of the fees collected only constitutes 50 per cent of the costs of carrying out the survey.

This alternative does not require any amendment to the existing National Land Code but needs the passing of the Surveyor General Circular to state categorically the basic charge for the checking all cadastral surveys and the extra charges for any corrections made. It also need to state categorically the release of 40 per cent of the survey fees by the Licensed Land Surveyors Board upon submission of the survey plan and the remaining 60 per cent will only be paid after the survey has been finalised. This alternative is seen as the most viable and practical package in order to improve the overall situation involving the execution of cadastral surveys by the licensed surveyors in the country. The viability of this package was tested by interviewing several survey personnel at the Land Office and the State Survey Department in Kota Bharu, as well as senior survey personnel at the Survey Department Headquarters in Kuala Lumpur. The result has shown a convincing support whereby out of 100 subjects, 95 per cent agreed to the package while the remaining 5 per cent failed to give any comment.

4.6. Conclusions

The proposed programme of improving the control network is viewed as a substantial improvement over the existing system. It appears that governments and planning agencies have over-looked the need to improve the existing control network system. What is evidenced is the high price being paid unnecessarily on surveys and other land administrative matters. Due to lack of data on certain areas, the benefit and cost measures do not present precise magnitudes - they are estimates.

It was found that the average cost of survey (including overheads) of a single land parcel (average size is 1.5 acres) is $7,540. The average production of a single survey party is 0.69 lot/day and 400 metres/day. Thus, the set target of 35 lots/month set by every State Director of Survey is never achieved. The estimated overall national costs of field survey (including overheads) is $80,784,000 per year. In each state, the estimated overall monthly costs is $612,000. Also, most of the overhead costs at the Survey Department are not recorded. An annual saving of about $170 million can be made by supplying a programmable pocket calculator to every survey party to ensure that checks are carried out in the field rather than in the office. Such an investment would cost the Survey Department about $35,000 and would offset the cost of the purchase of the calculator.

Surveyors submit their work to the Survey Department for scrutiny by technicians whose knowledge of surveying is often based on elementary instructions and experience in a drawing office and whose only rule book is the Survey Regulations. That so much work is returned to the surveyors is, however, in no way a reflection on the checking process; rather it is a condemnation of the professional standards of surveyors. Much of the work of the government as well as licensed surveyors is sub-standard and that a thorough checking must continue to operate in order to protect the public.

The proposed scale of fees that hammers licensed surveyors who made mistakes and ensuring that they do not recover 100 per cent of the full phenomenal figure of the survey fees until the surveys are finalised seems therefore a reasonable solution. Such an aggressive approach is necessary if the standards, which are considered desirable, are to be practiced. The stringent regulations laid down with respect to the execution of the cadastral surveys must be revised to allow discretion to be exercised so that unnecessary re-surveys which are costly and time consuming may be avoided. Considerations must therefore be given to monitor the progress of Government and licensed surveyors so that the expected productivity is achieved.

Under the present system, the Survey Department does not charge the checking service of surveys carried out by licensed surveyors. This costs the government at least $3 million a year. For the government to spend from 30 to 40 per cent on checking the work of licensed surveyors is a subsidy which the country cannot afford. The Survey Department can continue to check all surveys carried out by licensed surveyors but to charge them for the services given. It is estimated that this approach can generate an annual income of at least $5 million.

At present, the better surveyors are suffering the delays that arise because of the deficiencies of their counterparts. Instead, *good* work must be encouraged and must be rewarded, and conversely *bad* work must be penalised. As it is, the *good* surveyors are also being *penalised* for doing *good* work. An appropriate saying to describe this situation would be -

Four out of ten surveys are subject to queries

The other six suffer delays

CHAPTER 5: AUTOMATION AT THE DEPARTMENT OF SURVEY AND MAPPING

5.1. Introduction

Having discussed the deficiencies and weaknesses of the present cadastral survey system in the country, it is necessary to mention some of the steps already taken by the Department of Survey and Mapping to improve the cadastral survey backlog. The implementation of the Computer Assisted Land Surveying System (CALS), for example, is seen as an appropriate step to speed up the various stages of survey processing and management. The Government is conscious of the problem and a National Data Processing Committee, chaired by the Prime Minister's Department, was set up to study all aspects of computerisation in the various organisations including the Department of Survey and Mapping. The proposal to establish a computerised land information system in Malaysia was first mooted ten years ago when the New Straits Times, a national daily newspaper, published the following news item on 28th. May 1979:-

..........the problem of transfer of land ownership will be solved with the setting up of a Land Registration Centre. It was envisaged that the Centre would be equipped with computers capable of storing all data of land owners in the country.........

In October 1983, a tender was called for the supply, delivery, installation, testing and maintenance of a computer system with supporting software and applications packages on a turnkey basis.[1] The implementation of this pilot project, with an initial capital outlay of $2.75 million, formed the beginning of the graphics cadastre and was first started at the Survey Department in Johor in March 1985. This project is to be extended to the Survey Departments in Pahang and Perak in 1990 and to be followed to the other remaining states. The National Survey Cadastral Base will then produce base maps in graphical as well as digital forms for use by the planners and decision makers from all Ministries, Government Departments and the general public. This data base will then form the foundation of the framework of the Malaysian Land Information System (LIS).

At the same time, a computerised legal cadastre will be developed at each of the 99 Land Offices in Peninsular Malaysia with the installation of microcomputers. Through a capital intensive investment being made available to the Ministry of Land and Regional Development, the introduction of a high precision numerical cadastre will be a reality in the near future. The concept of the Land Data Bank which was approved in principle in March 1983, paved way for a digital cadastre in Malaysia.

As far as mapping is concerned, the existing standard and other topographic map series are 10 to 12 years out-of-date. The need to improve the map production was faced with two alternative approaches; to increase manpower or to introduce an automated mapping system. The Directorate of National Mapping had chosen the latter approach and tenders were invited and closed on the 8th. of September 1986 to provide a Computer Assisted Mapping System (CAMS) for the Department. An initial capital outlay of 10 million Ringgits was proposed with an increase of 5 professional staff. The tendered price for CAMS includes the provision for delivery, installation and the site preparation at the Survey Department Headquarters in Kuala Lumpur.

5.2. Initial Stage of Automation

Initially, two Electronic Data Processing (EDP) Systems were installed at the Computer Division, Survey Department Headquarters in Kuala Lumpur. These are the IBM 1130 System (installed on 1st. December 1969) and the EAI PACER 100 Automatic Plotting System (installed on 1st. March 1973 and subsequently upgraded on 1st. May 1975 and 31st. December 1981). The total costs of these systems were $1,737,200. The configuration of these two systems are presented in Appendix 5A (Tables 5.1, 5.2, 5.3 and 5.4).

5.2.1. Deficiencies of the System

The IBM 1130 system, purchased in 1969 with a memory of only 18K is considered obsolete and inadequate to handle the present requirements of the Department. The EAI PACER 100, purchased in 1973 with 16K memory was subsequently upgraded to 32K in 1975. The Central Processing Unit (CPU) memory and disk storage capacity are grossly inadequate to process or manipulate data for the Cadastral Survey Data Base as well as for updating the Standard Sheets. Furthermore, this system lacks the necessary software and hardware which are required to set up the Cadastral Survey Data Base as well as the interactive manipulation of such data.

The on-line and off-line flat bed plotters were purchased together with the EAI PACER 100 system in 1973 to form the Automatic Plotting System. Since this equipment was acquired, the two EAI PACER 100's frequently break down for long period and effort to put it right was very discouraging due to the unavailability of spares locally. The local agent providing the maintenance service was found to be unsatisfactory and since then, the maintenance has been temporarily taken over by Guthrie Engineering. Although Guthrie Engineering was appointed the sole agent for EAI computers in Malaysia, they still have difficulties in getting parts for the plotter. The problem became even worse when it was found that the production of EAI plotters had ceased in the USA. Other well-known computer suppliers were not in a position to support the software and hardware for these two plotters.

Three PDP 1104 computer systems were then purchased and installed at the Kelantan State Survey Department, the Topographical Division and the Electronic Computer Services. The system has a limited 132K memory capacity with no hard disk and uses magnetic tape. Eventually, the PDP 1104 system became a phased out model with no update facility. Furthermore, the system has other physical limitations such as the absence of multi-user terminal facility and cannot drive a plotter. From the unfortunate experiences of the Department, lessons were learnt regarding the acquisition of automated systems, its upgrading facility, and the after-sales service. Today, the IBM 1130, the EAI PACER 100 and the PDP 1104 systems are being used for training purposes. Since then, a feasibility study was undertaken and CALS was adopted.

5.3. Computer Assisted Land Surveying System (CALS)

The main objective of the implementation of CALS is to speed up the survey examination process from the data gathered in the field. Consequently, the base maps in graphical as well as digital forms may be used by the planners and decision makers from all Ministries and Government Departments. Base maps can be produced with the possibility of having attributes of land use and public services merged into them. It will then form the foundation of the framework of the Malaysian Land Information System (LIS). The system applications for CALS consists of the following:-

a) <u>the Cadastral Data Bank System (CDS)</u>

This involves the updating of the cadastral standard sheets and the preparation of the field tracings to be used by the land surveyors. Survey data are compiled from existing standard sheets and other source documents by the digitisation process. Up-to-date information of the land parcels to be surveyed as well as the adjoining lots will be included interactively on the field tracing. The work flow of CDS is presented in Appendix 5B (Figure 5.1).

b) <u>the Cadastral Survey Processing System (CPS)</u>

The CPS involves the processing of survey data, the production of final calculation sheets of surveyed land parcels, the updating of the Cadastral Survey Data Bank, the production of certified plans and the final document of titles. The work flow of CPS and its relationship with the CDS is presented in Appendix 5B.

c) <u>the Large Scale Mapping System (LMS)</u>

The main objective of this system is to present, graphically or digitally, all survey information. The cadastral survey standard sheet will form the basis for updating all land parcels, this information being related to a unique identification system; the lot number. Various types of survey data for LMS requirements are digitised and overlayed onto the Cadastral Survey Data Base. Alphanumeric data, such as those of land use and land classification, are captured and linked to the Cadastral Survey Data Base using the lot number as a common identifier. This will then be used for the preparation of land use maps, large scale town maps, and other thematic maps. The work flow of LMS is presented in Appendix 5C (Figure 5.2).

d) <u>the Management Information System (MIS)</u>

The MIS is made up of 3 distinct and unrelated components as follows:-

a) the Survey Record System (SRS);

b) the Personnel Record System (PRS); and

c) the Stores and Inventory System (SIS).

The SRS provides a close monitoring facility of the whole cadastral survey processes at the Survey Department starting from the receipt of the requisition for survey from the Land Office to the preparation of the certified plan and the submission of all title documents to the Land Office. The PRS covers information such as personnel particulars, salaries, service, education and training of all staff. The SIS will provide an accurate and efficient control over the running of survey stores in the state.

The work flow of the three applications systems of CALS is shown in Figure 5.3. The CALS configuration at the Johor State Survey Department is presented in Appendix 5D (Figure 5.4).

5.3.1. Cost Benefit Analysis of CALS

The estimated national costs of cadastral survey per state is $43,122,737 covering the 11 states in Peninsular Malaysia and the Federal Territory of Labuan (excluding the states of Sabah and Sarawak in East Malaysia). For analysis purposes, it is estimated that the CALS project can minimise the existing backlog in 10 years time. The breakdown of the costs of the CALS project is as follows.

Hardware	$1,749,340
Annual maintenance charges at 0.9%/month over 10 years	$1,889,287
Software	$ 729,411
Annual maintenance charges at 0.9%/month over 10 years	$ 787,764
Recurrent operating costs, estimated at $45,000 per year over 10 years	$ 450,000
Sub-total	$5,605,802

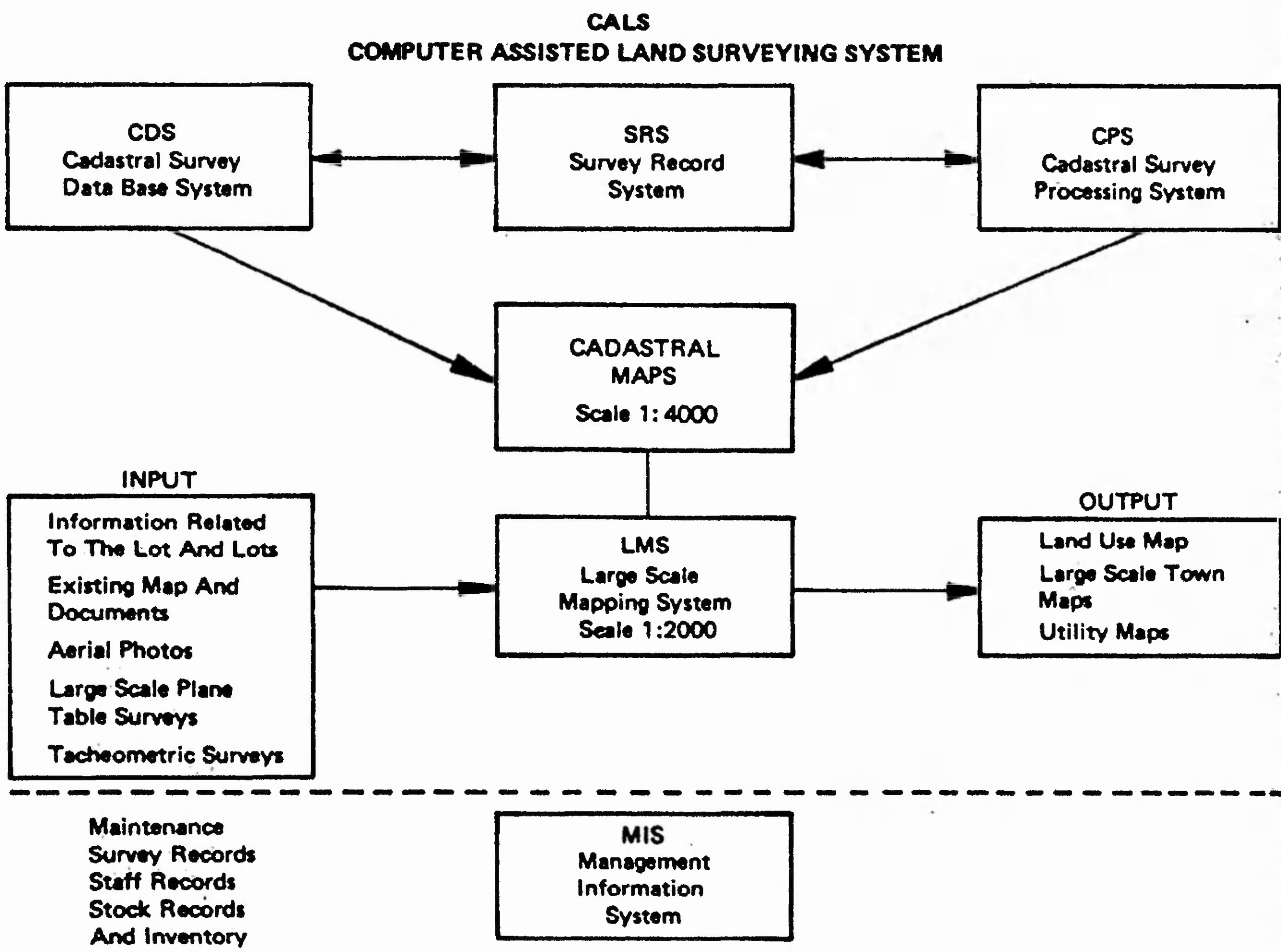


Figure 5.3. The work flow of CALS.

(Source: Abdul Majid Mohamed, 1985 "Proposed LIS in the Malaysian context", The Surveyor, Vol.20, No.1, pp 28)

The estimated manpower costs for each state at \$480,777 per year over 10 years is \$4,807,770. For an additional 2 professional staff at each state, estimated at \$2,500 per month over 10 years, the salary costs will be

$$= \$2,500 \times 2 \times 12 \times 10$$

$$= \$600,000$$

The total costs of the CALS project over 10 years is

$$= \$(5,605,802 + 4,807,770 + 600,000)$$

$$= \$11,013,572$$

Cost Savings

The estimated survey costs in each state (including overheads) under the present system using equipment such as EDM, theodolite and steel bands is \$54,291,555. Assuming that the traditional survey methodology as mentioned above is to be continued, the costs savings to be made in the 10 year period will be

$$= \$(54,291,555 - 11,013,572)$$

$$= \$43,277,983$$

The estimated annual savings in each state will be

$$= \frac{43,277,983}{10}$$

$$= \$4,327,798$$

The annual savings to be made in each state can be increased if less time is spent in the field. This can be achieved if a proper control network is established (discussed in Chapter 4) and the use of total stations and electronic data recorders are used, whenever appropriate. The cost of an average electronic theodolite and an electronic data recorder (at Government price) is about $50,000 and $1,500 respectively. It has to be said that the practicalities of using such automated survey instruments in Malaysia is restricted to surveys in built-up areas only. Cadastral surveys are mostly carried out in rough terrain, poor working conditions, thick vegetation cover which requires extensive clearing to be done, and in remote areas. For these reasons, the surveys using EDM, theodolite and steel bands are to be used. The CALS project will however solve most of the manual processes in the office (i.e the checking and examination of surveys and the production of CP's).

Based on the assumptions made, an annual savings of about $4.3 million (including overheads) can be made each year at each state Survey Department. At the national level, an annual savings of about $47.3 million could be made in the 11 states. For this reason, the extension of the CALS project to the other remaining states has to be expedited.

5.3.2. Project Justification

The main objective of the implementation of the CALS project is to speed up the survey examination process and the subsequent preparation of CP's. Such implementation is seen as an appropriate step taken to increase the efficiency of the various stages of cadastral survey processing and land management. In addition, the base maps produced in graphical as well as digital form will be of immense importance to the planners and decision makers from all Ministries and the Government Departments. It will then form the foundation of the framework of the Malaysian LIS.

Investigations into the present cadastral survey system have revealed that the main area which contributes to the existence of the survey backlog at the Survey Department is that of the field work. This area of backlog, which is classified as invisible, should be given more priority. It can be concluded at this stage that CALS will not solve this problem area. The other areas of backlog such as the checking and examination of surveys and the preparation of CP's, though of similar importance because they form part of the survey components, will be solved by CALS in the years to come when the system is installed at all the State Survey Departments. A 2.8 year factor is estimated as the time taken between the receipt of the requisition for survey from the Land Office and the completion of field survey by the Survey Department. Even with the traditional survey method using EDM, theodolite and steel band, a savings of $4.3 million can be made in each state annually. It is from this standpoint that the extension of the CALS project to the other remaining states can be justified.

5.4. Computer Assisted Mapping System (CAMS)

The present production capacity of 8 map sheets per year is inadequate to address the current requirements, not to mention the requirements of the future. This mapping system has already demonstrated its cost effectiveness in production in many overseas mapping agencies such as:-

a) the United States Geological Survey Division of National Mapping;
b) the United States Defense Mapping Agency;
c) the Royal Australian Survey Corps;
d) the Division of National Mapping, India;
e) the Mapping and Charting Establishment, Canada; and
f) the Department of Energy, Mines and Resources, Canada.

The CAMS project will involve collecting raw mapping data and forming a data base that can be manipulated, displayed and automatically drafted in any data combination, map projection and scale very quickly. This will eliminate the existing slow and tedious manual operations. The result will be a significant increase in the production of topographic map sheets of 1:50,000 scale from 8 to 50 a year. The CAMS project will not significantly change the existing mapping process but will introduce automated digital techniques in those stages which are manpower intensive. Also, the project will not replace the existing equipment but be used as an adjunct to it. Thus, the same number of staff will be able to produce maps at 5.25 times the present rate. The project can be introduced with a minimal disruption to the existing production, little increase in manpower, and with a high level of confidence in the overall cost estimates.

5.4.1. Configuration of CAMS

The CAMS conceptual outline is presented in Figure 5.5. Briefly, CAMS involves the procurement and integration of the following systems:-

a) a photogrammetric data collection and verification plotting system called the Computer Assisted Photogrammetric System (CAPS);

b) a cartographic processing system called the Computer Assisted Cartographic System (CACS);

c) a scanning system for high speed digitisation of existing maps called the Computer Assisted Raster Digitising System (CARDS); and

d) the Management Information System (MIS).

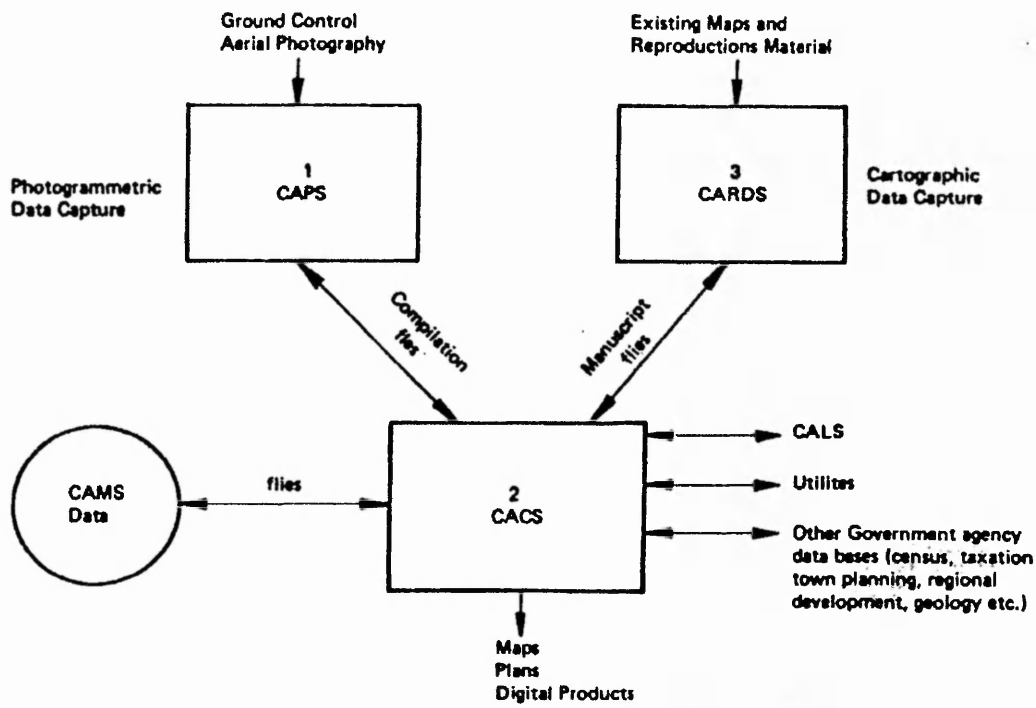


Figure 5.5. CAMS Conceptual Outline

(Source: Dept. of Survey and Mapping, Kuala Lumpur, May 1986)

5.4.2. Cost Benefit Analysis and Justification of CAMS

Under the present conventional mapping techniques, the cost of producing the national requirements of 550 map sheets, achievable in 11 years, is $54.45 million. A study has been carried out to assess the cost savings of CAMS over 11 year period with an increase of only 5 professional staff.[2] The total costs of CAMS over that period was found to be $32.46 million. The cost savings of $21.99 million can be made under the CAMS project over 11 years (i.e a saving of almost $2 million per year).

The increase in map production and the benefits of having a digital topographic data base are manifold. It is expected that in the future, users may have a variety of land use data such as geological, cadastral, census, utility, etc., integrated with the topographic data base. Thus, one of the requirements of CAMS is that the data base must be compatible with the land information system containing a wide variety of data types with a common reference system; the Malaysian Mapping Datum.

Another important aspect of CAMS is its value to the military. For security reasons, information of military significance such as military key points, bridge class loadings and certain road classifications cannot be shown on topographic maps. With a digital topographical data base, the additional information can be incorporated on a special military map series at little additional cost. It can be seen that the topographic data base is very beneficial to Malaysian defense.

Under the present system, map revision is a long and time consuming process. From the time of initiation of a map until it is printed, a typical period is about 2 to 3 years, depending upon its priority. Most of the time is consumed in the manual drafting processes. The automated process typically reduces this period to about 10 to 15 weeks. While this lead time is not serious in routine map production, the requirements for rapid response mapping to support the defense and other national priorities are seriously impaired. The most important issue is the linkage between the CALS and the CAMS projects. Together, they will form the basis for the formation of the Malaysian Land Information System (LIS).

5.5. Implementation of the Malaysian Land Information System (LIS)

It was mentioned in section 7.4.1. that the Cadastral Survey and the Topographic Data Bases will form the basis for the formation of the Malaysian LIS. There are strong economic as well as public interest arguments to justify that the Federal Government should take a greater role in the development of LIS. The setting up the CALS and CAMS projects at the Department of Survey and Mapping can thus benefit by taking a stronger view for the formation of the LIS. The Prime Minister's Department, together with the Ministry of Land and Regional Development, are seen as the main driving force for this effort. LIS comprises the land-based related data such as natural resources, land use and infrastructure. It must provide the end user with an effective and efficient use of data which inevitably will be on a shared basis. At present, there is much wasteful duplication of effort - particularly amongst the secondary users of major sources - in both the public and the private sectors attempting to utilise data sources to support their functions. Such duplication of efforts have already been proved in Chapter 4, one of which is the investigation surveys (before and after settlement work) carried out by the Settlement Officers from the Land Office using a prismatic compass and tape, and the surveys carried out by the surveyors from the Survey Department using theodolites, EDM and steel bands.

The LIS will become an essential asset for the Federal and the State Governments, the local authorities, the public utility companies, educational institutions and others whose business depends, directly or indirectly, on spatially related data. A great deal of research time is spent by various organisations in trying to reconcile the conflicting spatial framework as well as trying to find out what type of data is available and on what basis. Much of this effort takes place in isolation such that little collective benefit is gained from individual investment or expertise. On this basis, there are long term cost savings arguments for a central coordination of research, development and implementation of LIS and the data base arena. Under this concept, data collected by any public agency should be regarded as public goods and therefore publicly available insofar as is compatible with the protection of confidentiality. The cost justification to a specific agency of organising and referencing data to facilitate spatial analysis should be seen purely in terms of the direct utility of that data to the collecting agency, but within the broader frame of its collective utility as a public resource.

5.5.1. The LIS Design and Management Structure

The establishment of the LIS must be represented by the departments and organisations which form the main users of land-based related data. At least 48 organisations from the Federal Departments, State Economic Development Corporations (SEDC's), educational establishments and statutory bodies as presented in Appendix 5E have been identified as being the main users and therefore could be involved directly in the formation of LIS.

Since the Government forms the main supplier and user of land information, it must adopt a central role and give the lead to secure this responsibility for a meaningful coordination. The Government must also be responsible for the promotion, training and bringing the different users together, and to study the various proposals for developing the national policy together with the LIS Main Steering Committee to be headed by the Director General of Survey and Mapping. It is proposed that the LIS Main Steering Committee be formed comprising at least two representatives from the following organisations:-

a) Prime Minister's Department;

b) Department of Federal Lands;

c) Ministry of Land and Regional Development;

d) Malaysian Administrative, Modernisation and Manpower Planning Unit (MAMPU);

e) State Executive Councils;

f) MARA Institute of Technology (ITM); and

g) University of Technology Malaysia (UTM).

The Main Steering Committee is the body responsible for the wise execution of LIS. The choice to include ITM and UTM into the Main Steering Committee is because both institutions run the land surveying courses in the country. It can provide experts, researchers or academics relating to LIS as well as venues for short and long courses. The Committee is responsible for the following three main tasks:-

a) to provide a focus and forum for user groups;

b) to carry out promotional activities; and

c) to oversee the progress and to submit proposals for developing the national policy.

One representative from each organisation listed in Appendix 5E, must be nominated into the LIS Working Committee. It is proposed that the Chairman of this Committee is the Director General of the Department of Federal Lands, who is also the member of the LIS Main Steering Committee. All representatives must interact with the Ministry of Land and Regional Development. The proposed Malaysian LIS Design and Management Structure in presented in Figure 5.6.

Measures must be taken to initiate and bring about the common benefits of LIS by removing the barriers to change. Some of these barriers are human and institutional, some are administrative and legal, some are financial, and others are of a technical nature. The principle barriers reflects the following:-

a) the problems of dealing with a great diversity of users and uses; and

b) that LIS is the only tool for better decision making - any lack of awareness of potential benefits can therefore result in failure to recognise the central importance of this system.

The benefits of LIS depend on linking different data sets together. This standard linkage requires a locational reference i.e. coordinates, and based upon data documentation and exchange standards. Since many users (including potential users) are not sufficiently aware of the benefits of LIS, a major promotional exercise, to be carried out by the LIS Main Steering Committee, is required to maximise returns on the huge investment in information storage. Personnel from all departments and organisations, especially the main users as listed in Appendix 5E, must be trained to appreciate the importance of LIS, and such information must be shared between them.

5.5.2. LIS Model and its Benefits

In adopting a proper LIS model, the following essential factors must be considered so that the optimum benefit can be achieved. Assumptions are made in areas where the Department of Survey and Mapping has successfully embarked upon automation such as the CALS and the CAMS projects, that the systems are fully operational and that other proposals made in the previous chapters have been taken into consideration. The essential factors are:-

i) Large scale cadastral maps

That a series of large scale cadastral maps showing all the land parcel boundaries, the infrastructure and the natural features is available. In built-up areas,

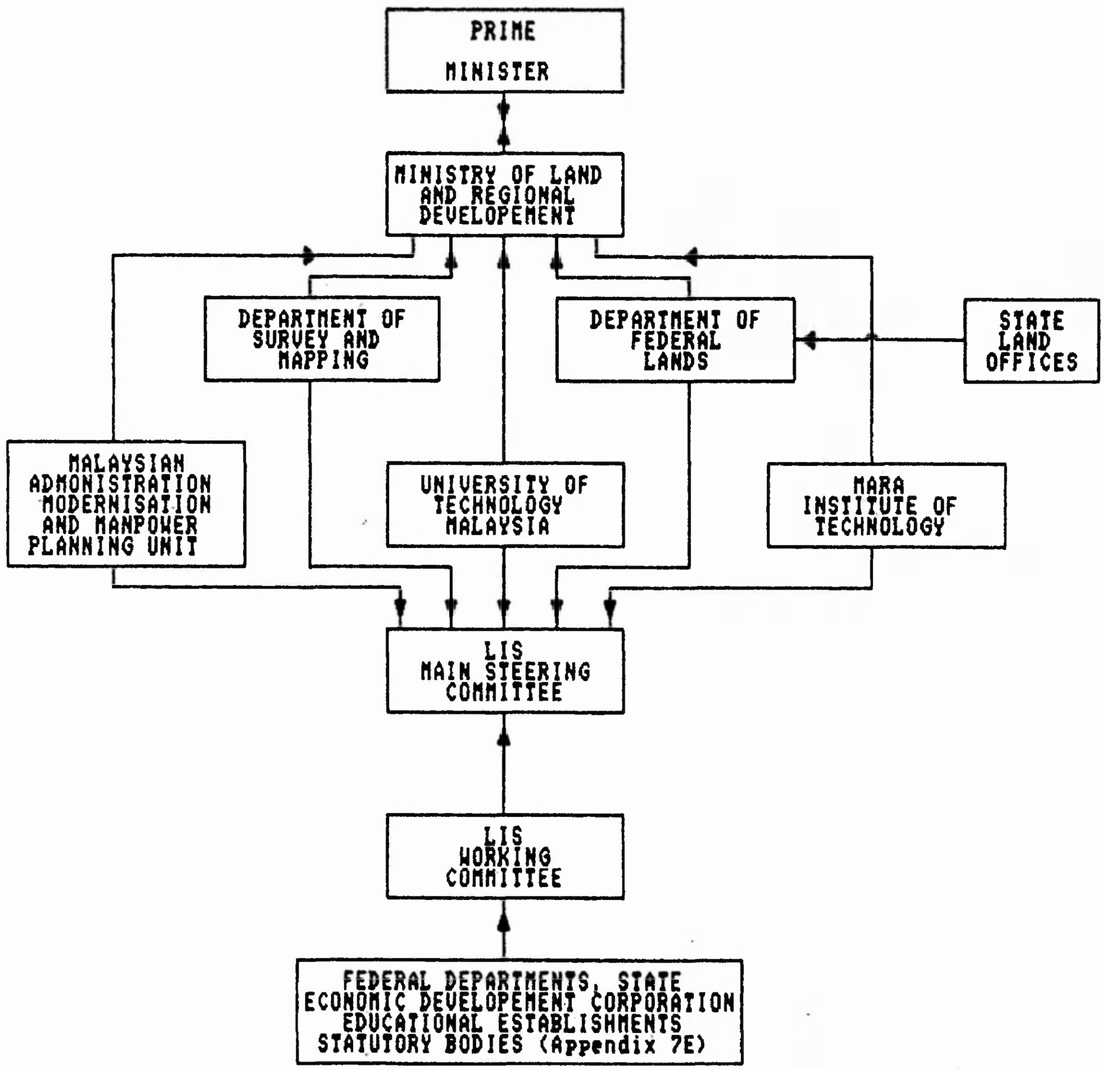


Figure 5.6. The proposed Malaysian LIS Design and Management Structure.

scales of 1:1,500, 1:1,000 or greater are used, decreasing to about 1:2,500 or less in rural areas.

ii) The legal component of the cadastre

The Register containing information on ownership, valuation and any other matters dealt with by the cadastre must be up-to-date. All land parcels must have a unique identification; the lot number. The legal component must be of prime importance and every effort must be taken to revise out-dated land laws.

iii) Complete cadastre

A dense national control network system must be established and maintained; without this, survey operation will be costly and time consuming. Such a system is mandatory so as to enable the integration of all forms of spatial information to take place. The cadastre must include an unambiguous definition of the parcel, both in map and digital forms and on the ground, and permanently monumented. This will allow each land parcel to be precisely defined and located on the ground, even if the boundary marks are missing or disturbed.

iv) Dynamic cadastre

In order for the cadastre to be dynamic, it must be continually updated. There must be legally enforceable procedures which require that all changes to the information in the cadastre must automatically and immediately update the Registers.

v) State guarantee

The State must continue to guarantee the titles to land in order to gain public confidence. Thus, the information in the Registers must be complete, correct and have legal status.

vi) Free access to data

The contents of the Registers should be public and within reason, be freely available.

Unless the above factors are fulfilled and efforts have been undertaken to improve the situation, the LIS will be an unsuccessful and wasting project. But once fulfilled, the future choice of a suitable LIS model can be assessed for the local cadastral requirements, the title registration system and the legal system.

There are generally two theoretical models of a land data and information system. The first (Model 1) is to position the title registration as a central component, secondary to the other information on land parcels.[3] This theoretical model was proposed by Zienmann[4] and presented in Figure 5.7. The second (Model 2), presented in Figure 5.8., is to place the title registration as a perimeter file based around the hub or the central files of information on title boundaries i.e. the legal description of the land parcel.

Sedunary[5] used this approach by placing the Land Ownership and Tenure System (LOTS) files as the central component known as the basic spatial unit. Although in the second model, the title registration forms one of the perimeter files and appears to play a similar role to such matters as utilities, valuation, land use, etc., in reality it plays a greater role, approaching to that of the first model described by Zienmann.[6]

In general, it can be seen that the information of an LIS model concerns the relationship between the title registration and cadastral surveying. Within a cadastre, there are two levels or categories of data. The first comprises the central or primary elements in the system which are the technical record of the legal parcellation of the land through any given territory. This is usually represented on maps of a suitable scale, and the authoritative record which is usually embodied in associated registers; the record usually being of a legal nature. The other category comprises the secondary components in the system which includes valuation, utility and land use data and which are usually related by a common identifier to the primary registers.

In the Malaysian context, Model 1 is recommended because in the long term, such a system will always be up-to-date since it is part of the conveyancing process. Also, the land parcel boundaries will be defined by a legal process and the ownership details associated with each parcel will continue to be guaranteed by the State Authority. Furthermore, a title registration system has the greatest potential of achieving a complete cadastral data base for the whole country. Thus, the LIS must be based on land parcels, the descriptions of which are legally acceptable and the ownership of which is certain. Certainty of ownerships in a concise and manageable record requires a land title register backed by a State guarantee and good quality cadastral survey. By adopting Model 1, there is no further need to amend the existing cadastral system and land law, but rather, the need to improve the existing system must be taken very seriously so that the implementation of LIS can be a success. To achieve this goal, the Survey Department must improve the present control framework, and then establish a dense cadastral control, particularly in developing and built-up areas.

The need to adopt such a model should be an important element within the land administration system. The Ministry of Land and Regional Development in collaboration with the Prime Minister's Department must play a central role as outlined in the proposed Malaysian LIS model (Figure 5.6.) and then be supported by the other LIS Working Committee which is represented by the other main users of spatial land-related data as listed in Appendix 5E. Such a modelling approach is necessary in order to formulate long-term goals; otherwise, improvements have no direction and any individual sub-systems generated may not be compatible in the future. As technology improves and the national demand and the general public change, the model needs to be continually updated. By doing so, any staged development can be properly planned by the politicians and the responsible authorities, and be generally accepted by the public.

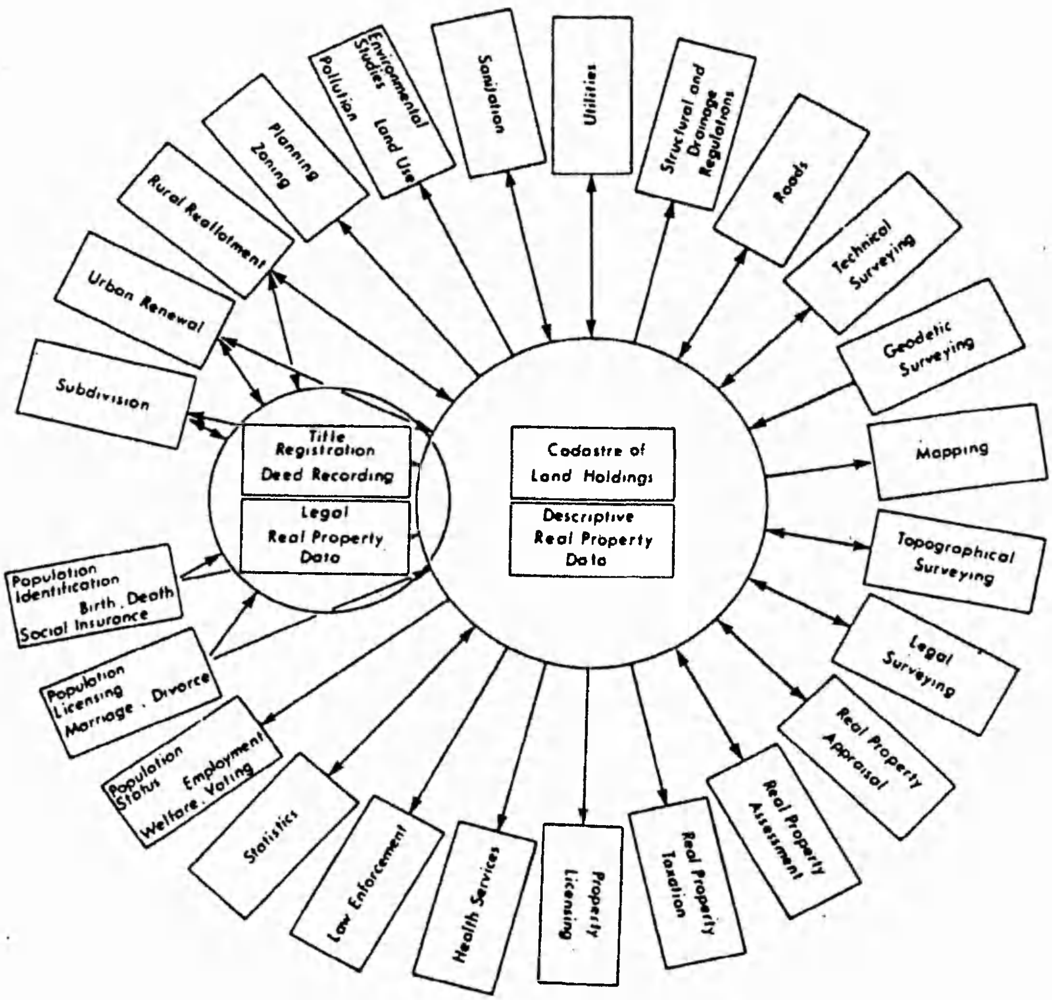


Figure 5.7. LIS Model 1 - Title Registration System as the Central Component.

(Source: Zienmann, H., 1975, Technical and Legal Aspects of a Cadastre-based Land Information System, The Canadian Surveyor, Vol. 29, No.1, pp 14.)

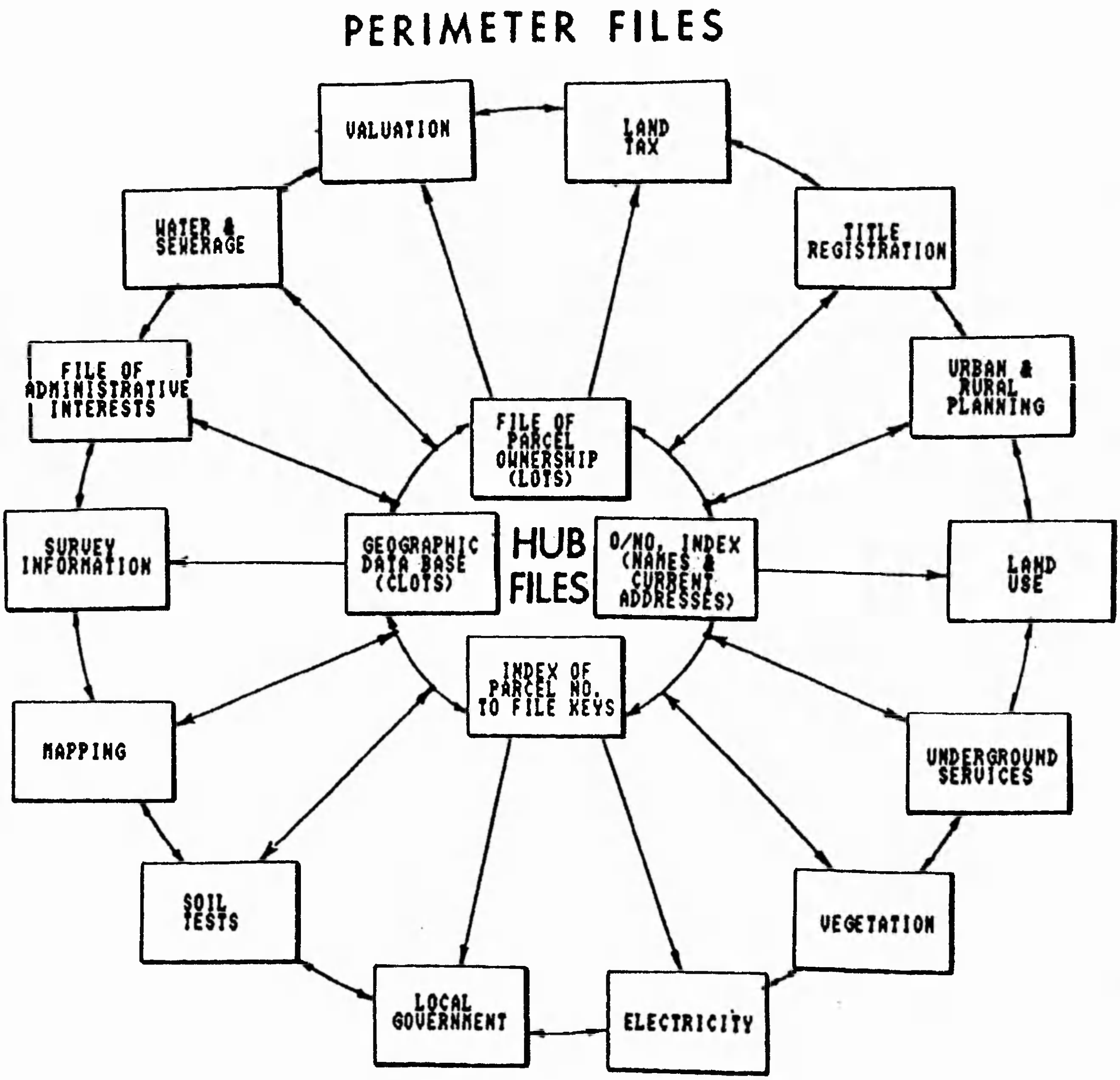


Figure 5.8. LIS Model 2 - Legal Description of Land Parcel as the Central Component.

(Source: Sedunary, M.E., 1981, LOTS: A South Australian Approach to a Total, Fully Integrated Land Information System, Proc. of the 23rd. Australian Survey Congress, Sydney, pp 34)

5.6. Cost Analysis of Surveys Using a Total Station and Data Recorder

The following cost analysis on the use of automated surveying instrument is never intended to propose exclusively, the use of such instrumentation in cadastral surveying. In section 5.3.1., the implementation of the CALS project in each state and the continuation of the use of the present instrumentation can result in an annual saving of $4.3 million per year. However, when conditions allow, such automated instrumentation should be used whenever possible. The survey companies can certainly consider using such instrument for other types of surveys apart from cadastral. To demonstrate the savings achieved by using an electronic theodolite and data recorders over the manual booking method, a comparison of the *before and after* cases of three survey jobs was carried out by the Planning and Transportation Department of the Nottinghamshire County Council.[7] The three survey jobs are:-

- (i) 18 sheet survey;
- (ii) 12 sheet survey; and
- (iii) waste disposal survey.

5.6.1. Manual Booking

For the 18 sheet survey, three men (surveyor, booker and chainman) carried out the survey and spent a total of 6.5 hours collecting 320 detail points. On the next day, the survey was prepared for inputting (coding minor points, leader information, etc.) and sent to the Computing Services Unit. Four hours were spent on the punching of the survey data. As the surveyor is usually out on site after sending the survey data to the office for punching, he did not see the input on the terminal until the next day. The first run in MOSS generally failed due to typing errors detected by the program and 1.5 hours were spent on *screen edit* before a successful run was achieved and a plot of the survey was made. Gross errors not detected by the program were then rectified and a further plot was made. The plotting time was alleviated from what was often a 3.5 day turn-round to two days with the purchase of a new Benson flat-bed plotter.

For the 12 sheet survey, the job was carried out by two men (surveyor and chainman) and took 6.5 hours to complete. Three hours were spent on punching of survey data. A further 1.5 hours were spent on editing the survey data after the first run in MOSS failed due to typing errors detected by the program. These gross errors were then rectified and a further plot was made.

For the waste disposal survey, the job was also carried out by two men (surveyor and chainman) but took 8 hours to complete. Punching of survey data took 2 hours and a further 1.5 hours on *screen edit* after the first run failed due to typing errors detected by the program. After the gross errors were rectified, a further plot was made which took another 1.5 hours. Contours were then added and the program was re-run. The cost breakdown of the three survey operations using manual booking is presented in Appendix 5F.

5.6.2. Use of an Electronic Theodolite and Data Recorder

The use of data recorder obviated the need for a booker. In the 18 sheet survey, two men (surveyor and chainman) took 6.5 hours to complete the task. The survey data was down loaded to the mainframe via the 'N Gen Megaframe' network in less than 10 minutes. The use of the data recorder also produced a data file with no gross errors due to typing, misreading or mis-booking. A plot was produced immediately with a possible turn-round of 24 hours. The 12 sheet survey also involved the same man-hours and the cost of the operation is similar to that of the 18 sheet survey. For the waste disposal survey, the job was carried out by two men (surveyor and chainman) and took 5.5 hours to complete. The down loading of the survey data also took 10 minutes. The cost breakdown of the three survey operations using the automated instrument is presented in Appendix 5G.

5.6.3. Cost Summary

From Appendices 5F and 5G, it has been demonstrated that the use of the data recorder in surveying has led to a considerable amount of savings being made in terms of costs and man-hours over the manual booking method. The cost summary of the three survey jobs is summarised in Table 5.5.

Table 5.5. Cost Summary

Survey	With ordinary theodolite and manual booking		With Total Station and data recorder	
	Man hours	Costs £	Man hours	Costs £
18 sheets	27	350.06	14	193.97
12 sheets	20.5	269.90	14	193.97
Waste disposal survey	23	293.12	12	149.04
Total	70.5	912.08	40	536.98
Savings			30.5	376.10

The Nottinghamshire County Council has estimated that about 50 surveys, quite similar to the 18 sheet survey in terms of job size and the required manpower, will be carried out annually. Similarly, about 120 surveys, quite similar to the 12 sheet and the waste disposal surveys will be carried out annually. The estimated annual costs and the subsequent savings accrued are summarised in Table 5.6. Obviously, the annual savings achieved when the appropriate Total Station system is used have to be based on the costs of acquiring such a system. Three leading Total Station systems on the market were assessed and the actual cost breakdown of each system, together with the essential accessories, is presented in Appendix 5H. The following is the summary of the cost breakdown of each system.

a) NIKON DTM5 Electronic Total Station
NIKON DR1 Data Recorder
Total cost = £11,710.00

b) Geodimeter 440
Husky Hunter
Total costs = £15,577.00

c) KERN E1 Electronic Theodolite
Alphacord 64 Field Computer
Total costs = £14,347.00

Table 5.6. Annual Costs and Savings

Survey	With ordinary theodolite and manual booking		With Total Station and data recorder	
	Man hours	Costs £	Man hours	Costs £
120 x 18 sheets	1,350	17,503.00	700	9,698.50
Savings			650	7,804.50
120 x 12 sheets	2,460	32,388.00	1,680	23,276.40
Savings			780	9,111.60
120 x waste disposal	2,760	35,174.40	1,440	17,884.80
Savings			1,320	17,884.80

Total annual savings:-

a) Man hours: 650 + 780 + 1,320 = 2,750

b) Costs: £(7,804.50 + 9,111.60 + 17,289.60)
= £34,205.70

The Nottinghamshire County Council decided to purchase the Nikon system because it was the least expensive. It was also preferred because of its portability and the ease of use. It could be seen, theoretically, from the execution of the three types of surveys that the purchase of the Nikon Total Station system would pay for itself in under a year. From this piece of evidence, the Survey Department as well as the survey companies in Malaysia should be encouraged to invest in the above system and this is not an exaggeration for various survey and mapping organisations throughout the world have proved to be the case. Land surveyors must be encouraged by whatever means to use the capacity and the presence of automated instrument. The idea is not to eliminate the traditional skills and the many survey methods but to make skill more productive and to do work that was previously beyond their resources.[8]

In 1980, a group of surveyors and scientists used a total station of the first generation for a practical test.[9] The use of the instrument for cadastral surveying in Switzerland from the technical and economical point of view was studied and some of the results obtained were as follows:-

a) In the whole job involving about 10,000 data points, no errors in the measured angles and distances were found. The use of electronic systems thus put an end to transcription and plotting errors; and

b) The accuracy of the system was found to be acceptable. For example, the traverse with the biggest errors in latitude, departure and height was well within 40 per cent of the given tolerance.

The only detected errors were that of coding. About 3.7 per cent of the points measured and coded twice from different stations were found to have coding errors. It suggests that checking of field codes and to use a standard coding format are of great importance because there is often a considerable time lag between the data acquisition in the field and the processing in the office. The later an error is discovered, the more it costs to eliminate it. In engineering applications, an increase in production by 20 to 60 per cent was achieved.[10] Nowadays, with the use of total stations and electronic data recorders, the processing time is significantly reduced and the final maps can be produced in a matter of hours as described earlier by the study carried out by the Nottinghamshire County Council.

5.6.4. Advantages of Total Station Surveying and the Use of Data Recorders

The advantages of using a total station instrument and data recorders (also called data loggers) in surveying can be summarised under following three main headings.

a) Productivity

Productivity can be increased through reduced time and manpower, thereby reducing the cost of surveys. This is achievable because the total station instrument is portable, the increased speed of set-up, the inherent measurement speed, the auto-reduction of horizontal and vertical distances, and the possibility of interfacing with the automated data recorders. The most important advantage of automatic data acquisition is the speed in which the data is recorded and processed. As the data is already computer compatible, processing takes place at the speed of the computer and not at the speed of the person entering the data.

b) Reduction of Errors

The advantage of automatic data recording is evident at the data processing stage. Data can be stored in a single format and this necessitates the use of a very systematic approach to measuring and data recording. This should result in fewer mistakes being made in the field because a standard routine is followed. A total station instrument coupled with a data recorder offers not only considerable savings in both time taken and the cost of surveys as mentioned in (a), but it also eliminates transcription errors. Similarly, vertical and horizontal distances are reduced automatically thereby minimising calculation mistakes.

c) Universal Surveying Capability

The use of a total station instrument can be further extended to a wide variety of usage because it is extremely versatile and universally applicable. If used in conjunction with automatic data recorders, the stored data can be further examined. Since the processing requires no operator intervention, it can take place at times when the computer might otherwise be idle. If the processing is performed during normal working hours, the surveyor can be working on other tasks. Thus, the full potential of a total station instrument cannot be realised until it is used in conjunction with automated systems of data recording, processing and plotting. This method has been the norm in many developed countries as the labour costs continue to rise and the capital cost of such instrument, although still high, continues to drop. The high instrument cost has been the main disadvantage so far, but if utilised correctly, such instrument should pay for itself within a short period of time. Above all, it proves to be increasingly economical in the long term.

5.6.5. Cadastral Surveying Applications

In order to gain the optimum benefits of the CALS project, the use of total station and electronic data recorders must be of prime consideration. This however needs large sums of money which could be the main obstacle. In the initial stage, the use of data recorders must be a major step towards the application of automated instrument besides EDM to cadastral surveying. In this case, it could be an invaluable piece of equipment and be used as a hand held, manually input recorder. Undoubtedly, the traditional field book has a lot of physical advantages to offer. It is light, compact, cheap, easily obtained, and relatively resistant to water and other environmental factors such as humidity, extreme field temperature and sunlight. It is also resistant to other influences such as electromagnetic fields. Above all, no maintenance is required.[11]

It is the right moment for the Survey Department and the Ministry of Land and Regional Development to take the risk of investing on the wider use of electronic theodolites and electronic data recorders in cadastral surveying. Already, \$2.75 million have been spent on the CALS project at the Johor Survey Department and the problem of survey backlog will not be reduced until more money is allocated for acquiring these instruments. For any survey work, the prime factor to be taken into account is the speed with which the field data is recorded and processed. Such speed cannot be achieved with the use of traditional booking. An orthodox statement such as...........*a system in use a hundred years ago cannot be replaced because it had proved to be a viable and working system*........is not applicable and practical in today's time. It is also proposed that with the introduction of data recorders and electronic theodolites, the field booking method should not be totally abandoned but used as a supplement to electronic recording.

An article describing the application of modern survey instruments was published in The Surveyor (The Professional Journal of The Institution of Surveyors, Malaysia) (Appendix 5I).[12] Figure 5.9 illustrates the application of such instruments. Data entry may either be through keyboard (from field books) or telephone from remote data collectors and then validated and edited in the normal way. Computation of coordinates and levels of all points are carried out from any kind of field observation. The traverses are calculated and adjusted using least squares. The grid may be plotted at any angle with annotations, and other points with (or without codes), levels or string features may be included. Detail points may be presented in cartesian coordinates (x,y,z) and with the coding system, these points which define a specific feature (e.g. house, road, tree, hedge, etc.) may be recognised. Output may either be graphical (contours, spot heights, details, title and annotation) or digital (printout of original field data).

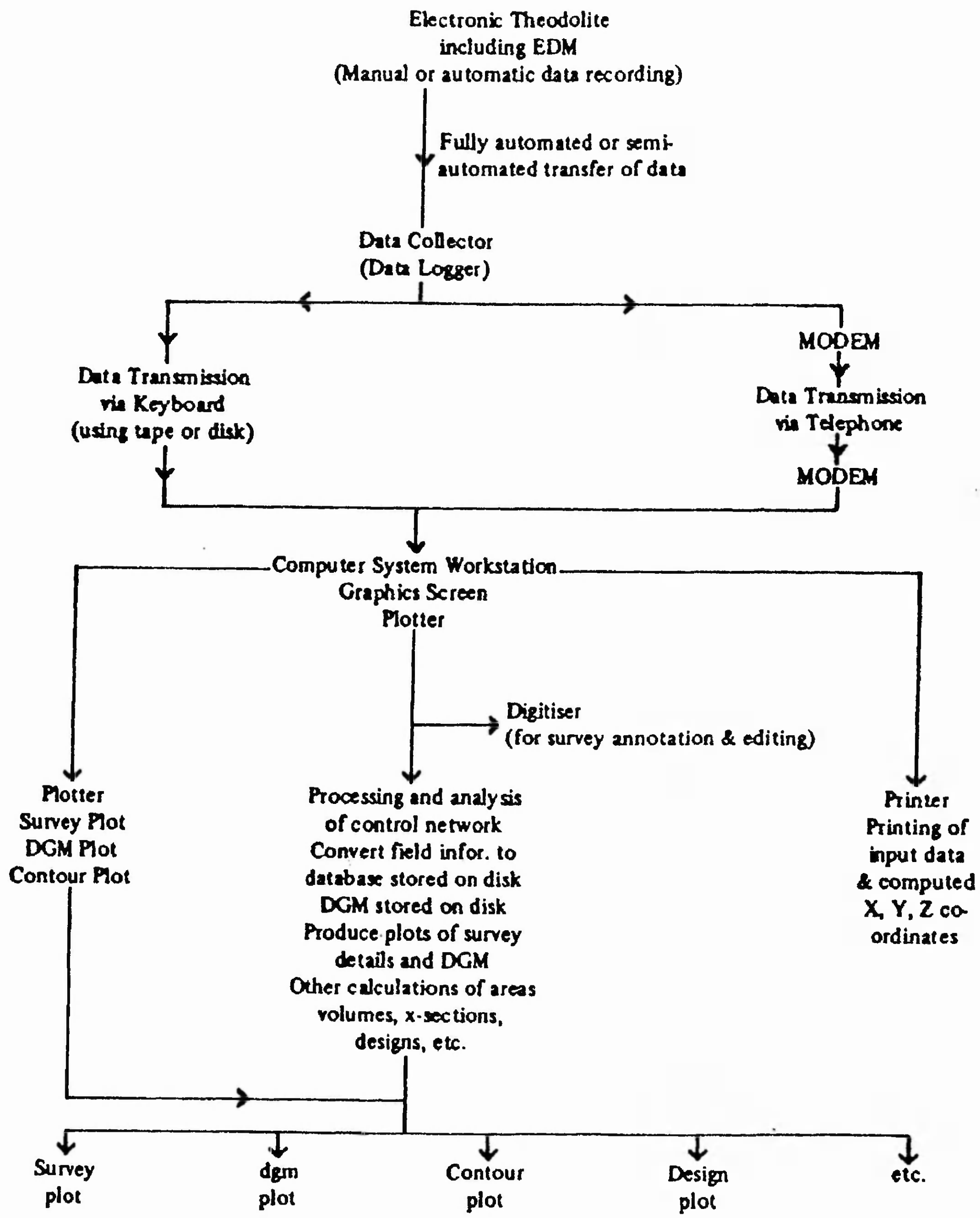


Figure 5.9. Automated Survey System.

(Source: Wan Muhd Aminuddin Wan Hussin, 1988, The Surveyor, Vol. 23, No. 2, pp 13).

5.7. Conclusions

In the field work aspect, the Survey Department must be committed at this stage to continue using equipment like EDM, theodolites and steel bands for cadastral surveying. Cost benefits analysis has shown that a significant annual savings of about $4.3 million can be made in each state with the introduction of the CALS project in an attempt to improve the efficiency in the office (computing of survey data and preparation of CP's) but continue to use the same instrument in the field. The costs analysis on the use of total stations and electronic data recorders at the Nottinghamshire County Council has shown that an estimated annual savings of about £34,200 and 2,750 man-hours can be made instead of using manual booking.

With the eventual implementation of the Malaysian LIS, reliable information is stored and the chances of making and implementing better decisions will be increased. Nevertheless, the following factors have to be considered:-

a) the storage and retrieval of information about land for the purposes of administration and planning;
b) the systematic compilation of up-to-date, complete and reliable cadastral records;
c) the ability to merge and display in graphical form, different combinations of spatial data especially those relating to cadastre, services and topography;

d) the process and analysis of those data in order to produce comprehensive and useful land information.

LIS covers a wide spectrum of which that relating to the cadastre is an especially essential subset. It is through the cadastre that many of the tangible benefits to society can arise. The benefits are however difficult to predict in a quantifiable form. The initial costs are high and the benefits are not immediate. As far as the eventual implementation of LIS in Malaysia is concerned, the main problem is not the lack of resources, either in terms of educated manpower and available capital but to use the available resources wisely. There now exists specialists, though not in great numbers, and the required financial resources as evidenced by the setting up of the CALS and the CAMS projects. The main problem lies in the lack of motivation and the passive attitude towards change. Generally, the passive attitude of certain groups has been identified as being one of the main barriers towards change and the overall improvement of the surveying industry; this has to be re-examined seriously and will be discussed in detail in Chapter 8.

With the introduction of total stations and data recorders in cadastral surveying and the implementation of the LIS, these are not the fundamentally important steps to be taken but rather that a complete change in philosophy and technique is warranted in one jump. It is thus more important to establish a good working manual system before incurring the large financial investment that is inevitable with computerisation. Of course, electronic theodolites, data recorders as well as computers are used to improve efficiency in the particular aspects of the collection and the manipulation of survey data. Care is required in the introduction of such instrument with regards to system support and after-sales services as the Survey Department had already unfortunate experiences with the IBM 1130 and the PDP 1104 computer systems as well as the EAI PACER 100 automated plotting system.

CHAPTER 6: WEAKNESSES OF THE NATIONAL LAND CODE, 1965

6.1. The Need for Amendment

The need to formulate a National Land Code (NLC) (Act 56 of 1965) to suit the present needs, socio-economic philosophy and technology has been of great concern to people of various professions and the general public alike. The various administrative systems and the types of land titles adopted by the various States in the country has led to the formulation of the NLC to suit the local conditions and this was an important step in the evolution of a modern and systematic land administration. The very useful contribution of the existing NLC needs to be stated categorically because it is then possible to put forward new ideas or advocate changes to the existing practice.

Generally, it can be said that the present laws governing the execution of cadastral surveys in Malaysia are satisfactory. Discussions with many surveyors in the country have revealed that the laws i.e. the NLC which govern the execution of cadastral surveys are very acceptable, though too rigid in some areas. There are certain provisions which need serious attention. Like any other laws, there are certain provisions which appear to create a *bottleneck* to the smooth flow of work. Such provisions have so far created dissatisfaction to many surveyors because of its failure to serve the surveying industry effectively.

Amongst the provisions in the NLC that need special attention are sections 10(1)(b), 81(1)(c), 114 and 403. The majority of surveyors with whom this problem was discussed approved the need for an urgent amendment. Sections 10(1)(b) and 81(1)(c) outline the system of collection of survey fees which under the present system becomes the responsibility of the Land Office. However, it has been established that the cadastral survey has become the prerogative of the Survey Department. Sections 114 and 403 relate to the necessity of the land owner to take all reasonable steps to prevent any damage, destruction or unlawful removal of boundary marks, and the penalty imposed, on conviction of such act. In this chapter, it is intended to demonstrate the consequences of some of the weaknesses of certain provisions in the NLC.

6.1.1. Provisions Relating to the Collection of Survey Fees

The State Land Office is entrusted with the collection of survey fees carried out in the state. Such survey fees collected become state revenue which is in turn transferred to the Federal Government.

Section 10(1)(b) of the NLC states that -

The Minister may, after consultation with the National Land Council, by order notified in the Gazette of the Federation, prescribe - ....the fees, costs and other sums to be charged for any survey carried out by that Department.

and section 81(1)(c) states that -

The following sums shall become due to the State Authority at the time when it approves the alienation of any land under this Act - ....the amount, or estimated amount, of any survey fees chargeable in respect of the land where the land is to be surveyed by a Survey Officer.

From section 10(1)(b), it can be interpreted that such collection of monies for any survey is regulated by the Minister at Federal level. In section 81(1)(c), such duty falls under the jurisdiction of the State Authority through the Land Office of each state. Under the Federal Constitution, land is a state concern and by this definition the Land Office is responsible for administrative matters only and exclude survey matters. In this context, the collection of survey fees, which is considered as part of the survey process, becomes the responsibility of the Survey Department under the direction of the Federal Government.

The manner in which administrative powers in the country is delegated to that of the State on one side and the Federal on the other, leads to the contradiction of sections 10(1)(b) and 81(1)(c) in terms of its context. Section 10(1)(b) outlines the duty of the Minister (of Lands and Regional Development) to prescribe the survey fees for surveys carried out by the Survey Department which is a Federal department. Section 81(1)(c) however explains that such fees should be paid to the Land Office which is controlled by the State Authority. Thus, section 81(1)(c) should be amended to specify precisely that the collection of survey fees will become the duty of the Survey Department which is responsible for the execution of the cadastral surveys to conform to the requirement as prescribed in section 10(1)(b). There are several reasons to support such amendment.

One of the obvious consequences facing the survey industry under the present administrative system with regards to collection of survey fees is the lack of concerted effort and appreciation by the Land Office in solving the national cadastral backlog. The Land Office is seen as a body which deals with the requisition for cadastral surveys in the country and directing the Survey Department as to where the survey is to be carried out. Following this, a settlement tracing is prepared by the Land Office based on out-dated survey information to show the location of the site. This is then sent to the Survey Department. Although cadastral survey in the country has long been the rightful responsibility of the Survey Department, it is appropriate that such requests for surveys be made by the Land Office as it involves the land in the state which is controlled by the State Authority. However, payment of survey fees should be made to the Survey

Department for the work being executed.

Instead of relying on the settlement tracing, the Survey Department prepares its own version called the *field tracing* which is used by the land surveyors. Reliable and up-to-date survey information is included on the field tracing, because the survey data is readily available by referring to existing field books, calculation sheets and title documents in its possession. Often, unreliable information on the settlement tracing contradicts that of the field tracing. This duplication of work is unnecessary and much time and money could be saved if only the Survey Department is entrusted with the task of preparing instructions to surveys. Such contradiction, if goes undetected, often results in overlapping of title. This is one of the most problematic areas facing the Survey Department in dealing with survey queries which often takes too long to be verified.

For the LIS in the country to work effectively, such an amendment is vital and necessary. Not only should information on the extent of survey and the collection of survey fees be stored but also the standard sheets of the country can be kept up-to-date. Surveys of alienated land carried out by the Government surveyor can be systematically monitored and the cadastral backlog can be effectively regulated and minimised. Better data recording and up-dating procedures of survey records, which at the present becomes the responsibility of the Survey Department Headquarters in Kuala Lumpur, can be accommodated under a single management.

Under the present system, survey fees collected by the Land Office are sent to the Federal Government. The Survey Department on the other hand submits report of the progress of survey work carried out to the Survey Headquarters which is controlled by the Federal Government. Thus, two different sets of data which are submitted to the Federal Government often contradict one another because the Land Office only submits the net sum of survey fees collected for surveys carried out by the Survey Department without describing in detail from which land parcel such monies were collected. This is because the Land Offices in the country do not have the records for surveys carried out by the Survey Department. If the collection of survey fees falls under the jurisdiction of the Survey Department, a complete record of surveys carried out in the state can be prepared together with the amount of monies paid for such surveys. Thus, the Land Office should only be responsible for the collection of land rents and premiums and other administrative aspects of land in the state after the document of title for each land parcel is submitted to the respective proprietors. This is seen as an indirect way of monitoring the alienation of State land.

6.1.2. Provisions Relating to the Preservation of Boundary Marks

After a survey is carried out, a certified plan (CP) is prepared by the Survey Department and submitted to the Land Office. The Settlement Officer (SO), under the direction of the District Land Administrator, will then make the necessary settlement arrangements. Settlement here refers to the act of showing the boundary marks to the land owner upon completion of the survey. During the course of the settlement work, the attention of the land owner should be drawn to section 114 of the NLC which emphasises the implied conditions relating to the preservation of the boundary marks. When the settlement work is completed, the document of title is prepared from the CP and certified by the State Director of Survey. The plan is then attached to the relevant form and sent to the Land Office for registration. However, the Manual for Land Administration states that, for any title survey carried out by the licensed surveyor, the task of showing the boundary marks of the land to the land owner upon completion of survey (i.e. settlement) is to be performed by the licensed surveyor concerned.[1] It is thus clear that settlement work should be carried out by the surveyor who actually carry out the survey. Thus, amendment to the existing regulation is seen as vital to avoid any duplication of work, and queries and delays as a result of the failure to locate the exact position of the boundary marks upon completion of the survey can be minimised.

Provisions were also set out in the Manual Administration with regards to settlement work such that whenever possible or whenever needed, the surveyors should assist the SO in showing the boundary marks to the proprietor upon completion of the survey.[2] If such surveys were carried out by the licensed surveyors, the Manual emphasises that the settlement work becomes the responsibility of the surveyor concerned upon completion of the survey.[3] This demonstrates that for surveys carried out by the Survey Department, settlement work is better off being executed by the surveyor who undertakes the survey rather than the SO who, in the end, may seek assistance from the surveyor to locate the boundaries. Thus the proposition that settlement work should be carried out by the department which does the survey is justified and appropriate because the department concerned is in a better position to identify and locate the boundary marks they establish.

As mentioned in Chapter 2, surveyors other than those from the Survey Department appointed under the NLC or the licensed surveyors registered under the Licensed Land Surveyors Ordinance, 1958 are not permitted to carry out the cadastral (title) surveys in the country. For surveys carried out by the licensed surveyors, the plans have to be certified by the State

Director of Survey as prescribed in section 396(1)(e) of the NLC which states that -

> *.......land may not be considered as being legally surveyed until ....a certified plan, showing the situation of the land, the position of its boundaries as so determined and of the boundary marks placed thereon and the area and lot number thereof has been approved by the Director of Survey.*

If section 81(1)(e) is amended in order not to contradict section 10(1)(b), at least two stages of work can be eliminated. The first is the preparation of the settlement tracing at the Land Office. The Survey Department also produces a field tracing (similar to that of the settlement tracing prepared by the Land Office) and all information necessary for the execution of the actual survey is gathered by the surveyor with limited reference being made to the settlement tracing. The second stage of work that could be saved is the settlement work by the SO's. Because the survey work is carried out by the Survey Department, the surveyors are thus better informed about the position of the survey marks they emplaced. Also, the surveyor meets the land owner (or his representative) while working on the site. Based on this evidence, the settlement work could be better executed by the surveyors rather than the SO's. By doing so, much time and money could be saved and settlement work could be carried out by the Survey Department in an orderly manner.

In the past when SO's visited the site to show the land owner the position of the boundary marks, frequently the marks were already covered by thick undergrowth. Locating the position of such marks could be a time consuming and difficult task and may perhaps necessitate another survey to be carried out by the land surveyors. Although the settlement work carried out by SO's involves a rough survey using only a prismatic compass and a steel band, more often than not cutting and clearing of the line of sight have to be carried out again and these add to the delays. This may involve another working day if the site is near to the Land Office, or perhaps three working days if the site is located more than a half-day travelling from the Land Office.

There are also cases where the lapse of time between the emplacement of boundary marks on the ground and the drawing of plan was unacceptable (sometimes 5 years). If the settlement work is carried out 5 years after the emplacement of the boundary marks, a considerable amount of cutting and clearing have to be done to relocate the boundary marks. If the SO can carry out the settlement work as soon as the survey is completed, then the work of locating the boundary marks does not pose a great problem. However, this is not the case. After such a long lapse of time before the settlement work, the boundary marks are not only covered in thick undergrowth but could well be disturbed, damaged or missing due to other uncontrolled reasons. Thus, the proposition whereby the settlement work is to be carried out by the surveyor immediately after completion of the survey, rather than by the SO from the Land Office is justified.

The settlement work also has other social problems associated with it. After the survey has been carried out, the Land Office sends a notice to the proprietor to attend at a time and place stated on the notice for the purpose of identifying the boundaries of the land. For a piece of land surveyed by the Survey Department involving many co-proprietors such as in the case of sub-division, partition or amalgamation, notices under the settlement law, as prescribed in the Manual for Land Administration, have to be sent to the proprietors by the SO for the execution of settlement work.[4] Numerous cases were reported where the proprietors (or their representatives) failed to attend.

The enforcement of certain customary law and tenure regulations in the country is also one of the factors that leads to a complicated land administrative system. Because of the strong attachment of some groups of people to the customary land law and customary land tenure in the states of Negri Sembilan and Malacca, these provisions are antiquated and also contradictory to the Islamic religious law *(syara')*. One example is the process of sharing of inherited property or heirlooms which contrasts with the Islamic *syara'* in the handling of heriditaments and leads to the existence of co-proprietorship. As such, any notice to be served which involves many co-proprietors often results in absentees on the day of the settlement proceedings. As a result, the settlement work cannot be carried out as no agreement and confirmation can be made between all the parties concerned. This automatically creates an unnecessary burden for the SO to send out such notices again to all the co-proprietors after the first notice was unsuccessful. The notice may be made effective by affixing copies in a conspicuous position on the land, court houses, mosques, *penghulu's* offices, community centres and other public places in the area where the land is situated. Such notices are also published in the Gazette or the newspaper circulating in the state. Such lack of co-operation has resulted in unnecessary delays and increased costs.

6.1.3. <u>Implied Conditions Concerning Boundary Marks</u>

It is the responsibility of the SO to show to the land owner all boundary marks upon completion of the survey, and to draw the attention of the land owner to the implied conditions as prescribed in section 114 of the NLC relating to the preservation of the boundary marks which states that -

> *All alienated land shall be subject to the following implied conditions relating to the boundary marks thereof -*
>
> *a) that the proprietor will take all reasonable steps to prevent their damage, destruction or unlawful removal;*

b) *that the proprietor will, if any of them are damaged, destroyed or unlawfully removed, give immediate notice of the fact to the Land Administrator, or the Penghulu having jurisdiction in the area in which the land is situated;*
c) *that the proprietor will, if so required by the Land Administrator, pay the cost of repairing or, as the case may be, replacing any of them which may have been damaged, destroyed or unlawfully removed; and*
d) *that the proprietor will, if so required by the Land Administrator, at his own expense clear any boundary line between any of them.*

Also related to the preservation of the boundary marks, section 403 of the NLC states that -

Any person who, without the authority of the Director of Survey, willfully destroys, damages, moves or otherwise interferes with a boundary mark shall be guilty of an offence and on conviction -
a) *shall be liable to a fine not exceeding five hundred dollars; and*
b) *may in addition to or in place of that penalty be ordered to pay to the State Authority a sum (recoverable as a fine) not exceeding three times the cost of repairing or re-emplacing the boundary marks and of making any survey rendered necessary by the act in respect of which he was convicted.*

Such a penalty imposed on the land owner for not looking after his boundary marks as prescribed in section 403 is considered austere, impractical and negative, and should be repealed. Discussions with many senior land surveyors (including licensed surveyors) in the country have revealed that the action of imposing a fine of $500 is not at all practical under any circumstances. After all, if any of the marks are missing the land owner has got to pay for the cost of relocating his boundary marks, and this could cost him less than $500. Although many had agreed that any intention to willfully destroy, damage, deface, move or interfere a boundary mark is an offence, such a punitive fine of $500 is considered too harsh and austere although it has never been implemented. When there is a strong evidence to prove that the land owner intentionally moved the boundary marks to another position in order to annex land from the adjoining lot, such act is a serious offence and imposing a penalty is considered justifiable and legitimate.

On the other hand, a fine of $500 in addition to the cost of repairing or re-emplacing the boundary marks is unjustifiable. The reason why such a penalty is never imposed is that the land owner can always engage a licensed surveyor to relocate his boundary marks at a much lower cost. For this reason, section 403 is weak. Because of its sophistry, it should be repealed from the NLC. In the last quarter of the century, no prosecution has been instituted under this provision although thousands of boundary marks have been willfully destroyed.

8.2. The Effect on the Agricultural Sector

The agricultural sector forms one of the main-stays of the economic development in the country. Although positive efforts have been made towards the development of manufacturing, services and other light industries in order to reduce the nation's dependence upon agricultural income in the light of the economic slowdown and recession, the country is forced to rely on agricultural sector for the development of the country more than any other sectors.[5] Such a phenomenon proves the importance of the agricultural sector in maintaining the economic stability of the country.

The National Poverty Statistics of 1984 showed that the small holders, especially those in the rural areas, are the ones who are faced with the impact of the agricultural failures. It was reported in the Mid-Term Review of the Fifth Malaysia Plan that the number of small holders has fallen from 924,800 in 1980 to 906,600 in 1983.[6] Poverty[7] amongst the small holders increased from 422,500 to 497,600 during the same period. More critical is the increase in the number of rubber small holders on a poverty level from 168,900 to 247,900 during the same period although the total number of the group decreased from 409,000 to 405,800.[8] This demonstrates the fall in the income and the dilemma facing the small holders during that period.

Apart from the NLC, there are other supporting acts which are applicable to agricultural practices such as the Land Act (1960), the Land Acquisition Act (1960) and the Padi Cultivators (Control of Rent and Security of Tenure) Act (1963). The NLC, which was based on the Torrens System, was aimed at simplifying land ownership and land management. It lists out all details which relates to the alienation of land as well as other land dealings. Under the fiscal cadastre, the Government gains revenue through the collection of land rent and all other monies chargeable on transactions involving land matters. For this reason, the NLC has laid down provisions to accommodate the smooth operation of land dealings by the District Land Administrator (formerly known as Collector of Land Revenue). The NLC has so far been accepted as having more relevance towards procedural land administration and management.

In the NLC, insufficient priority has been given on the subject on land development land as compared with land administration and management. It has to be made clear that land administration and its management, and land development are two different aspects though inter-related. If these two aspects are treated in isolation and without proper co-ordination and integration, any agricultural development project launched by the Government such as the National Agricultural Policy and the Rural Development Scheme will not meet the set target. Some of the provisions relating directly to agricultural practice are:-

Section 52 - which describes the different categories of land being alienated and its uses (agriculture, building and industry);

Section 53 - which describes the various conditions affecting the use of the alienated land before and after a particular land use is imposed;

Section 54 - which describes the application of various categories of land use to land alienated before a particular condition is imposed;

Section 115 - which describes the implied conditions affecting the agricultural land;

Section 120 - which describes the manner in which express conditions and restrictions in interests on alienated land are imposed;

Section 121 - which describes the land alienated under agricultural category.

The applicability and effectiveness of the above sections (together with other sections) towards the overall administration and management in land is debatable. Although it can be generally accepted that the present NLC has served its purpose, the poor and inefficient enforcement of the actual law by the authority has posed some concern especially to those in the legal profession and the general public alike. For example, the number of illegal squatters of agricultural land who farm illegally but avoid effective implementation of the law is considerable. Such is one example where the provisions as laid down in the NLC are not fully applied. There are several provisions in the NLC which are identified as weak, impractical and unsupportive towards the agricultural development initiated by the Government departments and other agricultural agencies. The following are two provisions in the NLC that have been identified as needing full consideration.

6.2.1. Sections 135 and 140 of the NLC

Section 135 lists the rights of the proprietor to apply for a sub-division so that the land may be sub-divided into separate titles. An application may be made to the State Director of Lands and Mines (if the land is held under the Registry Title) or the District Land Administrator (if the land is held under the Land Office Title). Section 140 lists the rights of two or more persons as co-proprietors to apply for a partition to be made. If the land is held under the Registry Title, such an application has to be made to the State Director of Lands and Mines and for Land Office Title to the District Land Administrator. These two provisions stress the rights of the proprietors and the co-proprietors to apply for sub-division and partition respectively, but no mention has been made towards the actual size of land permitted to be sub-divided or partitioned. One of the failures of the National Agricultural Policy is the inability of the State Authority to control the size of the sub-division and partition because there is no such provision in the NLC regulating these issues.[9] Not only the land size is uneconomical, other problems do arise some of which are low crop output, the planting of non-profitable crops and some land being left derelict.

In order to achieve the objectives of the National Agricultural Policy, sub-division, amalgamation and partition of land should be properly controlled and regulated by the Government. Although sections 146 and 147 of the NLC provide the amalgamation of land, it was found out that these two sections do not fulfill the needs of the initial concept of the National Agricultural Policy, i.e. to amalgamate land and to make it more feasible and profitable. These provisions indirectly forbid the amalgamation process to take place because it lays down stringent regulations associated with it. Section 146 states that any person in whom two or more contiguous lots of alienated land (i.e. if each of them shares at least one common boundary) are vested under separate titles (Registry or Land Office Title), amalgamation of those lots into one can only be considered if land is held under a single title situated in the same mukim, town or village.

Section 147 also lists further requirements to be met before an application for amalgamation can be approved. An application may only be approved if all the land parcels are being held under the same title (if land held under the Land Office Title, their combined area must exceed four hectares) and located in the same mukim, town or village. There should exist no dissimilarity between the land parcels in terms of the period for which the land is being held, its rates and categories of land use. Such stringent regulations laid down in the NLC inevitably restrict the effectiveness of the National Agricultural Policy whereby the initial aim is to amalgamate and re-group land; this may involve many titles and even a number of villages.

Some of the major land development agencies in the country are the Federal Land Development Authority (FELDA), the Federal Land Consolidation and Rehabilitation Authority (FELCRA), the Rubber Industry Smallholders Development Authority (RISDA) and the State Economic Development Corporations (SEDC's). Under the Fourth Malaysia Plan (1981-1985) as indicated in Table 6.1, FELDA has developed 161,600 hectares, FELCRA 31,100 hectares, RISDA 9,700 hectares and SEDC's 158,000 hectares.[10] Although the national achievement of the land development projects during the Fourth Malaysia Plan stood at 78.8 per cent, the hidden struggle faced by the agencies to achieve that mark was somewhat alarming. For example, the amalgamation and rehabilitation projects carried out by FELCRA in Kampung Teratak Batu of Pasir Putih in Kelantan, Kampung Kok of Langkawi in Kedah and Kampung Hulu Berang in Trengganu involved the painstaking effort of re-grouping all the land in the area by holding public meetings and inquiries in order to coax the proprietors to surrender their land.[11] During the earlier stages, FELCRA was faced with an enormous task of not only convincing the public about the benefits and returns of such a project, but also coaxing and persuading the general public to come to terms with the plan. It was an enormous task especially when the authority was confronted with people from all walks of life (i.e. a mixture of rich and poor proprietors).

RISDA was also involved in land development projects throughout the country. An outstanding example which was given much publicity because of its encouraging achievement was the RISDA Mini Estate Project. During the initial stages, several problems were encountered such as that of absentee land owners and land being held under different categories of land use. As mentioned earlier, section 147 of the NLC states that land may only be amalgamated if the categories of land use is the same. This led to enormous costly and timely delays to resolve such problems.

Under the amalgamation and rehabilitation schemes, although the proprietor is eligible to land ownership rights, all existing boundary marks will either be uprooted, buried or destroyed except those which form the perimeter boundaries of such schemes. What is missing in the NLC is the provision to sustain such projects legally. Currently, such projects are carried out based on the mutual understanding between the proprietors and the development agencies without any legal backing. In reality, the proprietors fail to locate the position of the boundaries yet the title documents indicate that such marks exist. The NLC also fails to address other situations such as when one of the proprietors wishes to withdraw from such project

Table 6.1. Progress in land development, 1981-1985 and target for 1986-1990, Malaysia.

Agency/ Programme	4th Malaysia Plan (1981-1985) Target	Achievement (Hectares)	%	5th Malaysia Plan (1986-1990) Target (Hectares)
Federal Programmes:				
1.FELDA	161,600	161,600	100.0	175,500
2.FELCRA	41,100	31,100	75.7	-
3.RISDA	9,770	9,770	100.0	-
Total:	212,470	202,470	95.3	175.500
State Programmes:				
	217,200	158,000	72.7	93,700
Joint Venture/Private Sector:(1)				
	100,000	57,100	57.1	17,500
TOTAL:	529,670	417,570	78.8	286,700

(1) *Refers only to land development in areas under regional development authorities.*

and requires a return of his land. Another example is when a piece of land which is owned by two or more co-proprietors but only a single co-proprietor is registered who eventually benefits from such project. From the above examples, the NLC should be revised to accommodate such eventualities so that development projects will be supported by the general public.

6.2.2. Recommendations

From the above examples, the NLC is seen to suffer from certain weaknesses and urgent steps have to be undertaken to rectify such weaknesses. The NLC is not the only law which suffers such weaknesses, there may be several other enactments having similar shortcomings but which are beyond the research area. The Land Act (1960) which is still in use in conjunction with the NLC should also be revised.

6.2.2.1. Matters Regarding Land Laws

When problems do arise as a result of some contradicting opinion due to certain ambiguities, it was found out that more often than not the NLC was accepted as being more superior although there exists some saving clauses which clearly state that the Land Act prevails under certain circumstances.[12] This shows the presence of uncertainty within certain provisions. A revision has to be made to the NLC to over-ride the

Land Act in areas of ambiguity and finally to annul the Act. Such a revision is an enormous task involving numerous disciplines. A special task force unit could be set up to investigate carefully and accurately all spheres of the NLC. Such unit must be represented by officers who are not only specialist in the legal and land aspects but also experts in the principles of the machinery of the Government. It is essential that the consequences of the social and political factors be evaluated and the amended provisions should have the confidence of those whom it serves. Like in most other Commonwealth countries, the land law in the country is based upon case histories and it must attempt to cover all eventualities.

6.2.2.2. Land Use Plan

Under the present system, the alienation of agricultural land is subjected to the implied conditions as well as express conditions and restrictions. Such conditions were imposed as a result of thorough studies being made together with all recommendations put forward by the various Government Departments and Agencies. This demonstrates the early safeguards and precautions taken prior to the promulgation of the NLC. What is lacking is the intellectual basis and guidance employed by the authority towards formulating the provisions with regards to the use of agricultural land. In the NLC there is no provision to support the proper use of agricultural land. A land use plan is seen as an essential tool to be used by the State Authority when approval for land alienation and change in land use are to be considered. If such a provision is accommodated in the NLC, proper monitoring and assessment of the use of land can be carried out by the State Authority.

A study was conducted by the Malaysian Agricultural Research and Development Institute (MARDI) entitled *Agro-Ecological Regions in Peninsular Malaysia* and the findings were published to demonstrate the importance of including land use plans in the NLC.[13] A table was produced to show the type of crops (and the marginal crops) suitable to be grown in a particular area based on ecological reasons[14] (Appendix 6A). An agro-ecological map was also produced to show the areas suitable for each crop[15] (Appendix 6B). The object of creating a land use plan is to secure the best use of resources within a number of constraints. The adoption of a proper land use plan can lead to more controlled agricultural activities and to get the best output. The Land Office and the Survey Department in every state can adopt such guidelines in the process of regulating the right land use for every region based on ecological reasons.

6.3. Automation in the Land Administration and Land Law

Apart from the weaknesses outlined in section 6.2. with regards to the agricultural and development sectors, there are several areas of short-comings in the NLC which are experienced today that need careful attention. Changes are needed because there are so many things taking place today which had not been foreseen in the early 1960's, one of which is the use of computers in land administration and management.

6.3.1. Land Administration and Management

Land administration and management in the country involves basically three main functions; the collection of land revenue, the keeping of land records and land management. With the introduction of the CALS project at the Survey Department in Johor, an extension to cover the administrative and management areas may be set up so that the various functions (including that of the Land Office) may be improved and up-graded. With the financial and human resources made available, several administrative and management areas must be revised in order to benefit from the introduction of computers. It must also be realised that not all aspects of land administration and management demand the use of computers. With the use of computers, the quality of work at the Land Office could be up-graded especially in view of the increase in the number of land titles. Also, the importance of having a correct land data base is far-reaching insofar as planning decisions are concerned. However, there may be a few obstacles which may be faced in using computers in land administration and management.

If the main object is to set up a Computerised Land Administration System as an extension to the CALS project, then it is imperative that the legal requirements of land administration be adhered to and information on land titles must be faithfully transferred to a data base. It should be realised that a computerised land administration system will not automatically solve the major problems facing the Land Offices. For instance, the delays in the processing of applications for State land mentioned in Chapter 3 which typically takes 564 days, are basically due to the result of slow decision making at the various departments involved in recommending the approval or inspecting such applications. A computerised land administration system will not help a great deal in this task. If the system has a sub-system for monitoring the work flow at various stages, the land officers may be able to keep track of the various applications and to clear certain bottle-necks if certain stages seem to be moving very slowly.

The use of computers should not be seen as a cure to all the existing problems faced by the Land Offices in the country. Many of the problems relating to land and its administration and management have been debated in the Parliament, the State Assemblies, seminars and the press, and this is not the only result of the inefficiency in the existing manual system or the requirements as laid down in the NLC. Rather, many of the problems raised are due to a variety of factors including political over which land officers have no control at all. There is also the lack of commitment as well as the human weaknesses on the part of some land officers. Under these circumstances, the introduction of the latest technology including the most powerful computers, will be limited. The use of computers in land administration and management will undoubtedly up-grade the quality of work as well as the quality of decision making in the Land Offices and various other committees dealing with land and planning matters.

The future use of computers in land administration and management in Malaysia is not inevitable although it is clear that if other Government Departments are making preparations to introduce (or have used) computers, it is hard to envisage that the existing system will remain unchanged. This is explained under the following three main land administrative areas.

6.3.1.1. Collection of Land Revenue and Other Land Dues

In the near future, the collection of land revenue and other land dues will have to be computerised. Land rent records will be stored in an electronic media of some form, the bills can be prepared based on the stored data and all records of payment and reconciliation statements will be processed by computers. Bills for the quit rent and other land dues can be sent out to the land owners at the beginning of the year stating that such bills are required to be settled before a certain date after which a penalty will be imposed on those who fail to do so.

Table 6.2 (Appendix 6C) shows the progress of land revenue collection in the District of Kota Bharu, Kelantan in 1985. Out of a total outstanding fees of $2,084,834.85, only $1,481,432.50 were collected by the end of the year. This constitutes only 71 per cent of the total amount of land revenue due with a remaining $603,402.35 still outstanding. Out of these figures, $287,589.40 (60 per cent) were from the previous years, with only $315,812.95 (20 per cent) from the current year. The situation can be improved in the coming years with the introduction of a computerised land revenue collection system.

6.3.1.2. Land Management

Management and decision making relating to land matters such as alienation, sub-division, land use (before and after-use including any conversion of land use type) and land acquisition will, in future, be based on more reliable and up-to-date information. With the setting up of LIS, these tasks will eventually be made possible. The system of storage of land data will be improved by an easy up-dating process and providing a much quicker access to all information relating to land. The alienation of State land, for example, can be quickly verified and any ambiguities can be resolved. At present, there is no systematic way of verifying any statements made by the applicants unless the land officer himself goes through each land title manually and noting relevant details such as whether an applicant already owns land in any particular district or not.[16] If the computerised land revenue collection system is not implemented, work on LIS can never be in full operation.

6.3.1.3. Custodian of the Legal Land Records and Land Titles

If all legal records such as land titles are stored in an electronic form, all dealings in land such as the registration of transfer of ownership and charges can be carried out more systematically and in less time.

Instead of volumes of land titles being kept in a strong room, land data can be stored either on magnetic tape or disk. Eventually, it would also be possible to gazette all the land officers manning with computers which possess the capability with regards to the land registration and rejection of any application for land dealings so that decisions can be made immediately. This proposal involves the basic changes in the existing laws and also convincing the public about the practicality and viability of keeping the legal records in electronic media.

6.3.2. Recommendations

As a result of introducing computers to land administration and management at the Land Offices, certain changes to the existing system have to be made. This is discussed under the following sub-headings.

a) Registry and Land Office Titles

Under the present system, land titles in each state are kept in two places; the Registry of Land Titles and the District Land Offices. The Registry of Land Titles, which is part of the State Director of Lands and Mines Office *(Pejabat Pengarah Tanah dan Galian Negeri)*, is located in the state capital. It keeps the titles (grant or state leases) of all town[17] and mukim[18] lots of 10 acres and above. The District Land Offices keep titles of all the other mukim land i.e. lots of less than 10 acres each. This division of role between the Registry and the Land Offices can lead to an ambiguous and confusing situation for the reasons which follow.

Firstly, town land means land within the town boundary as defined by the Land Office and the Survey Department. In most towns throughout Malaysia, the area covered by such boundaries is very small and most of the development process takes place outside the town boundaries. In fact, the municipal boundaries of many towns are completely different from the town boundaries adopted by the Land Office and the Survey Department.[19] In reality, the Registry of Land Titles does not keep titles of all land as the term is generally understood. Secondly, the existing ruling is that titles of land parcels which are sub-divided from a bigger land parcel have to follow the title of the parent land parcel. For example, titles of housing lots (e.g. 1,000 to 5,000 sq. ft.) in the *mukims* will be registered in the Registry of Land Titles if the parent lot is a Registry title. Consequently, it is possible to have some titles of a housing estate registered as Registry Titles while some are registered as Land Office Titles.

Such an arrangement is not conducive to proper land management because the Registrar has, in his immediate control, part of the land records in each district while the District Officer/District Land Administrator has the remainder. For any picture on land matters to be drawn in each district such as the distribution of foreign ownership, the District Officer/District Land Administrator has to liase with the Registrar which could be a few miles away. To draw any conclusion and analysis regarding land matters is very difficult, costly and time consuming although not impossible. A solution to this problem is to keep all the land titles of each district in one place. It is recommended that the Registry is closed and all land titles in each district be kept in the District Land Office. There are several reasons to support this recommendation. Firstly, by keeping all land titles of a particular district at the local District Land Office, setting up of an efficient LIS will be facilitated. Secondly, it does not require the land owners to travel to the state capital to settle all matters and queries regarding their land. This is favourable particularly in big states like Pahang, Perak, Johor, Trengganu, Kedah and Selangor. Thirdly, it rationalises the storage of land data at the district level. Fourthly, the State Director of Land and Mines is able to devote more time and attention to other important matters in land policy and the overall management in the state.

It is clear that the task of recalling all document of titles (i.e. titles kept by the land owners) and replacing all the Registry Titles with the Land Office Titles will be an enormous, difficult and costly job to be undertaken by the District Land Offices. However, if the country were to have some form of rational land administrative system, such a job (although difficult and costly as it may be) could be undertaken systematically and in phases i.e. district by district.

b) <u>Express Conditions and Restrictions-in-interest</u>

It is now common to find the State Authorities imposing express conditions and restrictions-in-interest on newly alienated State land or when the land owner applies for the conversion of land use from one type to the other. While the express conditions and restrictions-in-interest are useful instruments for the Government to enforce certain policies, some of them are written in rather cumbersome language.[20] Some are very detailed and specific. In other cases, the express conditions imposed are unnecessary and unrealistic since such requirements are covered by other laws. The end result is that such conditions and restrictions imposed are almost impossible to code, or if coding is attempted, it is likely to lead to errors in the LIS. In order to facilitate coding both for storage in electronic media and analysis purposes, it is important that express conditions and restrictions-in-interest be used sparingly and, if needed, be used in a standardised format. Such a format may be prepared by the State Director of Lands and Mines with consultations with the State Executive Council and latter included in the NLC.

c) <u>Identity Card Number</u>

Under the present system, it is required by law to include particulars on the instruments particulars such as addresses and national identity card numbers of those involved in land dealings. Before the NLC was last amended in July 1985, it was required under previous land laws to include only the names of the owners and those having interest in the land. As a result, many of the former land titles do not have the identity card numbers of the owners.

There were cases where disputes occurred when the land owners were given the wrong documents of title. One case reported took place in a remote village in the state of Kelantan. It happened when two persons, both having the same name and residing in the same village, were given the wrong title to their land. Both the addresses were similar with no house number and street name but just the name of the village. This is a common occurrence in some of the remote areas in Malaysia. If the identity card number of every land owner was included on the instrument, it would have served as a vital evidence to solve the above dispute because of its unique identification. (No two persons have the same identity card number). Any dispute could be solved easily without involving the State Authority if the identity card number was included on the instrument; instead, much time and money was spent unnecessarily to solve the above problem. It is also possible to tell whether two pieces of land having the same name belong to the same person or not.

Since the NLC was last amended in 1985, a new provision was included to make mandatory the inclusion of particulars of identity card for local individuals and passport details for foreigners on all documents of title. Section 436A of the NLC states that -

> *In making any application under this Act.......which requires the name of the person to be inserted, there shall be included, in the case of a natural individual a description of his citizenship, and the number of his identity card issued to him under the National Registration Act 1959, or where no such identity card has been issued to him, the description and the number of his passport, or other official document of identity, and in the case of a corporation a statement as to whether or not it is a foreign company.*

As in the case of previous documents of title issued before the promulgation of Section 436A, the District Land Administrator can insert on all title documents the identity card numbers and other identification details when the land owners visit the Land Offices to settle the annual quit rent. Notices can be published to make the general public aware of the existence of such provision by affixing such notifications at all conspicuous places (such as community centres, *penghulu's* offices or *balai raya*, mosques, etc.) as well as through the media (such as television, radio, local and national newspapers). It was found that land officers now include identity card numbers on the document of title for land parcels which recently have been the subject of transactions. Since the identity card number is a unique piece of information, it is necessary for all States to mandatorily adopt this system of identification not only on land titles but also on all land dealings such as the payment of quit rent, land premium and other land dues.

d) Use of Papers

With the eventual formation of the LIS, records which are at present kept on paper and bound up in a book may be converted into an electronic (digital) form. Section 158 of the NLC states that -

> *The Registrar shall open........two series of books, to be known respectively as a) the register of grants, and b) the register of State leases; and every grant and State lease registered by him under the Act ....shall be bound up in a book of the appropriate series and serially numbered.*

Although there is no urgency at the moment to advocate the case for storage of land information in an electronic media, there will be necessary in future for all records including the legal documents to be stored as such without paper being used. Detailed instructions on how the land titles are to be bound together into a book will have to be amended to suit the procedures of keeping land records in electronic media. There are many instances in the NLC which mentioned the keeping of land records on paper form such as Sections 159, 375 and 437, to mention a few, and as such these sections have to be amended. This is one area where attention has to be made if the nation is to take advantage of the computerised system. Better decision making affecting land and the up-grading of work quality by the land officers can be achieved by the use of the technological innovations presently available.

6.4. Insurance Principle

Like many other profession, surveyors do make mistakes and in the absence of a formal cadastre, errors in the interpretation of ancient title records and boundary descriptions were and are unavoidable. This in spite of the fact that land owners and real estate investors engaged the professional services of legal title examiners and licensed surveyors, all duly licensed and authorised by the authority. On balance though, most boundary and title problems were resolved without great hardship to the parties involved. There were, however, enough serious, even disastrous, situations in inadvertently spending money and effort on somebody else's land that eventually caused the creation of title insurance companies in countries like Australia and the USA.

In America, real estate may be insured against defects in the title, claims of rights, even ownership by others, and the reliability of the location of its legal boundaries. Title insurance companies have been set up and have grown to assume that risk. For a one-time fee, usually a small percentage of the assessed value of both land and buildings, the title insurance company will guarantee rights, title and interests, even boundaries, to individuals and corporations.[21] While title insurance companies have been around for over 100 years in America, their volume of business has increased dramatically during the last decade. By 1980, it had grown to a $1,260 million business. The State of California alone accounted for a total gross title fee of $298,362,862.[22]

6.4.1. Practicality of Title Insurance

In Malaysia, the introduction of the insurance principle as a means of providing compensation for an innocent person who suffers loss because of the effect of registration and the delays of surveys caused by the workload and the backlog at the Survey Department looks at first sight a viable proposition. On the positive side, it provides a security to anybody who is deprived of an interest which otherwise he would have had and therefore entitled to compensation from public funds. In the case of registered conveyancing, for example, the transfer and vesting of ownership are effected not by the execution of the instrument of transfer or other act of the owner but by the State through its officer, the Land Administrator. It is registration which is the operative act and such compensation required should be found out of general revenue.

In South Australia, provision was made for the establishment of an insurance fund in the first Act in 1858; one half-penny in the pound (approximately one-fifth of 1%) on the value of the land was levied on all land brought under the Act.[23] The highest tribute that could be paid to the Torrens system in Australia is the infrequency of claims on the Insurance Fund. Between 1 July 1958 and 31 March 1972 (nearly 14 years) £49,351 was paid on 294 claims, an average of £168 per claim, set against a current annual revenue of £12 million, and an annual handling of 225,000 applications for first registration, 1,400,000 dealings and 1,470,000 official searches and office copies.[24] In New South Wales, about £A21,000 had been paid out of the fund in 1939. Since then, three payments had been made; £A108 in 1942, £A61 and $A12,800 in 1949, thus highlighting this danger to the system.[25] In California in 1918, a judgment for $48,000 was obtained, only to find that the fund amounted to just over $39,000, and when they had taken it all, more than $8,000 still remain unpaid. In Nebraska in 1929, there was only $182 in the insurance fund to satisfy a judgment against it of $19,890.[26] In England, after the introduction of compulsory registration in 1897, an insurance fund which was built up by annual allocations of a proportion of the receipts from land registration fees was established to meet claims for indemnity. Claims against the fund were few and small, but by 1930 it amounted to more than half a million pounds.[27]

It can be deduced that an insurance fund which is dependent solely on the contributions made to it on registration is obviously very vulnerable before it has had time to build up; this will be a long process especially when registration is dependent on voluntary application. The present system in Malaysia, though imperfect in many ways and without any insurance policy, does not appear to have suffered adversely in consequence. In Sudan, the state legislation does not provide any insurance fund and the registration of any instrument or the making of any entry in the register does not in any case operate as a guarantee by the Government that the transaction ought to have been registered or that the entry was a proper one. Indemnity does not appear to be a feature of the Continental systems. It can be argued, therefore, that express provision for indemnity against loss is not essential to the effective operation of registration of title.

As described in Chapter 3, there are cases where a requisition for survey takes about 3 to 4 years to be effected. While such requisition for survey for a piece of agricultural land in a rural area, for example, where farming practices are carried out using traditional methods does not impose a great monetary loss to the proprietor, urgency for a survey for a piece of industrial land in the suburb to be effected may necessitate some legislative control so that the certified plan may be prepared in a timely manner. It is from this standpoint that the issue of compensation seems to be a crucial tool in the proper execution of surveys and to be completed in a timely manner so that any landed activity such as those relating to planning can be effectively monitored and executed.

Questions such as whether there should be a right to compensation for loss of earning as a result of a delay in the survey, or whether land value is too small to consider compensation, and how strong is the relationship between compensation and public participation in so far as they affect the acceptance of public development should therefore be considered very seriously. In this as in other areas of planning, therefore, policy and law are intimately entwined. If any system of compensation is to be instituted in the country at all, it must be designed to be fair and unbiased, and is directed to securing the best social use of land and tries to operate within a system of registration of title and land ownership under which there is attached to land a development value depending on the prospects of its profitable use. If there is to be a completely satisfactory basis for regulating the execution of survey to the preparation of final document of title which gets rid of the various arrears (backlog), that system itself must be revised for difficulties which arise out of a system which are not solved by framing a new code for assessing compensation and the collection of premium which operates within that system. Compensation should be based on the market value of land, the development value as well as the existing land use value. The development value here refers to the relationship between the co-existence of two things; market demand for the land for development purposes and planning permission, actual or assumed for such development. The above elements of land value are in fact the factors, which when aggregated in a proper case, go up to make up the market price of land. Such factors may be expressed in terms of the existing use value of land, the value of the prospect of development over and above the existing use, and the total cost of such development if carried out including the developer's profit should a final title is prepared in time. Although it may be argued that different valuers may take different views about the best method of valuing the land in the hypothetical circumstances which have to be imagined, an independent tribunal must decide whose evidence it prefers and determine the value as a question of fact.

Perhaps, the biggest drawback of title insurance survey is their proprietary as well as their insular nature. In America, in accordance with strict standards the private surveyor conducts very accurate field surveys of the land to be insured. Based on record research of relevant public boundary data and computation of field notes, a large scale (1:500 to

1:2,000) boundary plan is then prepared. The land surveyor certifies to title insurer, owner, lessee, and/or lender that the property boundaries as depicted on the plan are correct to the best of his professional ability. However, the uncoordinated land parcel *floats like an island* among all other abutting, but surveyed, properties.

If this idea of insurance principle is to be introduced in Malaysia, there is always a danger arising from the lack of comprehensive, up-to-date and reliable large scale cadastral maps, to which the title insurance survey can be related for permanent fit. QT's with provisionary coordinates and orientation will only add uncertainties and ambiguity to land administrators. In the legal sense, the guaranteeing of boundaries as in fixed boundary system is obviously quite a different matter from undertaking that a boundary mark can be relocated to the degree of precision as prescribed in the Survey Regulations. The fact that a trained surveyor can use the plan to re-establish a boundary mark is an apparent advantage that any land proprietor will say he wants to have, though its benefit is illusory. If the re-establishment is done officially, as it should be, it may be a very expensive costing process, perhaps something of the order of the original survey. On the other hand, the dimensions recorded on the CP's certainly indicate precise boundaries. The showing of dimensions would appear to be very convenient for any proprietor who wants the exact dimensions of his plot - and most proprietors, if asked, will say that they want such measurements though in point of fact they scarcely ever make use of them.

Nevertheless, title insurance and title insurance surveys have assisted in America's development. In the absence of a mandatory comprehensive cadastral system they continue to reduce the developer's risk of loss of valuable resources. Modern computer systems and related high costs are prodding individual competing title insurance companies towards sharing of proprietary information. They are, in fact, mini cadastral systems.[28] Until a public cadastre is established, they will continue to perform an important and necessary function, namely to aid and speed up land development. Although it remains a stop-gap method, title insurance surveys will remain in America for sometime to come.

6.5. Conclusions

In order to have a complete and correct implementation of land law, the NLC should be made simple to understand and unambiguous. Its procedures and regulations should be straight forward and easy to apply. Presently, an application for a conversion of a piece of land for development purposes is required to go through 42 procedural steps involving 18 to 20 Sections before a decision can be made. The application of the

Torrens System of registration on the whole only work in certain areas of the legal matters concerning land. Changes should therefore be made continuously to the identified areas already mentioned in order to accommodate the fast changing social and economic needs of the country. Two of the areas that need careful consideration are matters relating to the local customary laws and the strata title. A progressive NLC should preserve and ensure the continued success of the present land registration system which confers so much sense of security to the title holders. One of the safeguards to ensure that the foregoing is a continual process is that regular references to the professionals and the regular users of the NLC should be considered as an integral part of the process when considering any amendments or new enactments to the law dealing with land. There have been cases where amendments were made without in depth consideration of any repercussions which may be generated by these new provisions. If this is to persist, an effective and efficient NLC cannot be achieved.

CHAPTER 7: EDUCATION AND TRAINING

7.1. Introduction

The historical tradition of land surveying education in Malaysia has led to the development of an education model which was initially based upon that of the colonial. Since independence in 1957, various modifications have been made to suit the changing situation. A characteristic feature of this model is a uniform organisation and a comprehensive programme of general education in land surveying. The uniform organisation of education comprises in general four levels; secondary school, technician, technical assistant (semi-skilled), and professional (skilled).

At the first level, surveying education commences at the technical oriented secondary schools where students may choose a surveying subject in the Malaysian Certificate of Education (MCE). The MCE is equivalent to the O-level in the United Kingdom. Particular stress is being made on the cadastral and engineering surveying areas. The second is the surveying technician level offered at polytechnics. At present, there are five polytechnics in the country offering courses at certificate level with only the Ungku Omar Polytechnic in Perak and the Sultan Haji Ahmad Shah Polytechnic in Pahang offering a land (including engineering) surveying option. The third is the technical assistant level which is classified as semi-skilled. Two institutions namely the MARA Institute of Technology (ITM) and the University of Technology Malaysia (UTM) offer courses at diploma level. The fourth level is that which offer professional qualification and is also available at ITM and UTM. At ITM, the Advanced Diploma course in land surveying is recognised by the Public Services Department (PSD) and the Institution of Surveyors Malaysia (ISM) as equivalent to the Degree course offered at UTM.

Although all levels of education in land surveying are important, the third and the fourth levels (which are tertiary) are considered more significant towards the formation of the land surveying work force in the country. The following discussion is therefore concentrated on this particular area. The assessment of education and training of land surveyors in Malaysia may be divided into two main stages namely:-

a) the pre-employment stage (i.e. the tertiary level of land surveying education); and

b) the employment stage.

7.2. Tertiary education in land surveying

In Malaysia, ITM and UTM are suitably equipped to provide training to professional level. The extent and demand for the land surveying course is evidenced by the numbers applying to enter universities and polytechnics overseas such as in the United Kingdom and Australia. Such applicants do not necessarily find the course matching local needs; the tuition fees are becoming increasingly high and many students studying abroad have acute social problems. Lately, the numbers applying to study overseas, especially in the United Kingdom, have decreased dramatically and this has led to a harder competition to obtain places in the two local institutions.

The Diploma and Advanced Diploma programmes at ITM are to be seen as a continuum of study. The Diploma is however a quite clearly defined qualification in its own right and its form is largely fixed by the recognition accorded by PSD. It was argued that this linear approach may give rise to problems. Undoubtedly, it has proved to be one of the most efficient ways of providing both semi-professional and professional education for entrants whose qualifications are predominantly the MCE and the Higher Certificate of Education (HSC). The HSC is equivalent to the A-level in the United Kingdom.

The duration of the Diploma course is 3 years and is based on semester system; there are two semesters in an academic year. After the sixth semester in the final year, a student with sufficient academic achievement in terms of the final Cumulative Grade Point Average

(CGPA) as set out by the Institute can apply to proceed to the Advanced Diploma programme. The duration of this programme is $2^1/_2$ years (i.e. 5 semesters). The Advanced Diploma has been recognised by PSD and ISM as being equivalent to the degree from UTM as well as from other recognised universities and polytechnics abroad. It is however a different structure to that adopted by UTM where the Diploma and the Degree courses are run in parallel. The duration for the Diploma course is 3 years, similar to that of ITM. For the Degree course, the duration is 5 years and is not a continuum of the Diploma course. However, a diplomate may apply to pursue the Degree course (not in continuum) by being enrolled directly to the fourth year of the course after gaining a few years of working experience as well as the required academic grade set by the University.

Apart from ITM and UTM, the Ungku Omar Polytechnic (UOP) in Ipoh also runs a surveying course but at Certificate level with qualification of entrants below MCE and its Malay equivalent, the *Sijil Peperiksaan Malaysia (SPM).* Holder of the Certificate may enter ITM or UTM to study at the Diploma level in the third semester. However, there is no automatic transition for diplomates to the Advanced Diploma course at ITM or entry to the Diploma course for those with Certificates from the UOP at either ITM or UTM. Both ITM and UTM had played a very effective role in providing education and training for land surveyors at the professional and semi-professional levels in the country. The number of graduates over the years were increased to match the local requirements. The first land surveying graduates from UTM were awarded their degrees in 1978 while the graduates from ITM were awarded their Advanced Diplomas in 1985. Tables 7.1. and 7.2. (Appendix 7A) show the number of past graduates in land surveying from ITM and UTM at both levels. No exact figure was obtained from UTM for the number of past graduates before the year 1976 but it was estimated that about 15 to 20 students graduated annually at Diploma level since 1960 when the course was first set-up.[1] The Masters programme at UTM has also started with its first intake in 1988. The duration of this taught course is 18 months and the first intake is expected to graduate at the end of 1989. Table 7.3. shows the future projection of the number of graduates at Diploma, Degree and Masters levels from UTM up to the year 2000.[2]

It can be seen from Table 7.3. that the number of Diploma and Degree graduates from UTM are projected to be about 30 and 35 respectively up to the year 2000. For the Masters programme, an estimate of about 5 students a year for the years 1989 to 1993 are expected to graduate and will be increased to 10 in the years 1994 to 2000. It is also expected that the number of Malaysians pursuing the Masters programme overseas is likely to decrease considerably when the programme at UTM, which is tailored to suit the local requirements, is well-established. However, it can be said that the Malaysians will continue to pursue Doctorate degrees abroad until such a programme can be offered locally.

Apart from land surveyors graduating from local institutions, many have graduated from universities and polytechnics abroad which are recognised by PSD and ISM. Some of these are:-

a) Degree of Bachelor of Science in Surveying and Mapping Sciences (awarded by the Council for National Academics Awards, CNAA) from the North East London Polytechnic (NELP) (now known as Polytechnic of East London);
b) Degree of Bachelor of Science in Surveying Sciences from the University of Newcastle-upon-Tyne;
c) Degree of Bachelor of Applied Science (Surveying) from the Royal Melbourne Institute of Technology (RMIT) in Australia;
d) Degree of Bachelor of Science in Engineering Surveying from the University of New Brunswick, Canada; and;
e) Degree of Bachelor of Science (Land Surveying) from the University of Otago in New Zealand.

At the North East London Polytechnic (NELP), the degree course in Surveying and Mapping Sciences came into existence in September 1978. The course was formulated to provide a basis for possible specialisation in any of the mapping disciplines. It is intended that by the end of the second year, students will have received an education in the mapping sciences that will enable them to contribute positively, if offered employment at that stage. However, this is never put to test as all students continue to the third year and pursue to their particular interests either in one specialist area, or in a number of areas selected from the available options such as Geodesy, Advanced Survey Mathematics, Cartographic Systems, Digital Mapping, Analytical Photogrammetry, Land Registration and Cadastre, Land Development, Offshore Geodesy, and Dynamic Oceanography and Sedimentology. Principles and Procedures of Surveying and Mapping (PPSM) is a compulsory subject in the third year. This subject examines the principles and procedures underlying land and sea surveying and mapping practices. In so doing, the work of the first two years is re-examined and placed in context.

7.2.1. Restructuring the Training and Education of Land Surveyors

The land surveyors of today must be able not only to respond to the current needs but also capable of creating the techniques and principles that will solve tomorrow's problems. Clearly, the difference between education (i.e.theory) and training (i.e. practice) must be understood although both terms are often confused. In evaluating the needs for tertiary education for the land surveyors, it is a mistake to look at the needs of today's industry. Today's requirements justify university education but any existing doubts must be quickly removed by exploring tomorrow's needs. These needs can only be clearly seen after surveyors of today understand the responsibilities and the professional role, realising the inadequacy of the present working systems and becoming more aware of the growth of these problems. As such, for the development of education and training of land surveyors, the following keywords must be adopted. They are:-

a) Integration - between the academic courses and the training programmes to bring about high technical competence;

b) Relevance - the possibility to apply knowledge to foster developing industrial, commercial and national needs; and

c) Flexibility - to meet the rapidly changing needs of new and different types of surveyors and technologists from other fields in the future.

7.2.2. Course Structure

From the investigations carried out, it was identified that the course structure of the Diploma in Land Surveying at ITM, which is presented in Appendix 7B, needs an immediate modification. For example, in the First Semester, no surveying subject is being taught. The first surveying subject is introduced only in the Second Semester of the course. It is proposed that the surveying subject is introduced to the students in the First Semester of the course so that they can appreciate the subject and know what to expect from the course. This introduction of an element of reality into the surveying course at the initial stage certainly stimulate students' interest and enthusiasm, and thereby does much towards achieving the course objectives.

The Course Committee at ITM must consider the changes to be made to the existing course structure to ensure that it meets an acceptable standard. An appraisal of the course curriculum and teaching modules must also be recommended. Apart from land surveying the other subject which must be introduced in the first year of the course is Computing. It has been generally acceptable that much of the survey work nowadays involves the use of computers. Computers are considered as much a part of survey instrument as the theodolite or level. Students must also be taught the latest development in the technology. Computer developments in the form of electronic instrument, electronic data recorders, surveying packages and plotters have allowed automation of many of the manual survey processes. Major software packages, such as ECLIPSE and MOSS, can be interfaced with field instrumentation via data recorders and this has changed completely the manner of data collection as compared with thirty years ago. Such technology must be made known to the students so that they are ready to face working life upon graduation.

In general, the Course Committee should provide a forum for discussion on the operation of the course and the performance of students. The Committee should meet at least twice a year to ensure that the course is meeting its declared aims and to discuss any problems which may have arisen or proposals for improvements. Some of the specific duties and responsibilities that should be re-emphasised are:-

a) To appraise the curriculum and teaching methodology and to make recommendations for up-grading both the Diploma and Degree courses in land surveying;

b) To make recommendations on the acquisition of teaching aids and equipment;

c) To receive reports from the Course Tutor as well as subject lecturers and the assessment of appropriate actions and recommendations;

d) To ensure that all land surveying students make satisfactory attendance and progress and to take remedial actions where necessary; and

e) To make recommendations on other matters relevant to the organisation and administration of the course.

7.2.3. <u>Changes to the Existing Course Structure</u>

In this section, an analysis of the present course structure of the Diploma in Land Surveying at ITM (Appendix 7B) is made and several proposals are outlined. The few changes that may be made to the existing course structure are as follows:-

a) Technical Drawing subject (MEN 102) with 2.5 contact hours taught in the First Semester can be phased out; instead of being a discrete subject, drawing office routines become part of the cadastral and engineering subjects;

b) To reduce the Accelerated English subject (ENL 099) from 20 contact hours to 10; and

c) The three Physics subjects [Mechanics and Optics (ENG 156), Electricity (ENG 157) and Heat (ENG 158)] taught in the Second Semester should be reduced from a total of 17 contact hours to 12.

In the First Semester, a total of 12.5 contact hours gained from the elimination of Technical Drawing subject (MEN 102) in (a) and the reduction from 20 contact hours to 10 for the Accelerated English subject (ENL 099) as in (b) can be used for the teaching of surveying. It is proposed that out of the 12.5 contact hours gained, 5 contact hours can be used for the teaching of Cadastral Surveying, another 5 contact hours for Engineering Surveying and the remaining 2.5 contact hours for Computing.

In the Second Semester, the 6 contact hours allocated for Surveying (SUR 193) is insufficient. The 5 contact hours gained from (c) above can be used for the teaching of Surveying. Thus, from a total of 11 contact hours, 4 hours could be allocated for Cadastral Surveying, another 4 hours for Engineering Surveying, and the remaining 3 hours for Computing. Having studied the basic Cadastral Surveying and Engineering Surveying subjects in the first year of the course, the students will be in a better position and well prepared to face the more advanced surveying subjects in the second year.

In the Third, the Fifth and the Sixth Semesters of the course, Computations 1, 2 and 3 (SUR 246, SUR 346 and SUR 396 respectively), where 3 hours are being allocated for lectures and 2 hours for tutorials, should be changed to 1 hour lecture and 2 hours tutorial. Particular emphasis must be made on computer programming exercises applicable to processing of survey data. In the Fourth Semester, Computer Concept (CPT 209), which should be introduced in the first year of the course, could be replaced with Computations, following the similar proposed format to that of the Third, the Fifth and the Sixth Semesters. This proposal is made on the grounds that land surveying students will be better equipped with computing knowledge and will thus become more aware of the presence of modern techniques applicable to surveying.

For the Advance Diploma course, the present course structure is considered satisfactory. Discussions with lecturers at ITM and a number of licensed surveyors have revealed their approval of the course structure of the Advanced Diploma programme. The course includes key areas such as acquisition, processing and presentation of spatial data. It was also found that subjects like town and country planning, survey management and disciplines of land information are included in the course structure.

A study was carried out in Australia in 1978 to find the important areas of surveying to a graduate's professional career using questionnaires.[3] Importance has been rated on a scale of 0 (no importance) to 10 (highly relevant). The results of the study are:-

Cadastral surveying	8.5
Engineering surveying	7.5
Management and administration	5.5
Land development and management	4.8
Cartography	4.1
Geodesy	3.9
Digital data processing	3.9
Town planning	3.9
Photogrammetry	3.5
Astronomy	3.4
Research	2.9
Hydrographic surveying	1.8
Other	1.6

The study also include the assessment of the relative importance of surveying subject areas at graduate level. The results, using the similar scale as above, are as follows:-

Land development and management	7.0
Advanced surveying techniques	7.0
Modern instruments and techniques	7.0
Management and administration	6.7
Town planning	6.2
Cadastral surveying	6.2
Photogrammetry	5.9
Digital data processing	5.8
Geodesy	5.6
Remote sensing	4.9
Spatial information systems	4.7
Valuation	4.2
Cartography	4.1

From the results, it can be seen that the majority of the respondents have given more emphasis on subjects such as cadastral surveying, engineering surveying, management and administration. Although the results of the study are debatable because of the particular emphasis being made on cadastral surveying especially in countries where cadastre is of prime importance, other countries may have other priorities. As far as Malaysia is concerned, cadastral surveying is an important area and the results may form a basis for the land surveying profession to monitor the course structure of the land surveying courses at ITM and UTM.

The results also show that subjects which were previously beyond the areas of specialisation of the majority of land surveyors such as urban and rural planning, land valuation, management and administration have become increasingly important elements of land surveying education.

7.2.4. Surveying Field Course

At UTM and ITM, the practical training of the land surveying students at the diploma level leaves much to be desired. The practical training usually takes the form of a 3 month attachment to private survey companies or to the Survey Department so that they are placed in an actual working environment. The degree courses at both institutions however have residential field courses as part of the curriculum which are generally considered satisfactory. At the Survey Department, the students at diploma level are required to follow and learn, under the supervision of survey technicians, in areas like computing and drafting. Then they are sent to the field to carry out surveys under the supervision of the field officer. However, it was found that the majority of the survey companies are not at all keen to take students for attachment because of the fear that they will adversely affect their work progress.

At college, the practical sessions, both for

Engineering and Cadastral Surveying subjects, form a vital part of the course whereby the ability to put into practice the basic theory being taught is made. At present, an average of 4 hours a week are allocated for each practical session and this is carried out within the vicinity of the campus under the supervision of the lecturers.

The weekly surveying field course which forms an integral and essential part of the land surveying course is also lacking at ITM especially at the Diploma level. Some form of residential field course should be introduced so that the students are trained to work independently in groups and in a simulated site condition. Since the course is of a three-year duration, such residential field course can be conducted during the vacations at the end of the first and second year. The following field course schedule is proposed for the Diploma course at ITM.

Diploma in Land Surveying - First Year
(First and Second Semesters)

After the written examinations at the end of the Second Semester, 3 weeks may be allocated for the field course. In the first 2 weeks, the following exercises may be carried out - Estate Surveying which includes processes such as planning, reconnaissance, field work, reduction and computation of survey data, drafting and the submission of an individual report. In the third week, the Engineering Surveying exercise may be carried out including tasks such as setting-out of roads and buildings. All exercises are to be accompanied with the submission of an individual report.

Diploma in Land Surveying - Second Year
(Third and Fourth Semesters)

Another 3 weeks of field course may be conducted at the end of the Fourth Semester after the written examinations. The first week may be allocated for Cadastral Surveying which may include exercises such as control traversing and detailing. The second week may be used for Engineering Surveying which may include exercises such as road design and setting-out. The third week may be used for Trigonometrical Heighting and Geodetic Surveying. Again, all exercises are to be accompanied with the submission of an individual report.

Diploma in Land Surveying - Third Year
(Fifth and Sixth Semesters)

Only a week may be allocated at the end of the Fifth Semester for Hydrographic Surveying. The students normally start employment after the written examinations in the Sixth Semester of the final year.

The Advanced Diploma course in land surveying at ITM is of a $2^{1}/_{2}$ year duration (five semesters). Two sessions of field course may be conducted. The following proposal may form a guideline to the existing field course.

Advanced Diploma in Land Surveying - First Year (Seventh and Eighth Semesters)

Four weeks may be allocated for the field course. In the first week, monitoring exercise (of building or cliff) may be carried out. The second week may be used for design and setting-out (of roads and buildings). The third week may be used for hydrographic surveying which may be carried out at Kuantan Port in Pahang, Port Klang in Selangor or Penang Port in Penang. The fourth week may be allocated for the preparation of individual report.

Advanced Diploma in Land Surveying - Second Year (Ninth and Tenth Semesters)

The first 2 weeks may be allocated for photo control exercises (for large and small scale mapping). The third week may be used for Geodetic Surveying and this may involve triangulation exercises. The fourth week may be used for detail surveying of a site utilising modern instrumentation such as data recorders, electronic theodolites and land surveying packages for the processing of survey data. For each exercise, a submission of an individual report has to be made. By doing so, students are encouraged to manage themselves. Students are also quick to realise the importance of good field records, daily organisation, communication and management which may develop naturally. Reports will provide further practice in management.

7.2.5. Observations

The present system of field course conducted for the Advanced Diploma course at ITM is seen to be ideal and adequate and as such, no immediate modification may be necessary. For the Diploma course, the present arrangement is for a student to be attached to the Survey Department or survey companies after the written examinations at the end of the Fourth Semester. Students are required to follow and learn from survey technicians and are seldom given the chance to carry out independent work. It has been found that this kind of training is not effective and little was gained from the exercise. Students are not always given the chance to conduct actual jobs for fear of mistakes which may affect departmental work progress. Students carrying out field course at the survey companies also face a dilemma. Usually survey companies are not very keen to take in students for attachment because of fear that they adversely affect their work progress. Such companies think more of their trading role rather than providing training to the students. There are only a few survey companies which are conscientious enough to realise that they should help in providing practical training at all levels so that the pool of trained survey personnel in the country is increased even if they do inevitably incur expenses in providing such training.

Training experience gained from field work is seen as an essential part of education. The object of the exercise is to reinforce basic theory and to ensure that students become proficient in the use of survey instrument. It is therefore important that all students participate fully and thus gain the benefit from the experience. The introduction of an element of reality into the survey work certainly stimulates students' interest and enthusiasm, and thereby does much towards the achievement of the national objectives. The obvious benefits to students is the ability to be involved in a real life situation with all the necessary discussions and decisions to be made. For example, in carrying out a topographical survey exercise various necessary discussions have to be made with respect to the accuracy and specifications of the work, the type of instrument to use, the best route to follow, and other factors such as the establishment of vertical and horizontal control networks. The topographical survey exercise will obviously involve an extensive traverse to the specified accuracy and to provide horizontal controls. Detailing may be undertaken using EDM devices, electronic theodolites and data recorders.

To ensure the utmost participation and maximum benefits, students should work.in groups of three, or four when it involves more complex work. Any problem arising should be carefully discussed and any conclusion made must be one which is known and understood by all the members of the survey group. This includes decisions as to which routes to follow after considering all factors associated with it such as cost, time constraints and practicality. During the field course, each student must play every possible part of the exercise. This is a unique opportunity for the students to be involved in all stages of the preparation and completion of the exercise. Students should respond positively in the overall design and carry out the survey in the most enthusiastic manner. It must be emphasised to all students that the aims of undergoing such field courses are:-

a) to develop practical skills in a simulated environment;

b) to develop the ability to plan and organise survey work;

c) to develop the ability to analyse the observations and errors involved; and

d) to develop the ability to write a technical report on the work carried out.

In planning and organising a survey exercise, the following points must also be emphasised to the students. They are:-

a) select the type of instrument for the various tasks and to test the equipment to ensure that it is in good adjustment;

b) calibrate the EDM equipment to ascertain zero errors;

c) analyse the exercise and the reconnaissance required; and

d) establish control stations and reference them.

7.3. Training Within Employment

In general, there could be 2 main groups of people in the surveying profession in the event of the introduction of a modernised cadastre employing the use of computers and other modern equipment. The first group are those who have adopted computer technology and are confident with the concept. Those who are confident with this concept but are not in a position to acquire the system due to financial constraints may be classified under the first group. The second group are those whom are bemused by the changes and some of their problems may be due to not having the necessary background to understand.

The only way to resolve the malaise which has beset the surveying profession in the country is to ensure that surveyors become fully professional by keeping abreast with the general developments in surveying and by acquiring new technological capacities for the professional services expected and required by society. The respond to change should not be introspective, such that the opportunities offered by the ever increasing power and resource of technology should be regarded merely as a more efficient method of achieving the same objectives which traditionally have taken a little longer.

One area which is of prime importance is the use of computers and surveying packages that are available on the market. Examination of the local situation has revealed that almost all survey companies in the country have some form of *survey packages*. The majority are however restricted to the use of such packages for the calculation of bearings, adjustment of a closed traverse either by Bowditch or Transit rule, calculation of the linear misclosure and area. Such *package* which forms one of the most common computer programming courseworks in the first year of the land surveying course, is written in-house by one of the surveyors who has knowledge of computer programming. The subsequent survey drawing is being carried out manually. As the majority of surveyors have learned to use EDM instrument without fully understanding the theory of electronics and wave propagation, it is also possible to utilize survey packages without full cognizance of the underlying theories related to projections, spheroids, strings, etc. It must be realised that the proposal to use computers and modern survey equipment is not intended to eliminate the traditional field methods or to put licensed surveyors out of work. It would be futile to attempt to retain professional prestige and to improve financial status merely by defending obsolete survey equipment that had some justification in the past.

There are two distinct choices of computerisation. The first is to develop an in-house system. This necessitates selecting a computer processor and the associated peripherals followed by the development of the necessary software needed to produce the required results. The second is to purchase a Turnkey system which involves the assessment of the packages available on the market and to determine the one most suited to the mainstream of work carried out within the price range affordable to the buyer. Some packages are quite cheap and this could be just what the hard pressed self employed surveyor is looking for. With cheap packages, on-site tuition as well as other hidden extras are not available. With expensive packages, program up-date facilities, hardware maintenance contract, hotline help facilities and enough documentation are provided although these add substantially to the basic costs. Normally, any popular Turnkey system is usually in operation at other organisations and is therefore a proven product. This will obviously remove the fear that having bought a costly computer and peripherals, it will prove difficult to produce the software needed in a reasonable time.

Nowadays, there are many surveying packages available on the market. The variations in prices and capabilities of these packages give the survey companies guidance and choice in trying to buy such package for the first time, depending upon the financial situation and the nature of the work carried out. Appendix 9C lists some of the packages available on the market.[4] Certain information may be obsolete but it was intended to give a broad view of the various packages available and the capabilities of each system. As when buying a new car from the abundance and confusion of makes and models, one has to balance the needs and costs.

It was mentioned in Chapter 2 that mapping in Malaysia is based on the Rectified Skew Orthomorphic (RSO) Projection which is ideal for a narrow country with a skew axis. However, the reference grid for cadastral surveys is based on the Cassini Projection resting on the individual state origins. Ideally, the RSO projection used for mapping should also be used for cadastral surveying. Thus, the heterogeneous cadastral standard sheets based on the Cassini projection should be replaced by a homogeneous series based on the RSO projection at a scale of 1:5,000 with sub-sheets of larger scales for built-up areas. Currently, licensed surveyors send the coordinates of their surveys (which are based on the Cassini projection) to the Survey Department to be transformed to the RSO projection and a fee of $10 per coordinate is charged. It would have been ideal and convenient if the country has an integrated coordinated system for both its cadastral and topographical mapping.

7.3.1. Licensed Land Surveyors

To meet the demands for surveying work force in the country, the Government decided to enact a set of laws for the formation of the licensed land surveyors. As a result, the Licensed Land Surveyors Ordinance, 1958 was approved and published in the Government Gazette, and came into force on 1st. May 1958. The Ordinance provides for the establishment of the Licensed Land Surveyors Board to deal with the licensing and control of surveyors in private practice. The Board maintains a register of all surveyors, and possesses disciplinary powers in respect of those found guilty of professional misconduct or those convicted of a criminal offence. To carry out the objects and purposes of the Ordinance, the Licensed Land Surveyors Regulations, 1959 were promulgated. These Regulations pertain to registration, articles, examinations and the regulations regarding the execution of cadastral surveys. As on 31st. December 1988, there were 95 licensed land surveyors in the country. The majority of these surveyors set up offices or grouped together to form survey companies throughout the country. Others are either attached to educational institutions, statutory bodies or Survey

Departments. The breakdown of the licensed land surveyors, according to whether the license is restricted or not, were as follows:-

Private practice	90
Practice restricted only to certain specified statutory bodies	5
Total	95

It was found that, 52 of the 95 licensed land surveyors practicing in Malaysia do not have a formal degree qualification in land surveying but gained professional status through an articled system. Article means an indenture or writing containing a contract or an agreement for tuition in surveying, made between a surveyor and a person seeking to qualify himself for registration as a land surveyor. Before entering into articleship, a person has to show evidence that he had passed either an examination from a university or an exempting examination which is approved by the Board. Such examination passed by the candidate should include passes in English, Algebra, Geometry and Trigonometry.

After the articled pupil is accepted for registration, such pupil has to serve professionally for a total period of 4 years. Of this, not less than $2^1/_2$ years are to be spent in professional service in the field and not less than a year in the office. During the period of articleship, each pupil must undergo at least 2 years of instruction and experience in cadastral surveying. This must include a period of at least 6 months spent on title surveys in urban areas and another 6 months in rural areas. However, exemption from service to an appropriate extent is granted to those who possess qualification or experience as prescribed by section 14 of the Licensed Land Surveyors Regulations, 1959.

One contributing factor to the lack of change in the local cadastral system may be the method of education and training of surveyors based on the article system. Much of the material taught or passed on to future surveyors consider cadastral surveying as a static discipline and as an end in itself. The material does not sufficiently promote the view that cadastral surveying is a service discipline within the land administrative area which must keep pace with existing demands. Often the licensed surveyor is unable to keep up-to-date in the fields of electronics, photogrammetry, and the use of modern survey equipment. This system of training through articleship will in time disappear, and the trend has been towards a degree in land surveying as a prerequisite to a professional qualification.

7.3.2. Government Land Surveyors

At the Survey Department, the field officers are made up of survey technicians and technical assistants.

Typically, survey technicians do not have any formal education in land surveying but have passed departmental examinations. Technical assistants are Diploma holders but because the majority are fresh graduates, they may be inexperienced. Unlike in the United Kingdom where field officers are mostly Diploma and Degree holders, it has been the trend in Malaysia that graduate land surveyors are not sent to the field to carry out surveys but are placed in the management posts such as District Surveyors (DS's) and Heads of a particular unit/section. For the DS's the only field experience they have is the compulsory 6 months field work before taking up the post.

Findings have revealed that the main reason why 40 per cent of the cadastral surveys are subjected to queries is because of the incompetent field officers. For this reason, it is proposed that field officers should be trained in carrying out the surveys according to the requirements of the Survey Department as prescribed in the Survey Regulations. By so doing, the number of queries will be reduced which in turn will reduce the number of re-surveys and the overall time taken for the various cadastral survey processes. It was found that the Survey Department has failed to provide the requisite training requirements to all the survey personnel. It has been the policy of the Department to adopt on-the-job training for all personnel rather than by means of attending a specific course on a specific topic. As a result, a new staff member who is trained to do a specific task does not fully understand what has happened to a particular task before it is passed on to him, nor the likely processes that will take place afterwards. It is very common to find that a staff member who is placed in a particular unit/section for ten years or so, is reluctant to be transferred to another unit/section for fear of being required to undergo re-training.

At the State Survey Department in Kelantan, an investigation on the mobilization of graduate surveyors has yielded mixed results. Several graduate surveyors confessed their frustration in not being given the chance to go to the field to carry out surveys; instead they are placed in posts such as Heads of Sections. Many surveyors confessed their willingness to work outdoors occasionally, perhaps 3 months in a year, so that their technical skills can be maintained. A few field technicians also described their unwillingness to work indoors. However, the majority of field technicians described their grievances working outdoors. Typically, a field technician gets a field allowance of $150 per month. This extra earnings hardly offsets the monthly costs of his car which includes petrol maintenance and other expenses. Often, field officers have to carry out surveys in severe working conditions. Typically, the maximum distance travelled to the survey site is 20 miles. Often, they have to set off early for work in the field starts at seven o'clock in the morning. This means that the majority of the field officers set off at six o'clock in the morning and stop work at one o'clock in the afternoon. The atmospheric conditions in the country render it essential that the angle observations be made in the early morning and late afternoon.[5] From the above findings, it is proposed that new work patterns must be introduced so that all survey processes can be carried out efficiently by the personnel who have more interest in the job they are allocated. It must be ensured that the field technicians and other surveyors in the country are given the responsibilities and duties that match their competence. Survey personnel with qualifications in Diploma and Degree must be placed in areas where their services are badly needed rather than being attached to a unit/section for prolonged periods. If the present trend continues, a systematic erosion of the knowledge of various subject areas gained at the tertiary level of education is likely to happen.

The Survey Department Headquarters in Kuala Lumpur sometimes organise courses for field surveyors on selected topics. Findings have revealed that such courses are not effective but do provide a *break* to some. It is proposed that courses and seminars are held regularly at regional level, and each state has to be the host on a rotation basis. For example, the East Coast region may consist of Kelantan, Trengganu and

Pahang. The Northern Region may consist of Perlis, Kedah, Penang and Perak. The Southern Region may consist of Johor, Malacca, Negri Sembilan, Selangor and Wilayah Persekutuan. Such courses must stress the particular departmental requirements for the execution of cadastral surveys, to discuss the practical view points, the types of mistakes commonly made in the field, the development of the managerial and administrative responsibility. For example, a checker from the Computing Section may discuss the mistakes normally encountered when checking the surveys. These points are important as evidence has shown that most of the mistakes were found to be trivial. Particular emphasis must also be placed on the departmental progress target set as explained in Chapter 4. Above all, the Government must re-consider the field allowance for field officers because such financial reward is seen as one of the most important incentives in motivating the field officers and the upgrading the quality of survey.

7.3.3. Settlement Officers

Settlement Officers (SO's) at the Land Office do not possess a formal qualification in surveying. The only training received is the attendance of compulsory courses at the beginning of their career. SO's deal with land matters but are not knowledgeable about surveying. SO's also work under the direction of the

District Officers (DO's) who lack formal education in surveying. They are graduates in arts courses such as history, economics, public administration, geography, etc. It is important that SO's and DO's from the Land Office meet regularly with the survey personnel from the Survey Department to discuss the problems facing both departments.

It is also important to inculcate the idea that the reduction of the national cadastral survey backlog is a joint responsibility and to eradicate the current idea of categorically identifying the backlog as *Survey Department's backlog* and *Land Office's backlog* as well as the general concept of *....it is your department's problems and not mine.....*It is also important to train the DS's, DO's and SO's in order to develop techniques that will make it possible to find viable solutions that are required from time to time to promote the satisfactory work flow between the two departments. The principal aim is to transmit to the present survey officers and others involved in land matters, a formation that will give them the ability to cope with any new problem which may arise. It also follows that the educational programme in surveying in the country must include the DO's and SO's. The evaluative studies of the structure of the surveying industry, its operations and training of personnel should be taken as a prerequisite for policy formation.

Personnel from the Survey Department and the Land Office should be specially trained for dealing in land matters. Academic industrial attachments and exchanges should be encouraged for those personnel wishing to pursue research interests or to gain practical experience in surveying under supervision. There is also an *abundance* of graduate surveyors (Diploma and Degree) from local and overseas universities who have been trained in land related academic courses. Such personnel are a good source to be absorbed into the training of land specialists. It is proposed that at all 99 Land Offices in Peninsular (West) Malaysia, a land surveyor's post is created. This is discussed in Chapter 8.

7.3.4. Professional Development Education and its Effectiveness

There is a pressing need for the Survey Department, the Institution of Surveyors Malaysia (ISM), the Land Office and the survey companies to support strongly the professional development programmes. The programmes should be broadly based and have an objective of education rather than training; otherwise professional development programmes in a number of areas will have to provide bridging education to enable various types of personnel to understand the programme topic. The need for professional development programmes can be served by the availability of regular presentations in professional journals published at regular intervals. Currently, the only journal published locally is *The Surveyor*. It is published at quarterly intervals and the main handicap is the lack of information on land surveying matters; most of the contributions come from other professions such as the general practitioners and valuers (quantity surveyors).

To determine the probable methods of keeping up-to-date with new skills and knowledge, a survey was carried out involving licensed surveyors and survey officers at the Survey Department in Kota Bharu in Kelantan. The following results were obtained:-

	Percentage
Reading from journals	59.0
Attendance at seminars	50.5
Other professional activities (including discussion groups and conferences)	32.0
Industry liaison	10.0
Internal training courses	9.5

From the above results, a conclusion can be made that local land surveyors are in favour of a more professional journal to be published at regular intervals, perhaps monthly. This can be achieved by initially improving the existing journal, *The Surveyor*. The results also show that professional development by way of internal training courses had the least support. This might suggest that the majority of the respondents would have preferred such courses to be located away from the office which could also provide an occasional *break* from the office routines.

There are other approaches to professional development. Internal training courses of a refresher nature or teaching new technologies and undertaken by specialists from educational institutions, can save a considerable amount of money because the personnel do not have to travel. However, the results suggest that that independent study method such as professional journals is favourable because of its convenience, low cost and above all, freeing from physical attendance. Seminars on the other hand gives the participants the opportunity to clarify issues by asking questions and contributing to the discussion through comment. In addition, there is the benefit, which is difficult to quantify, of the informal interaction between participants during the seminar. Smaller groups provide not only a better learning environment but also a forum for discussing new problems facing the profession. Another practical resource which could be applied is that of professional development provided by other professional bodies. It is often wise to participate in inter-disciplinary teams, and specialists in particular should have an understanding of the knowledge required by other professionals to reach to a decision.

ISM has to play a greater role in bringing together all the land surveyors in the country. There are over 300 members of the Land Surveying Section of the Institution. Yet, attendance at institutional meetings is very poor and *restricted* only to an *elite* group of licensed surveyors; other category of members rarely attend. This is an area where ISM has to put its house in order by extinguishing the barrier between the professional, qualified and other categories of surveyors in the country. If ISM fails to close the gap, then the promotion of the profession and of the interests of all members will fail; ISM will not fulfill its expectation.

7.4. Conclusions

Educational planning for land surveying has to concentrate its attention on the curriculum, and its impact on working attitudes, particularly towards the technical profession. The educational institutions, Survey Department, survey companies and ISM should work for the improvement of the curriculum of educational and training courses. Unless correct values towards jobs of a technical nature are inculcated in the future graduates, there may arise the problem of a divergence between the needs and actual demands for this category of workers. Emphasis should therefore be placed on revising and changing the curriculum particularly at technically oriented colleges at secondary levels as well as institutions at tertiary levels offering land surveying courses, from being too academic oriented towards being more vocational biased. Once the curriculum has been reformed, attention will have to be paid towards the expansion of the course, inculcating up-to-date surveying subjects which are relevant to the present surveying trends.

The shortage of *bumiputra* (indigenous) surveyors in the country is also acute. Steps must therefore be taken to increase the output of *bumiputra* in surveying. This includes increasing the intake of *bumiputra* students at tertiary institutions that offer courses in surveying especially at UTM. There is also a growing requirement for lecturers in surveying with high qualifications to meet the needs of ITM and UTM. It has been identified that almost half of the academics at both institutions are under 35 years of age and holders of a first degree in land surveying. Although it was understood that both institutions are in the process of upgrading the qualification of all lecturers to masters and doctorate levels by sending them to Australia, Holland, New Zealand, UK or USA, such steps taken must be properly planned so that the required expertise in the areas of need e.g. LIS, digital mapping, remote sensing, etc., can be given top priority.

It is also essential to educate the surveyors in the use of modern surveying packages and this requires a planned comprehensive programme. It is considered that as the Survey Department has already introduced the CALS and the CAMS projects, then it should be the responsibility of the Department to take the leading role and to provide the necessary education and training for other surveyors in the use of computers and to make the system work. The re-education process would include mid-career training programmes, seminars and workshops and must include materials on efficient field practices and the overall exposure towards modern instrumentation and software. The survey companies must also provide the leading role and dynamism in the economy, given the resource constraints facing the public sector. The private sector is best placed to develop new ventures and improve technology and skills to meet the challenges and wealth creation. Survey companies can also advise the Government and other institutions about strategies for improving the performance of the surveying and mapping industry on an incremental basis.

CHAPTER 8: MANAGEMENT RE-ORGANISATION

8.1. Introduction

The execution of cadastral surveys in Malaysia involves the Survey Department and the Land Office. These two organisations form the main work force and the efficiency of the system in the country must be evaluated in terms of the management techniques in use (involving human, financial, instrumental, etc.) and what is achieved (i.e. the end product). Management is the art and science of making decisions in support of perceived objectives. Since the cadastral survey backlog may either originate at the Land Office (when the Requisition for Surveys were made), or at the Survey Department (when the field surveys were carried out, followed by the other processes such as checking and examination of surveys and the preparation of CP's), it is important that the management techniques in use at both departments are fully examined and analysed. Any weaknesses must be identified, and proposals and solutions must be based on various constraints and circumstances to meet the local needs.

Generally, there are two approaches to changes within the administration and management circle - reactive and proactive. The reactive approach is a reaction to change only when a problem forces a response to be made and thereafter endeavour to find the least expensive and least disturbing solution to the problem. This crisis-to-crisis approach will not always be the most desirable in the long term. Such an unprofessional and unscientific attitude in the past has proved to be expensive and must be eliminated in order to optimise efficiency. In the proactive approach, a constant study and review as well as positive criticism should be an ongoing activity. This approach also forms a manifestation of the awareness of the changes that are taking place within the profession. This involves a thorough investigation to be made in order to meet, not only the present requirements, but also those of the future which might involve less modification and less additional costs. What is required are the most responsible, dynamic, philosophical and far-sighted members of the organisation to restate the public responsibility and to build the state's confidence, and to chart the professional destiny. If the functional units/divisions fail to acknowledge the phenomenon of change, the modern and technically active oriented society surrounding the profession will destroy and devour it.

The following are two examples of the reactive approach that has been adopted at the Survey Department and its consequences. The first is the choice of acquiring a photo-copier machine at the Administrative Division of the Survey Department Headquarters in Kuala

Lumpur. A bottom of the range (table-top) model, purchased in the early part of 1986, failed to cater for the needs of the Division including the Training and Research Unit which involves producing large numbers of copies of training materials, working papers, etc. every day. As a result, the engineers had to service the machine once a week and finally the machine was written off in the middle of the year!

The second is the purchase of the IBM 1130 and the PDP 1104 computers together with the EAI PACER 100 plotting systems. The whole system which cost more than $3 million in the 1970's failed to provide an efficient service. Although it is generally accepted that the rate of change of computers is fast as manufacturers try to improve model after model, several important aspects have to be considered before acquiring such a system especially when public funds are involved. Factors that need investigating include the possibility of future up-grading capability if required and the capacity to handle the type of job so designated. These systems were found to be incapable of handling, even the most basic cadastral data base, had no up-grading facility, could not drive a plotter, were rapidly phased out, and suffered poor after-sales service.

In trying to organise any management structure, the fundamental positive approach should be such that steps are studied and undertaken to cope with and respond to the future as a single encompassing problem rather than trying to deal better or cope with what is already adopted. Management by objectives goes further than that and especially so in the more expanding, reviewing and demanding society where everything should be conditioned and shaped according to the current response. This demands professionalism in its most profound sense. If the profession is not keeping up, or more importantly, not keeping ahead, then the profession will abrogate the responsibility to the public and it follows that surveyors are no longer a professional unit.

8.2. Application of Management by Objectives (MBO)

Cadastral surveying and its administrative aspects are carried out within the larger framework involving the Land Office at the State level on one hand, and the Survey Department at the Federal level on the other. All members of management and, to a certain degree, all employees of the Survey Department and the Land Office therefore have a responsibility in the implementation of Management by Objectives (MBO) as a communication medium. In fact, without reasonable co-operation at all levels, the likelihood of substantial success is quite limited. The application of management technique must also be seen in a broader perspective of the Department of Survey and Mapping rather than the Survey Department alone. This is because cadastral surveys involve not only the Survey Department and the Land Office but also the interaction of several other divisions within the Department of Survey and Mapping. At the Department of Survey and Mapping, the members of management may be divided into three main groups:-

a) Top management;

b) Middle management; and

c) First-line management.

8.2.1. Top Management

The top management includes the Director General of Survey and Mapping, the Director of Cadastral Survey, the Director of Mapping, the Heads of major functional Divisions and Units such as the Photogrammetry, Photolithography, Cartography, Cadastral, Task Force, Instrument Repair, Computer and Electronics Services, Geodesy, and the State Directors of Survey. The organisational chart of these functional divisions and units is presented in Appendix 2D. The main function of this group is to establish policy and to determine the broad, total organisation objectives, beginning with a clear determination of the Department's roles and missions. Top management also specify objectives related to productivity targets, new map production techniques, expansion or growth, research and development, surveying techniques, etc. Normally, this category is concerned with the *what-to-do's* and relatively little with the *how-to-do's*.

8.2.2. Middle Management

The middle management comprise the Heads of various Sections within each Divisions mentioned in section 8.2.1. For example, within the Cartographic Division, those responsible for middle management are the Heads of various sub-sections such as Large and Small Scale Mapping, Thematic Mapping, etc. who may have other members of management reporting to them and who are accountable to those in the top management level. At the State Survey Department, the middle management comprises the Heads of the Computing Section, Drafting Section and the Registration Section. Their starting point is also a clear determination of their roles and missions which encompass those of their subordinate managers in the top management level. Middle management determines the objectives which will be most concerned with such key areas such as the production output, operational innovations, cost and managerial effectiveness, etc. This level of management is equally concerned with the *what-to-do's* and the *how-to-do's*.

8.2.3. First-line Management

The third category is the first-line management which represents supervisors over individual employees who carry out the tasks required to meet the objectives of the Department. As compared to the other two groups, the roles and missions of first-line management are largely defined by their supervisors from the middle management level. Subsequent objectives will, in general, be short-term in nature and directed towards key areas such as unit output, individual staff productivity, staff development, quality control, etc. First-line managers have a heavy concern for the *how-to-do's* and a relatively modest concern for the *what-to-do's*; many of which are identified by their supervisors in the middle management group.

8.3. Management Model

Investigation at the Survey Department has revealed that no formal management model has been adopted. Currently, the departmental aims and objectives are listed in the Departmental Reports which cover a five-year period, and set against an informal model without systematic justification being made but based on a rough departmental target of what the final achievement would be.[1] Based on this fact, a management model namely, Management by Objectives (MBO), is proposed. This model which was primarily applied to corporate level finance, sales and production, has become a philosophy of management that could be applied to virtually every profession.

The latest Departmental Report, *Projects in the Fifth Malaysia Plan (1986-1990) - Survey and Mapping Divisions*, is largely concerned with the systematic and methodological approach defining the aims and objectives of top management. It fails to include the invaluable contribution of effort from the middle management level, which should also be defined. This is vital because the middle management group is equally aware of the *how-to-do's*. By adopting such a philosophy, planning may be accomplished immediately prior to or in concert with action. The middle management group is the first to face any changes in plans which may be accommodated due to lack of time in adopting alternatives or lack of pre- determined objectives. Thus, it is appropriate for the middle management group to be well-informed of the aims and objectives of the Division.

The continuum of this model of management whereby the top management and the middle management levels are aware of the aims and objectives of the Department can be associated with the following MBR - MBO model:-[2]

Management by Reaction (MBR)	<———————>	Management by Objectives (MBO)

In this model, the top management level managers are more concerned with the objectives (MBO) and the middle level managers are responsible for deciding what actions (MBR) are to be adopted. By adopting this approach, the results to be achieved are pre-set and the appropriate action plans required for the achievement of these results can be moulded to scale. Such a management approach is seen to be more effective because the degree of effort is directed towards the objectives and the end results within the limited resources available.

8.4. Implementation of MBR - MBO Model

The above MBR - MBO model is based on a human and not a mechanical process. There are various steps to follow so that the implementation of such model at the Department of Survey and Mapping can achieve success. Based on the general concept of the MBR - MBO model, the following management model, presented by Figure 8.1., which shows the ideal flowline of objectives and reactions, is proposed for the Department of Survey and Mapping.

The proposed model stresses the importance of effective communication between the various parties in the Department. This element plays a very important role in trying to bring about the understanding and the various commitments, which is the catalyst of the MBR - MBO model. Any actions or proposals from each division must be carried forward by the medium level managers to the top level managers. The medium level managers here form the linkage between the first-line managers and the top level managers. An effective communication

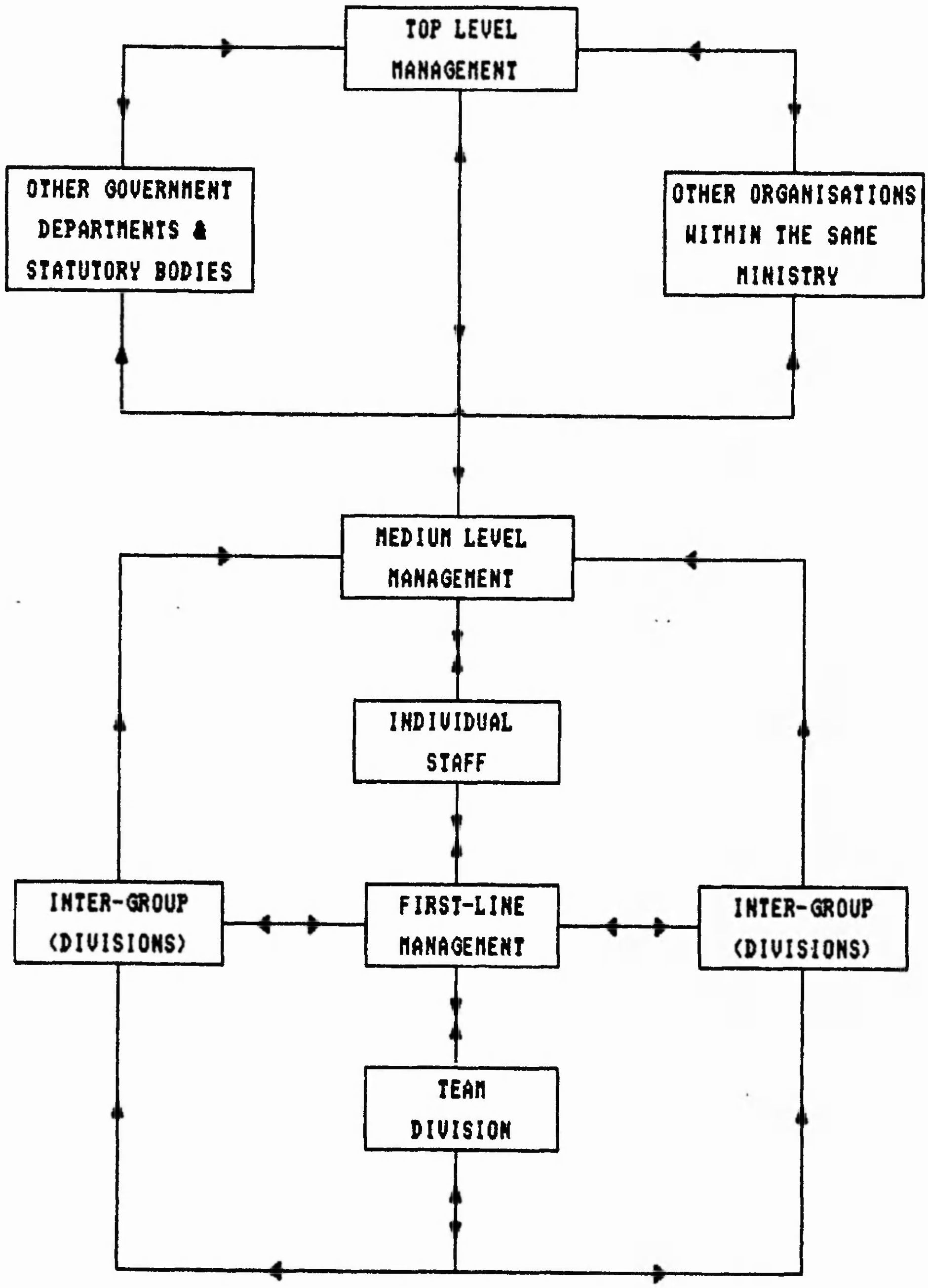


Figure 8.1. Ideal flowline of objective and reaction based on the MBR-MBO model.

needs the interaction of the various groups which form the whole work force of the Department i.e. the individual staff, the various intergroups, and the members of the three management levels mentioned in section 8.2. (top, middle and first-line management). One of the immediate benefits that can be achieved is the elimination of unnecessary duplication of effort which currently seems to take place at the Survey Department and the Land Office.

8.4.1. Individual Staff

Communication between staff on a one-to-one basis is the main principle of creating the flow diagram active. Individual staff includes both the Heads and staff within the Division. Any problems must be discussed as soon as they arise and such discussions should be initiated by the Head or his subordinate. Discussion should be focused on what the problems are and what should be done to take care of them, and not fixing or trying to escape from blame as normally happens.

8.4.2. Intergroup (Division)

Communication between the various divisions within the Department should be more geared towards trying to understand the needs of each divisions. This will provide a much broader feedback and to keep other divisions well informed. Meetings between the Heads of

Division must be carried out at regular intervals to discuss all the problems and finding ways to meet the needs of each division. A critique process may be applied to achieve the feedback with helpful suggestions, as well as trying to identify areas where mutual support is needed, and if potential conflict exists, then a way must be adopted to deal with the situation positively.

8.4.3. Medium Level Management

Communication between Divisions is best conducted through the Heads of Divisions. A closer co-operation and communication between Divisions is essential to the discussion of all matters arising thus saving a vast amount of wasted effort or duplication of work because of inadequate or late support from other Divisions. Any conflicting issues must be turned into a positive, rather than a destructive force and be dealt with openly, focusing on the specific areas of influence, objectivity and action.

8.4.4. Top Level Management

This involves the structuring of the Department's policy making and strategic planning. All factors that bring about an impact on the departmental progress must be thoroughly studied and investigated, even when that action may be at the expense of concerns within the functional Divisions. The determination and the interpretation of the aims and goals are the responsibility of this group. A tentative statement of roles and missions of the Department must be formulated and tested by all members of the top management group. By doing so, effective communication throughout the hierarchy is created. Periodic communication should be a regular part of the application of the flow diagram as presented in Figure 10.1. This brings about a common frame of reference within the Department; thus a feel of a part of the total operation is created.

With the eventual implementation of the Malaysian LIS, this kind of communication not only within the Department but also with other user departments seems vital. The success of LIS can only be achieved when all sectors realise the importance of such regular communication. Findings have revealed that in general the communication system between the various Divisions in the Department of Survey and Mapping is considered satisfactory. However, much more could be done to enhance the present situation especially between the Survey Department and the Land Office. Certain Divisions should be re-structured under a single management, based on the activities carried out so that duplication of effort is eliminated. For example, the Divisions of Cartography and Photolithography are two divisions which are very closely linked to one another because the processes involved in map making between these divisions are sequential in nature. Interchange of map reproduction materials (repromats) is frequent yet staff from the Cartographic Division seldom know the processes involved in the other divisions, and vice versa. What is more alarming is the situation whereby both divisions are placed under separate management and this produces a gap, both in terms of communication as well as map processing. Interchange of repromats sometimes takes longer than anticipated and this causes delay in map processing. What is important and should be initiated is the amalgamation of both divisions so that work processes could be speeded up and the staff be more aware of the processes involved.

In the case of the Land Office and the Survey Department, although both are under the same ministry (but under separate management), the problem of a communication gap is quite alarming. One of the reasons why the process of registration of title to land in the country is slow, is because various transactions involving the Land Office and the Cadastral Division take place under separate management. Unnecessary movement of files between both organisations takes time and involves various steps which could be reduced if both departments were amalgamated under a single management thus minimising unnecessary routines. At least two areas of work could be eliminated. The first is the preparation of Settlement Tracing by the Land

Office and to adopt the Field Tracing prepared by the Survey Department because the information is reliable and up-to-date. The second is the settlement work which could be carried out by the field officers from the Survey Department immediately after the completion of the survey.

8.5. Quality Assurance and Quality System

Quality assurance is a management system defined to give the maximum confidence that a given acceptable level of quality is being achieved with a minimum total expenditure.[3] In the context of cadastral surveying in Malaysia, it must be stressed that the application of quality assurance does not define quality; instead it refers to the management system which provides assurance that the processes have been correctly carried out to the required standard that has been laid down in the Survey Regulations. Quality assurance is therefore a means of obtaining the confidence that an acceptable level of quality surveys are carried out and that the number of queries are minimised.

At every State Survey Department, targets have been set to monitor the progress of all personnel and survey parties. Findings have revealed that these targets are not achieved. For example, a survey party is expected to complete surveys of at least 35 lots per month with an average size of 6-8 acres per lot. It was found that a typical survey party only manage to complete 0.69 lot per day while the expected progress is 1.4 lots. It was also expected that an average Checker at the Computing Section can finalise surveys of 4 lots per day but the current progress is only 2.9 lots. At the Drafting Section, the monthly progress of preparation of CP's is about 40, well below the set target of 100 per month.

Various proposals have been put forward in Chapters 4 and 5 with regards to the execution of cadastral surveys in an attempt to reduce the number of queries and to ensure that surveys comply to the requirements. Some of these proposals are the application of working from the whole to the part, the need for surveys to be self-checking and that checks are carried out in the field rather than in the office. Henceforth, quality assurance is a tool to ensure that such requirements are met and standards followed. Thus, it is proposed that the Survey Department re-define the progress targets, be it office or field work, and to stress the key issues such as the procedures to be followed while monitoring the outcome. The importance of acquiring the necessary knowledge and skills by all the personnel on the manner in which such surveys are to be carried out so that the amount of queries and litigations to surveys are minimised, is thus an essential element in the reduction of the national cadastral survey backlog.

The manner in which the reduction of the cadastral survey backlog can be properly monitored is by adopting a quality system feedback loop. Such a system must be dynamic so that it can respond to changes being introduced such as the use of modern survey equipment e.g. data recorders, electronic theodolites, survey packages, etc., and new ideas of work routine e.g. mobilization of staff. An example of a proposed computerised survey system at the Survey Department as well as the survey companies to replace the traditional equipment is presented in Figure 8.2. This model takes into account the use of an electronic data recorder for recording field information which is then down loaded to a computer system work station using a suitable package for subsequent processing and manipulation of survey data.

Rooney[4] developed a feedback loop which is an integral part of a quality system and can be applied to monitor the reduction of the cadastral survey backlog (Figure 8.3). The three main elements of the feedback loop in the context of cadastral surveying are that of defining the regulatory framework of working procedures for carrying out the surveys, the identification of the existing problems that lead to numerous queries, and the departmental progress targets laid down at each State Survey Department. Such defined procedures must be followed correctly so that the number of queries is minimised. The common mistakes being made by the field officers must also be identified and steps must be taken to re-educate them. The progress targets set by the Department must also be re-emphasized so that the general attitude of the personnel is geared towards its achievement by inculcating the necessary financial and promotional incentives. A key feature of a quality system is communication. The flow of information and feedback relies totally on communication between the various management levels. If an individual or group is resistant to receiving information (for whatever reason) or refuses to react, the loop fails and the quality system fails. The system relies totally on every one communicating fully, monitoring their activities, taking the necessary steps to remedy the identified problems as well as taking action on information communicated.

One of the main obstacles with introducing new administrative policies and instrumentation is that of human response. Different people respond differently to changes and surveyors are no exception. Discussions made with aged field technicians have revealed that the majority are not supportive to the introduction of automatic survey approaches such as the use of data recorders, electronic theodolites, etc., but prefer to practice along traditional lines. However, they are quite happy to see the new generation surveyors using such equipment. Even some engineers prefer to remain with simple cross-section design techniques rather than the new computerised concepts. Whether they like it or not, automated approaches are going to effect everyone in the surveying and mapping profession. The traditional approach is restricting much of the surveying practices. Great advantages in automation and accuracy can only be achieved by adopting new computerised concepts which form part of the natural advancement of the surveying profession.

Clearly, the introduction of the CALS and CAMS projects will not be appreciated until both projects are in operation at full scale. Some of the staff routines must therefore be redefined but in an orderly fashion. This approach must be adopted so that the staff can adjust to the new systems gradually and in a controlled manner. The current state of preparation of CP's at the Survey Department and the demand for conventional map making at the Cartographic Division which is based on craft skills is already decreasing. Draftsmen will find it hard to accept that such skills are no longer an asset.

8.6. Re-evaluation of the Principles and Techniques of Management

Investigations have revealed that there is a considerable overlap in the responsibilities and little or no coordination between the Survey Department and other Government agencies. There happens to be many uncoordinated individuals with various survey interests

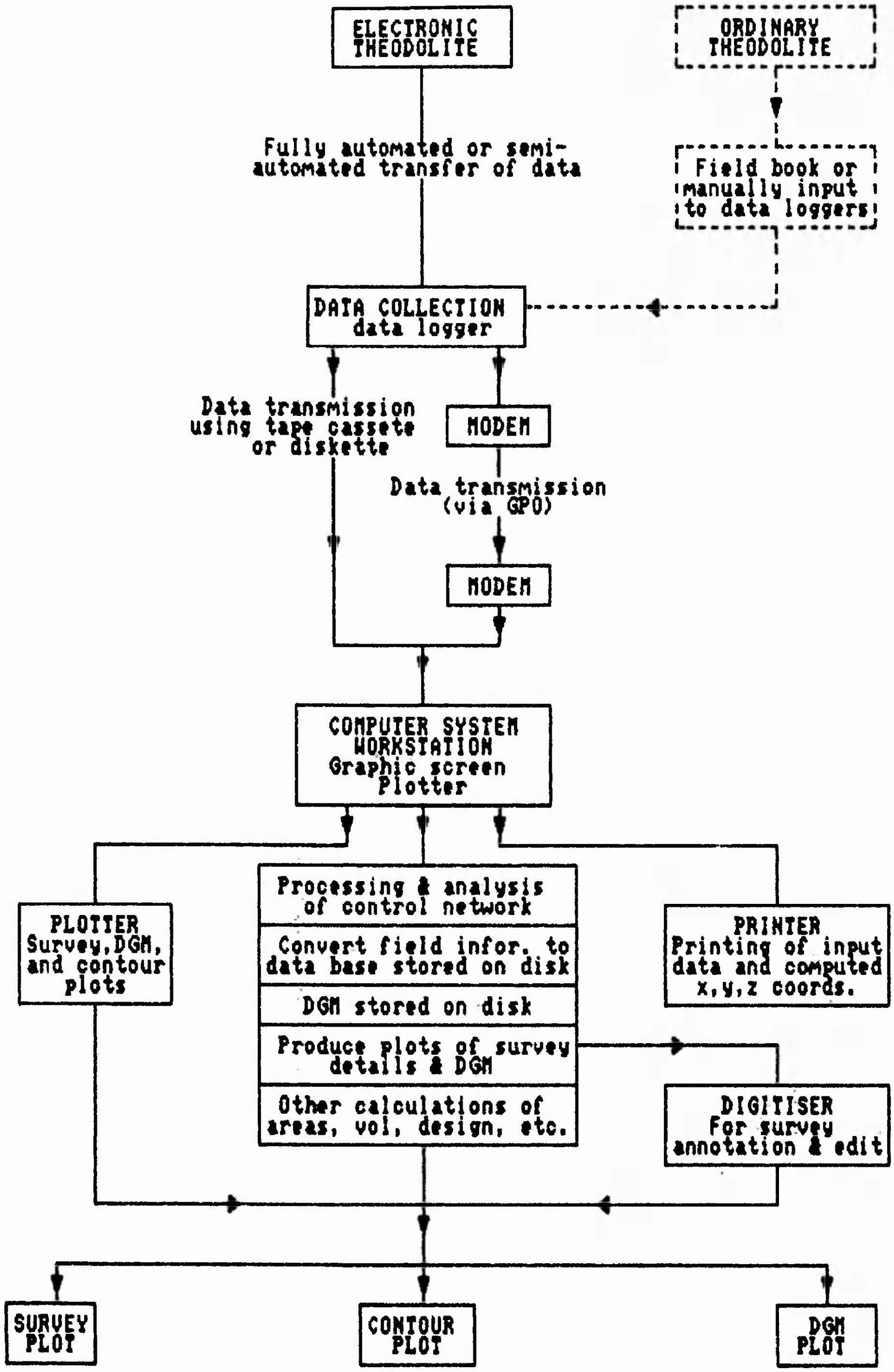


Figure 8.2. Proposed model of a computerised survey system for a survey organisation (including private survey companies).

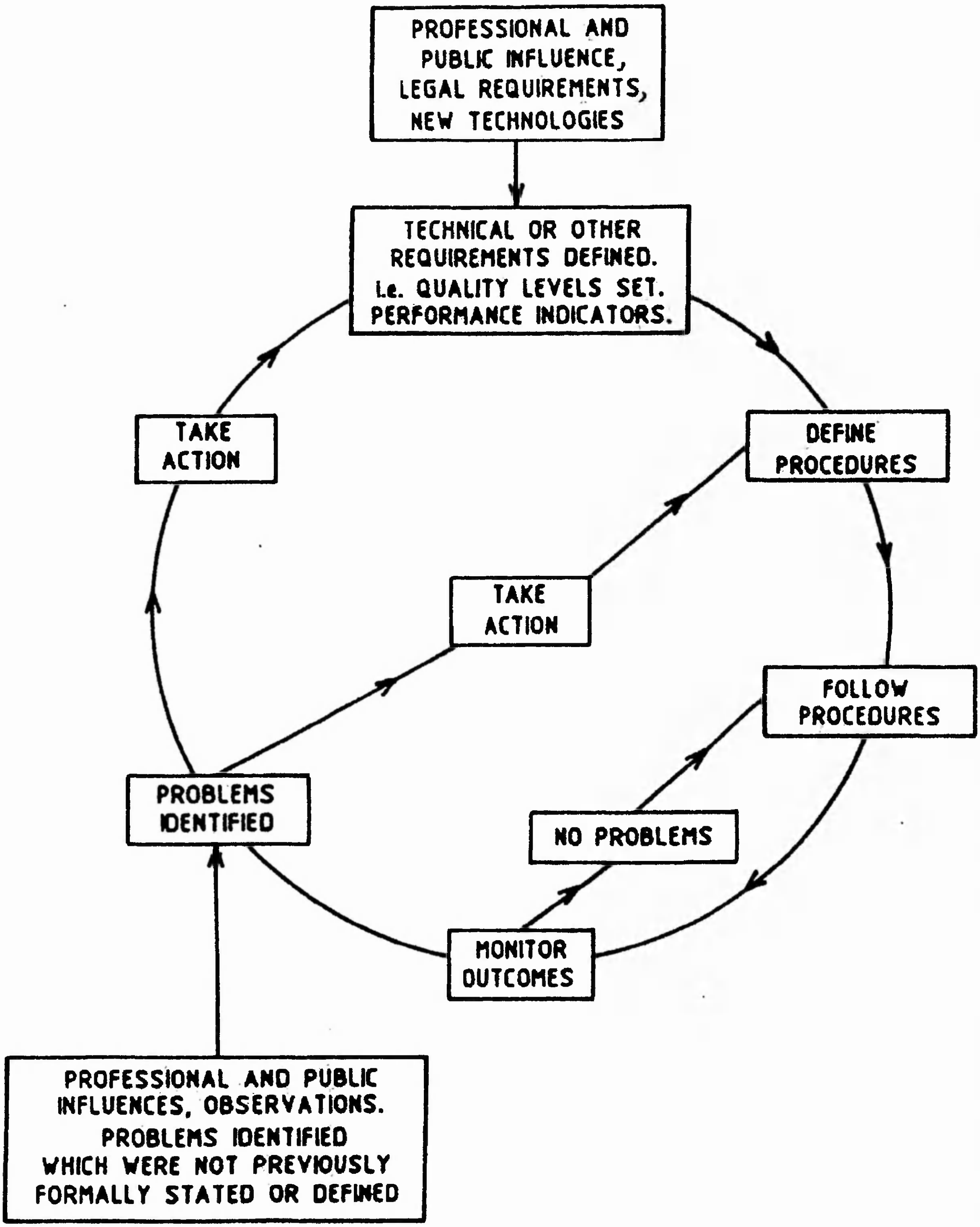


Figure 8.3. The Rooney Loop.

in many departments and agencies. What is worse is that everybody seems to work very hard protecting their own interests and personal egos. Again, the basic requirement is to improve the communication system between all departments. There must be a single and all encompassing concern for as well as an overview of, the whole field of survey activities without imperilling the ability of the separate areas to function and to meet their own responsibilities and needs.

It is clear that the involvement of the Government in surveying will increase rather than decrease. As far as the Malaysian LIS is concerned, all users of spatial data must form a cohesive group. Information relating to the environment and the demand for more information appears to increase. To achieve a sound LIS, there is a need to coordinate the accumulation of information and to file it with a common code which will then allow searching and comparison of data to take place. This information includes the many and varied characteristics that relate to the concept of land in a broad sense such as soil, existing and optimum land use, location, surface and sub-surface improvements, conservation and related matters, statistical information, location to facilities such as schools, parks and services, and the two large but still integrated segments of land assessment and land registration.

It was identified that there were at least 48 organisations from the various Government Departments, State Economic Development Corporations, State Authorities, statutory bodies, educational institutions and other private organisations, which form the main users of land-related data and can be involved directly towards the formation of the Malaysian LIS (see Appendix 5E).

The Prime Minister's Department in collaboration with the Department of Survey and Mapping must assume the responsibility of coordinating and bringing together these various organisations. The National Land Council can also be made responsible for the assessment of records in the country such as that of land registration and mapping. The setting-up of the Main Steering Committee which consists of the selected members of the government organisations and educational institutions, and the LIS Working Committee which consists of the other remaining representatives as described in Chapter 5 (section 5.5.1), could form a two-tier organisation which could operate in the same manner as a Federal-State type of government with the State Councilors serving in their own capacities. Such an organisation, which could eventually be independently controlled and financed, must ensure that all the public and private sectors operate in harmony; that priorities are set and recognized, and that a meaningful long term view of the entire area of land information is formulated.

Currently, information relating to land is kept in a variety of district, state and Federal Government offices. As far as land registration is concerned, Malaysia has 99 Land Offices, each of which maintains its own records and staff to prepare and maintain those records. With the setting up of the Cadastral Data Bank in the country, one significant move towards a comprehensive data bank can be made. The National Land Council could be the single clearing house for all land registration documentations serving the whole country. The Council would be capable of receiving documents and land related data which could be coded and abstracted into a master system of land registration records.

Relevant information at the National Land Council would be available to any State Land Office through the unique parcel identification system (lot number), and based on the coordinate system. A copy of a particular land parcel from the Land Office may be requested in a matter of seconds. It seems that in this day and age, the idea of lawyers having to attend at the State or District Land Offices in order to search for title records is outdated. Instead, the lawyer can by telephone, request the Land Office to send photographic copies of any land parcel for his use.

Apart from the above proposals, it is also intended to discuss three other areas which are of great concern to the surveying profession in the country and which if undetected, could affect the cadastral survey system. The first area relates to the creation of the Land Surveyor's post at all of the 99 Land Offices in the country and the general increase in manpower at both the Survey Department and the Land Office. The second area relates to the issue of Qualified Title to land before a survey is carried out. The third area relates to some of the problems facing the licensed surveyors concerning the competition amongst the survey companies as well as the problem of undercutting survey fees.

8.7. Land Surveyor's Post at the Land Office and Manpower Survey

At a meeting held on the 21st. May 1983 discussing the various problems facing the Survey Department and the Land Office, the Ministry of Land and Regional Development had reached an agreement to create a land surveyor's post at all of the 99 Land Offices in the country.[5] Until today, such a resolution is not put into practice. Discussions with Senior SO's have revealed that such a resolution was strongly rejected, though this is not the reason for its delay. It is envisaged that the Ministry of Land and Regional Development speeds up the creation of the land surveyor's post at all the 99 Land Offices in an attempt to minimize the cadastral survey backlog as well as improving land administration. The following are some of the duties at the Land Office that could be carried out by the surveyors.

a) <u>Liaison</u>

Currently, liaison between the Land Office and the Survey Department as well as other departments in the state are dealt with by the SO who do not have any formal qualification in surveying. It is envisaged that such duties can be carried out effectively by qualified (graduate) surveyors who are more knowledgeable in survey and other technical matters.

b) <u>Requisition for Surveys (RS)</u>

If the Ministry were to proceed with the present system whereby RS's continue to become the prerogative of the State Land Office, then the surveyor could play an effective role in speeding the process as well as reducing the number of queries and litigations. Under the present system, the number of RS's, sent to the State Director of Survey, having insufficient information as well as not complying to the requirements of the Survey Department, continue to rise.[6] As a result, these RS's are sent back to the Survey Department thereby causing delays.

c) <u>Settlement Work</u>

All surveys carried out by the Survey Department are based on the RS's received from the Land Office. The time lapse between the completion of survey (by the surveyors from the Survey Department) and settlement work (by the SO's from the Land Office) is normally counted in months. As a result, survey marks are normally missing or disturbed, and the settlement work has to be postponed until such marks are re-established. If the settlement work continues to become the responsibility of the Land Office, then the emplacement of a surveyor could speed up the process. Communication between the Land Office and the Survey Department could be enhanced, and the number of queries could be reduced. It was also envisaged that the present work load borne by the SO, such as legal and technical matters, will then become the responsibility of a qualified surveyor. Appropriately, the surveyor could become the Head of the Survey and Technical Division at the Land Office, which is currently under the control of a Settlement Officer.

d) Training

The surveyor can also provide the necessary training to the SO's at the Land Office. Under the present system, SO's spend one month at the Survey Department doing office work and 3 months in the field as part of the compulsory training scheme at the beginning of their career. What is clear is the limited time allocated for the training and not much can be absorbed in 4 months, not even the most basic knowledge of surveying. With the emplacement of a qualified surveyor at the Land Office, in-house training could be provided to the SO on a continuing basis.

8.8. Manpower Survey

The current output of survey personnel bears no relation seemingly to the requirements of the industry. With fast improving surveying technology, it would appear that most survey companies would need less staff, and not more. They may even need less field staff because improved instrumentation would result in a faster turn-over of field work. The present economic slowdown facing the country has led many survey companies to retrench some field and office staff. It essentially put to a stop many housing development projects and hence the need for cadastral surveying has reduced. It would appear that the availability of jobs should be properly looked at from a long term perspective, taking into consideration matters such as investment climate, working environment, educational system and the political perspective as embodied in the Malaysian Five Year Plans [e.g. 5th.MP - (1986-1990), 6th.MP -(1991- 1995), etc.]. From the manpower survey carried out, the following conclusions were derived:-

a) Field party

i) Perimeter survey

Under the 6th.MP (1991-1995), it is estimated that 1.6 million acres of land are required by the various State Authorities, Statutory Bodies and the Federal Government for planning and development. At least 30 field parties are required to carry out this category of survey with an expected progress of about 315,000 acres per year, and to be completed in 5 years.

ii) <u>Reconnaissance survey</u>

It is estimated that the amount of surveys required for the purpose of planning and development under the 6th.MP, to be undertaken by FELDA, is about 1.3 million acres. At least 35 survey parties are required to carry out the survey with an expected progress of 226,000 acres per year.

iii) <u>Survey work for other Departments</u>

It is estimated that under the 6th.MP, the State Survey Departments will receive at least 37,000 RS's. At least 165 survey parties are required to carry out this category of work.

iv) <u>Control surveys</u>

At least 20 survey parties are required to carry out surveys for the purposes of establishing control traverses and other miscellaneous surveys.

From the manpower survey carried out, it was found that least 250 survey parties are required to cope with the various types of surveys for the various planning and development projects and other departmental works. In 1988, there were only 211 survey parties in the 11 State Survey Departments in West Malaysia.[7] Thus an increase of at least 39 survey parties are needed to cope with the amount of work load under the 6th.MP.

b) Office Staff

The number of personnel in the office must also be increased to cope with the work load. It was identified that the need to increase the number of personnel according to the various categories are as follows:-

Category	No. of staff to be increased
A (graduate)	15
B (technical assistant)	28
C (technician)	132
D (technician)	265
Total	440

At the end of 1988, the number of personnel, both field and office, remained almost unchanged. It is proposed that the Ministry of Land and Regional Development will continue to increase its effort to have talks with the Public Services Department to increase its manpower especially in Category A (i.e. graduate surveyors) and Category B (i.e. technical assistants). Technician posts i.e. Categories C and D which are non-promotional and not filled at present should be reduced as their number accounted for 80 per cent of the civil service strength. In 1987, about 10,000 civil service posts in the country were abolished as a means of trimming the size of the country's bureaucracy.[8]

At the Land Office, lack of staff is also a critical problem. As an example, it was found that the unit responsible for the conversion of QT to Final title at the Kota Bharu District Land Office is only manned by one SO. In 1975, the number of applications received were 2,017 with a previous backlog of 2,370. Only 1,887 (43 per cent) were approved and managed to be converted to Final Title in that year.[9] This means that a total of 2,500 cases were brought forward to the following year (1976) which then became the new annual work load. Such increase in the number of personnel is an essential element which has to be considered thoroughly by the Ministry of Land and Regional Development.

8.9. Motivation and Motivators

To minimize the survey backlog, the Survey Department should stress on good management. Findings have revealed that the present state of poor management has been the main contributory factor to the enormous backlog in the three main areas of cadastral processes; field survey, computation and plan drawing. Managing at the Survey Department requires the creation and maintenance of an environment in which surveyors work together in groups toward the accomplishment of common objectives. Surveyors from the top and middle management levels cannot do this job without knowing what motivates personnel. The building of motivatory factors into organisational roles, the staffing of these roles, and the entire process of leadership must be built on a knowledge of motivation.

Motivation is a general term applying to the entire class of drives, desires, needs, and similar forces.[10] To say that surveyors motivate their subordinates is to say that they do those things which they hope will satisfy their drives and desires and induce the subordinates to act in a desired manner. Motivators are those things which induce an individual to perform. While motivations reflect wants, motivators are the identified rewards or incentives that sharpen the drive to satisfy these needs. They are also the means by which conflicting needs may be reconciled or one need heightened so that it will be given priority over another. In examining the various leading theories of motivation and motivators, one seldom now hear reference to *the carrot and the stick*. This metaphor relates to the use of rewards and penalties in order to induce desired behaviour. Despite all the researches and theories of motivation, reward and punishment are still considered strong motivators. At the same time, in all theories of motivation the inducements of some kind of carrot are recognised. Often this is money in the form of pay or bonuses. Even though money is not the only motivating force, it has been and will continue to be an important one.

At the Survey Department, the field officers only get $150 a month as field allowance on top of the monthly wages. Findings have revealed that this has been the main reason for the poor productivity amongst field officers. What is evidenced is the extra expenses incurred while working in the field and such allowance could not be considered as a reward. The trouble with the *stick approach* is that, every field officer will get a *carrot* through the automatic annual salary increment, regardless of performance; this does not help to make them more productive. The *stick* in the form of fear - fear of loss of job, loss of income, demotion, etc. - has been and continues to be a strong motivator in general sense. Though admittedly not the best kind, this has never been put into practice for fear of defensive or retaliatory behaviour, poor quality work, or even dishonesty. But what was evidenced is the general poor productivity of field officers and the *malfunction stick*.

8.9.1. Application of the Expectancy Theory of Motivation

The fact that two survey personnel at the same level with different work output but gaining the same annual salary increment and no penalty action being taken on the weaker personnel has led to criticism over the years. It is firmly believed that survey personnel will be motivated to carry out the work satisfactorily and to reach a goal if they believe in the worth of that goal and if they can see what they do will help them in achieving it. In relation to the monthly progress target of every survey personnel as described in Chapter 4 (in terms of the chainage of survey, number of surveys being checked and the number of plans being drafted), these targets have never been achieved. The failure of the Survey Department to achieve these targets should have driven to the assessment of the award and penalty theory.

a) The Vroom Theory and Practice

The Vroom's expectancy theory of motivation states that such motivation can be determined by the value individuals place on the outcome of their effort (whether positive or negative), multiplied by the confidence they have that their efforts will materially aid in achieving a goal. In other words, Vroom makes the point that motivation is a product of the anticipated worth that an individual places on a goal and the chances he or she sees of achieving that goal. Vroom's theory may be stated as[11]

Force = Valence x Expectancy

where force is the strength of a person's motivation, valence is the strength of an individual's preference for an outcome, and expectancy is the probability that a particular action will lead to a desired outcome.

When a Checker is indifferent about achieving the progress target such as capable of checking 4 surveys per day, a valence of zero occurs, and there is negative valence when the Checker fails to achieve that target. Likewise, a Checker would have no motivation to achieve a target set by the department if the expectancy were zero or negative. The force exerted to do something will depend on both valence and expectancy. Moreover, a motive to accomplish some action might be determined by a desire to accomplish something else. For example, a Checker might be willing to work hard by capable of checking at least 4 surveys a day, or more if circumstances allow, for a valence in the form of being eligible to attend the interview for a promotion to the post of a Senior Checker. The fact that there are allegations that the wrong people were being promoted to a senior post is a fair issue. Findings have also revealed that there are some survey personnel who attend the promotion interview 6 times already because their age and the number of years of service make them eligible to attend the interview, but never make it is also a true occurrence. Although Vroom's theory fits the concept of harmony of objectives that different surveyors have different personal goals and completely consistent with the system of managing by objectives, this theory is difficult to apply.

b) <u>The Porter and Lawler Model</u>

In this model, the amount of effort (the strength of motivation and energy exerted) depends on the value of a reward plus the amount of energy a surveyor believes is required and the probability of receiving the award. The perceived effort and probability of actually getting a reward are, in turn, also influenced by the record of actual performance. Clearly, if surveyors know that they can do a survey or if they have done it, they have a better appreciation of the effort required and know better the probability of rewards.

Actual performance in a survey task is determined principally by effort expended. It is also greatly influenced by the surveyor's ability (knowledge and skills) to do the job and by his or her perception of what the required task is (i.e. the extent to which the surveyor understand the goals, required activities, the other departmental requirements, and other elements of a task). Performance, in turn, is seen as leading to intrinsic rewards (such as a sense of accomplishment or self-actualisation) and extrinsic rewards (such as working conditions and status). These rewards, tempered by what the surveyor sees as equitable, lead to job satisfaction. But performance also influences equitable rewards. What the field officer sees as a fair reward for effort will necessary affect the satisfaction derived. Likewise, the actual value of rewards will be influenced by satisfaction. The Porter and Lawler model of motivation, while more complex than that of Vroom's theory of motivation, is a portrayal of a system of motivation. To the surveyors in the top and middle management levels, the Porter and Lawler model means that motivation is not a simple cause and effect matter. It means, too, that those in these two categories should carefully assess their reward structures and that through careful planning, managing by objectives, and clear definition of duties and responsibilities by good organisational structure, the effort-performance-reward satisfaction system can be integrated into an entire system of managing at the Survey Department.

An important factor in adopting the Porter and Lawler motivation model is whether surveyors perceive the reward structure as being fair or not. One way of addressing this issue is through the concept of equity which refers to the surveyors' subjective judgments about the equity or fairness of the reward they got in relationship to the inputs (which includes many factors such as effort, experience, educational achievements; etc.) in comparison with others. J. Stacy Adams[12,13] states that the equity concept is given by:-

$$\frac{\text{Outcomes by a person}}{\text{Inputs by a person}} = \frac{\text{Outcomes by another person}}{\text{Inputs by another person}}$$

There should be a balance of the outcomes/inputs relationship for one surveyor in comparison with another surveyor. If surveyors feel that they are inadequately awarded, they may be dissatisfied, reduce the quantity or quality of .output, or leave the organisation. If the surveyors perceive the rewards as equitable, they will continue at the same level of output. If the surveyors think that the rewards are greater than what is considered equitable, they may work harder. It is also possible that some may discount the reward. One of the identified problems is that surveyors themselves over-estimate their own contributions and the rewards they receive. Certain inequities may be tolerated for some time but prolonged feelings of inequity, as evidences have shown, result in strong reactions to an apparently minor occurrence. For example, a surveyor being reprimanded for being a few minutes late may get angry and will affect the day's performance, not so much because of the reprimand but because of the long-standing feelings that the rewards for his contributions are inequitable in comparison with others. In another example, a field officer, employed by a survey company, may be satisfied with the field allowance of $200 until he finds out another field officer from another survey firm doing similar work gets $20 more.

8.9.2. Reinforcement Theory

A surveyor can be motivated by proper design of their work environment and praise for their performance. Findings have revealed that punishment for poor performance produces negative results. The positive reinforcement theory deals with praising good performance. Working situations should be analysed to determine what causes surveyors to act the way they do, and then initiate changes to eliminate troublesome areas, bottlenecks and obstructions to performance. Specific progress targets should be set with surveyors participation and assistance, prompt and regular feedback of results is made available, and performance improvements are rewarded with recognition and praise. Even when the performance of a surveyor does not equal the set progress target of 35 lots/month, ways must be found to solve the problem and praise him for the good things he does. It has also been found highly useful and motivating to give surveyors full information on the department's backlog, especially in areas they are involved. Investigations have revealed that the majority of the surveyors did not realised the extent of the backlog and that they are part of the economy.

Although this reinforcement theory sounds almost too simple to work, a number of survey companies in the U.K. have found this approach beneficial. J.A. Story and Partners in Surrey, Keith Horan Associates in Leek, and Sharrock-Oaks Surveys in Derby observed that this approach saved the company a substantial amount of money by merely inducing field officers to work until 5 o'clock in the evening (if conditions are feasible) although this may exceed the set target of observation of 200 points per day. Such an approach as well as the concept of awareness emphasise the removal of obstructions to performance, careful planning and organisation, control through feedback and the expansion of communication. The three motivation techniques are money, the use of participation, and improving the quality of working life.

a) <u>Money</u>

In the earlier discussion of the carrot and stick approach, money can never be overlooked as a motivator. Whether in the form of wages, world tour of a life time or any other things that may be given to people for performance, money is important. Money is often more than its monetary value; it can also mean status or power. It is true that money can motivate only when the prospective payment is large relative to a surveyor's income. The trouble with the present field allowance of $150 a month is that they are not large enough to motivate the field technicians. They may keep the them from being dissatisfied and from looking for another job, but unless they are large enough to be felt, they are not likely to be a strong motivator. The current field allowance of $150 a month is hardly sufficient to cover the costs of extensive daily travelling expenses. It was found that the average distance travelled by field officers is 30 miles. The way to ensure that the field allowance has meaning as a reward for accomplishment is to generate the income and to base the allowance as much as possible on the nature of the working condition in the field. For a technician from the same grade but working in the office and not getting the extra $150 a month, he would be better off because there is no need to spend more on car maintenance, does not mean travelling long distances and working in an air-conditioned room.

b) Participation

One technique that has been given strong support as the result of motivation theory and research is the increased awareness and the use of participation. Participation is also a means of recognition and gives people a sense of accomplishment. For example, there are people involved in the CALS and CAMS projects who are putting more hours in it. Although their salary is similar to those in the other sections, it is the intellectual stimulation and excitement which are non-quantifiable and more paramount than financial incentives. There is also the need to educate the field technicians, to make them aware of the true costs of survey and the extent of the backlog.

It has been identified that the extent of backlog in the field work is more critical than that of checking the survey and drawing of plan in the office. Under the present system, surveyors and other field officers never attend any formal course or lecture related to the work. Attendance of such courses are only *restricted* to those working in the office and if this system continues, the field lack the general awareness that survey operation is expensive, that such delays and backlog are costing the government, and should see themselves as part of the economy. Although there are many formulae to calculate the hourly costs incurred by a survey personnel, a general rough figure would be:

$$\text{Cost per hour} = \frac{\text{annual salary of personnel}}{500}$$

c) Quality of Work

One of the most interesting approaches to motivation is the quality of working life program which rose prominence in the 1970's. Although this is not applicable to field officers, this program has been regarded as a promising means of dealing with stagnating productivity, especially in USA and Europe. Workers and union representatives have also seen it as a means of improving productivity and justifying higher pay. Although this would mean incurring extra costs on office improvement and refurbishment, it has been seen as a means of increasing productivity through the reorganisation process and improving communications. Above all, changing work arrangements through technical modifications such as the redesign of the cadastral processes as discussed in Chapter 4 and 5, reducing the unnecessary bureaucratic processes, and a better quality control system (section 8.5), are seen as essential elements in improving job enrichment and achieving a higher sense of challenge and achievement. Job enrichment may be achieved by adopting the following methods:-

a) giving the survey personel more freedom in deciding about such things as work distribution, method and pace;

b) encouraging participation and interaction between personnel;

c) giving survey personnel a feeling of personal responsibility for their tasks;

d) taking steps to make sure that survey personnel contribute to the finished map or plan;

e) giving survey personnel feedback on their job performance before their supervisors get it; and

f) involving survey personnel at all levels in analysis and change of physical aspects of the work environment such as layout of office, temperature, lighting and cleanliness.

8.9.3. <u>Contingency Approach to Motivation</u>

Motivation must be considered from a system of contingency point of view. Given the complexities of motivating surveyors with ranging personalities and in different situations, risks of failure exist when any single motivator, or group of motivators, is applied without taking into account these variables. Human behaviour is not a simple matter but must be looked upon as a system of variables and interaction of which certain motivating factors are important elements. Two identified variables are:-

a) Dependence of Motivation on Organisational Climate

Motivating factors do not exist in a vacuum. Even surveyors' desires and drives are conditioned by physiological needs or by needs arising from a person's background. But what surveyors are willing to strive for is also affected by the organisational climate in which they work. At times a climate may curb motivations; at other times it may arouse them.

b) Motivation, Leadership and Managership

The interaction of motivation and organisational climate not only underscores the systems aspects of motivation but also emphasises how motivation both depends on and influences leadership style and management practice. Both surveyors in the top and middle management levels must respond to the motivations of every surveyors from the front-line (bottom-line) if they are to design an environment in which surveyors will perform willingly. Likewise, those in the top and middle management levels can design a climate that will arouse motivation. They should see that departmental progress targets are set, strategies are developed and communicated, and plans to achieve these targets are outlined. A Communication Committee should be set up to let the idea pass around to all personnel. The style of leadership and the ability to solve communication problems are also central to managing. Surveyors from these two levels should create an effective environment to make sure that quality control mechanism, information, and approaches furnish other surveyors with the feedback knowledge in order to have an effective motivation.

8.10. Introduction of Qualified Title (QT)

Prior to 1965 before QT was introduced, property development in the country was very slow. The country would not have achieved the present state of progress if not for the introduction of QT. The provision of QT was a dynamic step and has contributed positively towards the national development but it has not been altogether faultless. With the introduction of QT, a compromise to the position of the Torrens System of registration of title to land has been made. It allows a land parcel to be issued and registered, a QT is issued in advance of survey and has the same rights as a Final Title except:-[14]

a) that the boundaries of the land shown on the document of title are provisional only i.e. its dimensions, area, orientation and location are approximate, except those which may have been established by any earlier survey; and

b) that the land parcel cannot be sub-divided or partitioned, or included in any amalgamation.

QT is provided in the NLC to enable land to be alienated or to enable title to be issued in advance of survey to the individual land parcel upon sub-division or partition or to the combined area upon amalgamation. Basically the aim is to enable the approved applicant (in the case of alienation) and the proprietor of the individual land parcel upon sub-division or partition, or of the combined area of land upon amalgamation, to transfer, charge or lease in respect of the land before a survey is effected (according to the provision of section 396 of the NLC).

8.10.1. Weaknesses of Qualified Title

Because QT confers on the proprietor the same rights as a Final Title except that the boundaries and plot size are provisional, the uncertainties in location, size and shape of the land parcel have brought widespread litigations. Most proprietors who are not aware of the differences between a QT and a Final Title, just accepted the QT and realized its limitations only when problems arose. The problems facing land proprietors having QT's are quite alarming and its long term effect on the land registration system should not be taken lightly. The following three examples are some of the cases illustrating the weaknesses of QT. They are:-

a) A piece of land in Cameron Highlands with an area of 0.149 hectare (16,000 sq. ft.) was issued with a QT of having 0.297 hectare (32,000 sq. ft.);
b) at the 2nd. mile, Ipoh Road in Wilayah Persekutuan, three QT's purporting to confer three shop lots were

later found to have sufficient land for only two; and

c) a piece of industrial land at Kepong in the state of Selangor which was issued with a QT was later found to have overlapping boundaries with the adjacent land parcels, causing frictions and litigations.

QT is supposed to be a provisional title, but for all practical purposes it is as good as a Final Title. Except for the prohibitions as stated in section 8.10, there are no restrictions on inheritance, development or other land dealings and therefore, the question that can be posed to the owner of a QT is 'why he should invite unnecessary delay and incur more expense just to get a Final Title?' QT was introduced to ease the pressure posed by certain groups of proprietors e.g. housing developers and miners. It should not be considered as a means to end the existing problem of survey backlog and to keep up-to-date the standard sheets at the State Survey Departments. With the eventual implementation of the LIS, such provisional records will pose a greater problem in trying to establish an accurate record of land ownership in the country. In the end it is not only the proprietor that loses but the nation as a whole. There is at the moment, no provision in the NLC which requires the proprietor to change his QT to a Final Title. Furthermore, if the actual area of land occupied by a particular proprietor is bigger than the area shown on the QT and the annual quit rent being paid is less, being a peaceful person, he naturally prefers to let things to stay peacefully as it is.

QT was designed as a result of numerous complaints made by housing developers and mining proprietors. The allegation that cadastral survey takes too long before a Final Title is issued is a fair one. Housing developers prefer to have *instant titles* so that more money can be raised after a particular project is completed. Hundreds of thousands of QT's were issued by the Land Offices especially in Johor, Selangor, Perak and Penang and the developers still asked for more. When a person buys a piece of land from a developer, the title he gets is a QT although all the survey fees being paid to the developer includes the issue of a Final Title. After the sale has been made, the developer who is no longer the owner of the land parcel, has no further interest whether such land parcel has a Final title or not. There is no law to compel the developer to get a Final Title for the land parcel he had just sold.

On the whole, it can be said that the introduction of QT has satisfied the people who needed it most. This does not mean that in doing so, no problems arose; in fact the negative effects are rather disturbing. The answers to the reactions from the proprietors who own QT's are always varied; some are moderately satisfied, some are not satisfied, and some ended in frustration. Such frustrations are not only due to extra expenses incurred but also the endless problem brought about by the indefinite nature of the land parcel held under QT. There were also cases where QT's were issued for land parcels which in actual fact were non-existence on the ground, and for land parcels located wholly over deep mining pools. Such examples highlighted earlier were not the only cases that had caused problems; indeed, there were other cases which were never publicised. Before the situation gets completely out of hand, it is perhaps prudent to take remedial action which could make the situation more tolerable. In the following section, a proposal is put forward which necessitates a concerted administrative action to be made and a small additional provision in the NLC to be effected. It is proposed that a QT should have a limited life period of six years after which conversion to Final Title is compulsory.

8.10.2. Limited Life Period of Qualified Title

It is proposed that a QT should have a limited life period of six years in selected areas especially in principal towns and cities as well as other areas which have high land values. For any area in the state where it is to be declared a *Coordinated Zone* as discussed in Chapter 4, i.e. areas which were chosen for the establishment of a series of dense control points, the

Ministry of Land and Regional Development could apply the proposal of QT having a limited life period of six years by concentrating on surveys for land parcels which were alienated under QT's. A six-year period was chosen as a result of an investigation carried out at the District Land Office in Kota Bharu; it is derived from the average time taken by a licensed surveyor practicing in Kelantan to finalise a query to a cadastral survey.

8.11. Problems Facing the Survey Companies

The competition encountered amongst survey companies and the problems of undercutting the survey fees, especially for engineering works were at one time a very serious problem in Malaysia. Obviously there should be competition amongst survey companies, but such competition should be a healthy one without breaching professional ethics. It must be remembered that all survey companies exist because, for better or for worse, we live in a world in which private enterprise is allowed to flourish; and the only possible justification for its continuation is that its efficiency is ensured by competition. Any steps to remove competition without good reason should not be supported. Progress is helped by competition and its suppression could be inhibiting.

The Board of Land Surveyors Malaysia has set the scale of fees for cadastral surveys in the Thirteenth Schedule, 1959 and was last revised in 1986. Fees for cadastral surveys carried out by licensed surveyors are deposited in advance with the Board, which then makes progress payments at various stages until the submission of the survey plan. The Board retains one per cent of the fees for administrative charges. For engineering and topographical surveys undertaken by Government Departments and Statutory Bodies, the Federal Treasury has set a circular describing the scale of fees [Reference number: (K&B)(8.09) 735/3/1-22 Jd.2(74) dated 17th. November 1982]. This circular consists of three parts; Part I being for the usual types of engineering and topographical surveys for the Public Works Department (PWD) and other Statutory Bodies, Part II being specifically for the Drainage and Irrigation Department (DID), and Part III for the National Electricity Board (NEB). The Thirteenth Schedule and the circular (from the Federal Treasury) seek to simplify the revision of the scale of survey fees in terms of future inflation by just assigning a new monetary figure for the *party-day*. For example, the basic unit for a party-day for engineering and topographical surveys is $450 for Peninsular Malaysia and $585 for the states of Sabah and Sarawak in East Malaysia. Hence, with the scales of fees for cadastral surveys and for engineering and topographical surveys properly drawn up, there should be no unhealthy competition among survey companies. The client is free to choose the survey company that gives him satisfactory services. There should be no inclination to shop around because the survey fees would be basically the same; the differences being mainly in tangibles such as courtesy, service, follow-up actions etc. But human nature being such as it is, the tendency for a survey company badly in need of a job, is to offer a discount. The company thinks more of its trading function and less of its professional role. When one company offers a discount, it starts a vicious circle. The words get around and such company may be able to attract clients. Other survey companies may have to offer discounts as well if they are to stay in business.

There were also cases where certain malpractices have occurred when survey companies were asked to submit quotations for surveys to various statutory bodies based on the rates of the Federal Treasury. A survey company badly in need of a job may seemingly adhere to the rates of the Federal Treasury but willfully omit to charge for certain items of work, thus bringing its quotation down in the hope that it will be accepted. Even when the correct amount of survey fees were deposited with the Board, cases do occur where certain companies may get the work after earlier irregular negotiations to offer discounts. The Board must take appropriate actions in an effort to reduce such malpractices. Normally, it is always hampered by the lack of evidence. Direct evidence, such as *through a smoking gun*, is hard to come by. It is proposed that an independent inspectorate body is set up to deal with such malpractices. All survey companies must abide by all professional ethics, with the Board utilizing all the disciplinary powers it has. It is also proposed that both ITM and UTM inculcate in would-be surveyors of the professional values that could enhance the role of the profession.

8.12. <u>Conclusions</u>

It can be concluded that efficient management at the Survey Department, the Land Office and the survey companies plays a very important role in keeping the cadastral system in order. To ensure excellence, all personnel have to abide by four main principles:-

a) *Effectiveness* - to ensure a proper implementation of government policies and programmes;

b) *Efficiency* - to ensure cost and time effectiveness;

c) *Responsibility* - to ensure that all personnel at all levels have integrity, trustworthiness and a high sense of accountability; and

d) *Responsiveness* - to ensure the service can change with time and to cater for the needs of the public and country.

The basic problems of survey backlog and land registration in the country were not how to better deal or cope with what is already existing or even how to refine and up-date the existing system but rather a problem of how to cope with and respond to the future as a single encompassing problem. A systematic approach towards defining the aims and objectives of the Survey Department, the Land Office and the profession as a whole which are to be carried out by all the various levels of management groups must be properly outlined. A management model defining the objectives and reactions based on MBR - MBO is proposed. It is only through a systematic management approach that a proper cadastral system and registration of title to land will become a reality. Some of the clear benefits are:-

a) Certainty of ownership and improved conveyancing - the compilation of land records necessitates a systematic adjudication system i.e. the formal identification and recognition of the ownership of land. This should provide certainty not only as to the land proprietor but also about what other rights exist in the land, thereby leading to a greater social cohesion. The costs and delays in transferring property rights can also be reduced through a systematic land registration system. Duplication of efforts such as repeated investigation of old titles and land records can be avoided, thus saving on costs.

b) Reduction in land disputes and security of tenure - disputes concerning land and boundaries can give rise to expensive litigations. Settlement of such disputes should be part of the adjudication process and will not only lead to greater productivity from the land but also reduce court and litigation costs. Any identified defects in any title can be cured by the judicious use of appropriate powers. Greater security and state guarantee should in turn lead to greater productivity especially in rural areas where farmers can invest their capital and resources in it;

c) Stimulation and monitoring of the land market - a cheap, secure and effective system for recording and transferring interests in land will improve the efficiency of the land market. It can also be used to monitor land transactions and ownership;

d) Security for credit - by having a limited life period QT and systematic conversion to Final Title, land parcels can be used as security against any loan. Evidence has shown that the combination of a sound title and the ability to raise long-term credit can give rise to a substantial increase in productivity from the land; and

e) Management of state lands - a systematic cadastral system and cadastral maps will benefit the state in the administration of state land which will give rise to improved revenue collection, land taxation, land reform (such as land distribution, land consolidation and other development projects) and physical planning.

CHAPTER 9: CONCLUSIONS

The whole process of cadastral surveying in Malaysia has been shown to be time consuming and costly. Smooth operation of the country's development projects are hampered or unable to be carried out systematically as a result of work being delayed at various stages. At the Survey Department, the three processes of cadastral surveys are field work, checking and examination of survey, and the preparation of certified plan. The four areas which form the key root to the problem of cadastral survey backlog have been identified as follows:-

a) <u>Survey methodology</u>

A major determining factor in the cost of a survey and the speed with which it may be completed is the accuracy standard that is deemed necessary to sustain. In the past, this has often been determined by what is technically possible rather than by what is necessary and sufficient for the operation of the cadastre. Thus, at a time when traversing was considered the most appropriate method of cadastral surveying, the necessary standards were determined by what is technically reasonable to achieve - for instance a linear proportional error of 1:8,000 for first class surveys and 1:4,000 for second class surveys. However, a linear proportional error of 1:25,000 and 1:15,000 are always achieved for first and second class surveys respectively - on the understanding that the smaller the value of proportional error, the better is the quality of the survey without understanding in detail the reasonable approach and flexible standards that could be adopted to suit various conditions such as local land use, land value or the type of boundary marks most appropriate for the area.

The present concept of measuring the quality of surveys by the relative accuracy method of a minimum allowable closing error does not necessarily secure quality because the survey is only accurate unto itself. Quality can only be achieved by the introduction of precision through precise horizontal control throughout the country especially in built-up areas. Within such a precisely coordinated control grid, the surveyors can then use the concept of positional accuracy which is of course relative accuracy but is now relative to the absolute values of the horizontal control network and permits a meaningful statement of quality. It appears that governments and planning agencies have over-looked the need to improve the existing control network system. It has been demonstrated in Chapter 4 that an annual savings of about $43 million can be made in 25 years by improving the existing survey controls (first and second order) covering the whole country.

It was also found that every State Survey Department is spending $612,000 per month on cadastral surveys. The estimated overall national monthly costs of survey (including overheads) is $80,784,00 (in 1988 prices). By applying the principle of checks in the field, an annual saving of about $170 million can be made. Every survey party is to be supplied with a programmable pocket calculator to ensure that checks are carried out in the field rather than in the office. Such an investment would cost the Survey Department about $35,000 and would offset the cost of the calculator. It was also found that many personnel are not aware of the concept of costs and that they are part of the national economy. Even many of the overhead costs at the Survey Department are not recorded.

Considerations must also be given to monitor the progress of Government and licensed surveyors so that the expected productivity is achieved. It has been found that while the Survey Department is committed to the use of instrumentation like EDM, theodolites and steel bands for cadastral surveying, the overall progress in the country is not controlled by the use of such equipment and other automated techniques in the office, even though cost benefits analysis suggests that a significant annual savings of about $4.3 million can be made in each state with the introduction of the CALS project. The main aim of this project is to show that improved efficiency in .the office (i.e. the computing of survey data and the preparation of certified plans) will improve the progress. The main issues such as the establishment of a dense network of primary and secondary controls, the general attitude of all personnel towards work by having a more responsible approach, the amendment of certain regulations that govern the execution of surveys, a more systematic management system approach at the Survey Department and the Land Office, etc. have been analysed and proposals have been tested. Such proposals may be applied urgently so that the whole problem of backlog and its minimisation can be tackled as a joint responsibility.

It must be appreciated that the use of electronic theodolites and data recorders can improve the efficiency of field work. The costs analysis on the use of this equipment as demonstrated by the Nottinghamshire County Council has shown that an estimated annual savings of about £34,200 and 2,750 man-hours can be made against the costs of manual booking procedures. With the eventual implementation of the Malaysian LIS, reliable information is stored and the chances of making and implementing better decisions will be increased. It is of prime importance to realise that with the introduction of total stations and data recorders in cadastral surveying and the implementation of the LIS, these are not the fundamentally important steps to be taken that a complete change in philosophy and technique is warranted in one jump. It is more important to establish a good working manual system before incurring the large financial investment that is inevitable with computerisation. Of course, the use of electronic theodolites, data recorders as well as computers can improve efficiency in the particular aspects of the collection and the manipulation of survey data. However, care is required in the introduction of such equipment with regards to system support and after-sales services as the Survey Department had already unfortunate experiences with the IBM 1130 and the PDP 1104 computer systems as well as the EAI PACER 100 automated plotting system. LIS covers a wide spectrum of which that relating to the cadastre is an especially essential subset. It is through the cadastre that many of the tangible benefits to society can arise. The benefits are however difficult to predict. The initial costs are high and the benefits are not immediate. With the eventual implementation of LIS in Malaysia, the main problem is not the lack of resources, either in terms of educated manpower and available capital but to be able to use the available resources wisely. There now exists specialists, though not in great numbers, and the required financial resources as evidenced by the setting up of the CALS and the CAMS projects. The main problem lies with some sections of the work force who exhibit a passive attitude which lacks motivation towards change. Generally, this passive attitude has been identified as being one of the main barriers towards change and the overall improvement of the surveying industry; this has to be re-examined seriously.

b) Legal aspect

The regulations that govern the execution of cadastral surveys in the country have more often reflected the state of the art in surveying at the time they were introduced, for instance, the type of equipment available. In order to have a complete and correct implementation of land law, the NLC should be made simple to understand and unambiguous. Its procedures and regulations should be straight forward and easy to apply. Currently, an application for a change of use for a piece of land to development purposes is required to go through 42 procedural steps involving 18 to 20 sections before a decision can be made. Changes should be made continuously to accommodate the fast changing social and economic needs of the country. A progressive NLC should preserve and ensure the continued success of the present land registration system which confers so much sense of security to the title holders. One of the safeguards to ensure that the foregoing is a continual process is that, regular reference to the professionals and the regular users of the NLC should be considered as an integral part of the process when considering any amendments or new enactments to the law dealing with land. There have been cases where amendments were made without in depth consideration of any repercussions which may be generated by these new provisions. If this is to persist, an effective and efficient NLC cannot be achieved. Thus, the stringent regulations laid down with respect to the execution of the cadastral surveys must be revised to allow discretion to be exercised so that unnecessary re-surveys which are costly and time consuming may be avoided.

c) Education and training

Educational planning for land surveying has to concentrate its attention on the curriculum and its impact on working attitudes, particularly towards the technical profession. The educational institutions, Survey Department, survey companies and ISM should work for the improvement of the curriculum of educational and training courses. Unless correct values towards jobs of a technical nature are inculcated in the future land surveyors, there may arise the problem of a divergence between the needs and actual demands for this category of worker. Emphasis should therefore be placed on revising and changing the curriculum, particularly at technically oriented colleges at secondary levels as well as institutions at tertiary levels offering land surveying courses, from being too academically oriented towards being more vocationally biased. Once the curriculum has been reformed, attention will have to be paid towards the expansion of the course, maintaining an up-to-date approach to surveying subjects which are relevant to the current surveying trends.

There is also a growing requirement for lecturers in land surveying with high qualifications to meet the needs of ITM and UTM. It has been identified that almost half of the academics at both institutions are under 35 years of age and holders of a first degree in land surveying. Although it has been accepted that both institutions are in the process of upgrading the qualification of all lecturers to masters and doctorate levels by sending them to Australia, Holland, Japan, New Zealand, UK or USA, such steps taken must be properly planned so that the required expertise in the areas of need e.g. land information system, digital mapping, remote sensing, etc., can be given top priority.

It is also essential to educate the land surveyors in the use of modern surveying packages and this requires a planned comprehensive programme. It is considered that as the Survey Department has already introduced the CALS and the CAMS projects, then it should be the responsibility of the Department to take the leading role and to provide the necessary education and training for other land surveyors in the use of computers and to make the system work. The re-education process would include mid-career training programmes, seminars and workshops and must include literature on efficient field practices and the overall exposure towards modern instrumentation and software.

The survey companies must also provide the leading role and dynamism in the economy, given the resource constraints facing the public sector. The private sector is best placed to develop new ventures and improve technology and skills to meet the challenges and wealth creation. Survey companies can also advise the Government and other institutions about strategies for improving the performance of the surveying and mapping industry on an incremental basis.

d) <u>Management</u>

Efficient management at the Survey Department, the Land Office and the survey companies plays a very important role in keeping the cadastral system in order. Particular emphasis must be taken to ensure that proper implementation of government policies and programmes are carried out effectively so that they are cost and time effective. Thus, the re-education programme for all personnel must stress the key issues such as acquiring a high level of integrity, trustworthiness and accountability so that a dynamic and responsive surveying profession that can change with the times and cater for the needs of the public and country is created. The application of the MBR-MBO approach towards defining the aims and objectives of the Survey Department, the Land Office and the survey profession as a whole which are to be carried out by all the various levels of management groups must also be properly outlined. It is only through a systematic management approach that a proper cadastral system and registration of title to land will become a reality. In turn a systematic cadastral system and cadastral maps will benefit the state in the administration of state land. This will give rise to improved revenue collection, land taxation, land reform (such as land distribution, land consolidation and other development projects) physical planning, certainty of ownership and improved conveyancing, reduction in land disputes and security of tenure.

APPENDICES

REFERENCES

BIBLIOGRAPHY

APPENDIX 1A

SURVEY COMPANIES, GOVERNMENT DEPARTMENTS AND EDUCATIONAL INSTITUTIONS VISITED IN MALAYSIA AND THE UNITED KINGDOM.

1. Survey companies visited in Malaysia

a) *Jurukur Perunding Chartered and Licensed Land Surveyors* at Bandar Baru Sri Petaling, Selangor;

b) *Syarikat Jurukur Konsultant* at Taman Tun Dr. Ismail in Kuala Lumpur;

c) *Geomex Surveys and Ukuarah Jurukur Berlesen* at Ipoh Road in Kuala Lumpur;

d) *K.S.N. Land Survey Consultant* at Subang Jaya in Selangor;

e) *Jurukur Fuaad dan Rakan-Rakan* at Kota Bharu in Kelantan; and

f) *Jurukur Berjasa* at Kota Bharu in Kelantan.

2. Educational institutions visited in Malaysia

a) *MARA Institute of Technology (ITM)* at Shah Alam, Selangor; and

b) *University of Technology Malaysia (UTM)* at Skudai, Johor.

3. Government departments visited in Malaysia

a) *Survey Department Headquarters (Cadastral Survey Division)* at Gurney Road, Kuala Lumpur;

b) *Federal Land Development Authority (FELDA) Headquarters,* Surveying Division, Kuala Lumpur;

c) *Federal Land Consolidation and Rehabilitation Authority (FELCRA) Headquarters,* Surveying Division, Kuala Lumpur;

d) *City Hall*, Federal Territory of Kuala Lumpur, Survey and Technical Division, Kuala Lumpur;

e) *Kelantan State Survey Department*, Kota Bharu, Kelantan;

f) *Land Office*, Kota Bharu, Kelantan; and

g) *Trengganu State Survey Department*, Kuala Trengganu, Trengganu.

4. Survey companies visited in the United Kingdom

a) *Survey Three Ltd.* at Beeston in Nottingham;

b) *Gascoines Chartered Surveyors* at Arnold in Nottingham;

c) *J.A. Story and Partners* at Mitcham in Surrey;

d) *Sharrock-Oaks Surveys* in Derby;

e) *Keith Horan Associates* in Leek; and

f) *M.N. Oliver and Co.* at Sale in Chesire.

5. Educational institutions visited in the U.K.

a) *North East London Polytechnic (NELP),* Department of Land Surveying, Barking in Dagenham; and

b) *Trent Polytechnic,* Department of Environmental Studies, (Higher National Diploma in Engineering Surveying), Nottingham.

6. <u>Seminars, conferences and short courses attended in the United Kingdom</u>

a) *Short course on Terrain Modelling in Engineering and Surveying* at University of Surrey in Guildford (7 - 9th. April 1987);

b) *Seminar: G.I.S. Today* at Salford College of Technology, Manchester (24th. June 1987);

c) *Annual Field Surveying Course* at Ferryside in Dyfed, South Wales (for HND students, Trent Polytechnic), (8 - 19th. June 1987);

d) *Conference: Standards and Accuracies* at Reading University (28 - 29th. March 1988).

e) *Annual Field Surveying Course* at Llanfairfechan in North Wales (for BEng. Civil Engineering (Hons) First Year Students, Trent Polytechnic, (24th. October - 1st. November 1988); and

f) *Conference: Quality Assurance for the Surveying Profession* at the Institute of Engineering and Space Geodesy, University of Nottingham (25th. January 1989).

APPENDIX 1B

QUESTIONNAIRES

Name of Firm:.......................................
Address of Firm:....................................
....
....
....
Surveyor's Name:....................................
Date and Time:......................................

1. Briefly - describe the history of the company;
   - how old is the company; and
   - the structure of the company.

2. Issue of ownership of the company.
   - discuss briefly in terms of principals, partners, team leaders, etc.;

   - how work is allocated (whether it is autocratic, anticipative, democratic, etc.; and

   - describe briefly the management style.

3. What are the priorities in term of objectives at the present time? Has this changed over the past years;

4. The financial, human and instrumental resources available.
   - How many qualified Land Surveyors, Assistant Land Surveyors, Technical Assistants, and other field staff being employed;

   - how many articled students;

   - under normal circumstances, how many staff are there in a field party? Who are they? (e.g. how many qualified Land Surveyors, field assistants, chainmen, etc.);

   - the various instruments already available and any plan to buy some other new instruments;

   - how many technicians (field technicians, office technicians - draughtsmen, computation men (including computer operators, etc.) are employed and how the criteria is set;

- recruiting new staff - what are the qualities that are needed for the different types of work;

- how often is new instrument bought, and whether they are bought new from the market, second-hand or hire;
- how is the instrument repaired - whether send it back to the manufacturer, established repairer, a free-lance repairer or self-repair; and

- how often is the instrument serviced.

5. Which mode of staff training is conducted and preferred?
   - in-house training;

   - send to a training board for a certain period; or
   - any other mode of training;

   - send staff to educational institution locally or abroad for training;

   - any sort of departmental examinations set (either by certain professional institution, Survey Department, or prepared in-house); and

   - what proportion of staff is allocated to undergo training at any one particular time.

6. The nature of jobs undertaken.
   - any specialisation of work e.g. cadastral survey hydrographic survey, engineering survey, tunnelling, etc.;

   - is the instrument available to carry out the job or hire;

   - how the price is set for doing a particular job; is it based on area basis or hourly basis;

   - is it based on the number of personnels required to carry out the job;

   - is there a standard rate set by a body responsible for the running of all the survey companies;

   - any fundamental parameters set in fixing a specification for doing a particular job;

   - competitions encountered - where does they come from and who are the major rivals;

   - what are the steps taken to be competitive (e.g. pricing, special service quality, extra services like giving further reports and advice, etc.);

- competitions encountered
  - with other companies;
  - with the government;
  - other semi-government agencies;
  - others.

- any problem of price under-cutting of survey fees by the rivals;

- any special rate or discount to attract more clients;

7. Comment on the availability of jobs.
   - such as making friends and establish various contacts to get jobs from government departments, semi-government departments and the general public;

   - how jobs are obtained other than the above methods;

   - what proportion of jobs come from contacts with friends, government, semi-government, etc. (in terms of percentage/value of jobs).

8. Views and comments on up-grading the overall survey system and methodology and the reaction to the following:-
   a) computer-aided survey;
   b) automated and manual data collection;
   c) the use of electronic theodolite and any other sophisticated survey instruments;
   d) automated plotting and digitisation; and
   e) other current issues.

9. Views and comments on up-grading the present system adopted in the office in terms of administration, field work procedures and other office routines.

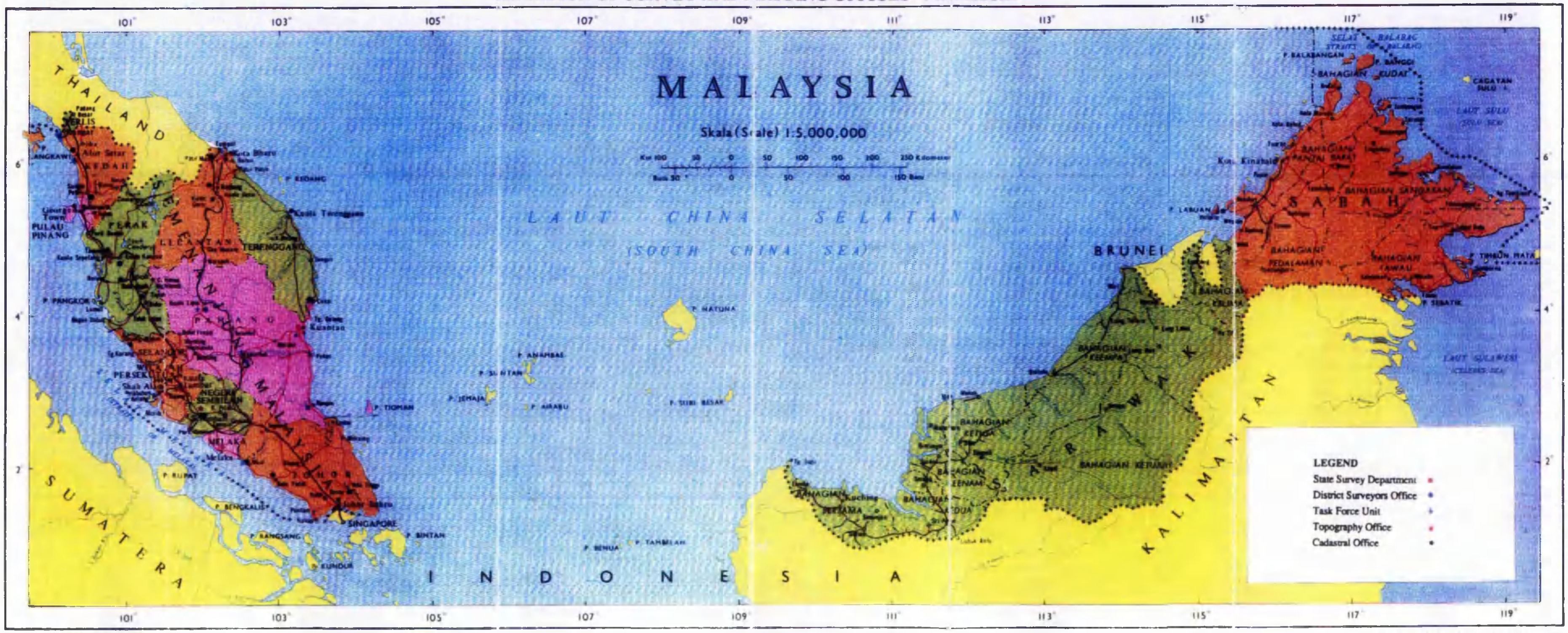
10. Views and comments on how partnership is going to affect the future of the firm (e.g. to be a partner of another engineering firm, air-survey firm, estate agent, etc.).

11. Views and comments on the future of the surveying profession in the country and the role of the company in the economic development of the country.

APPENDIX 2A

SARAWAK PERLIS KELANTAN JOHOR KEDAH SABAH

LOCATION OF SURVEY AND MAPPING OFFICES - MALAYSIA



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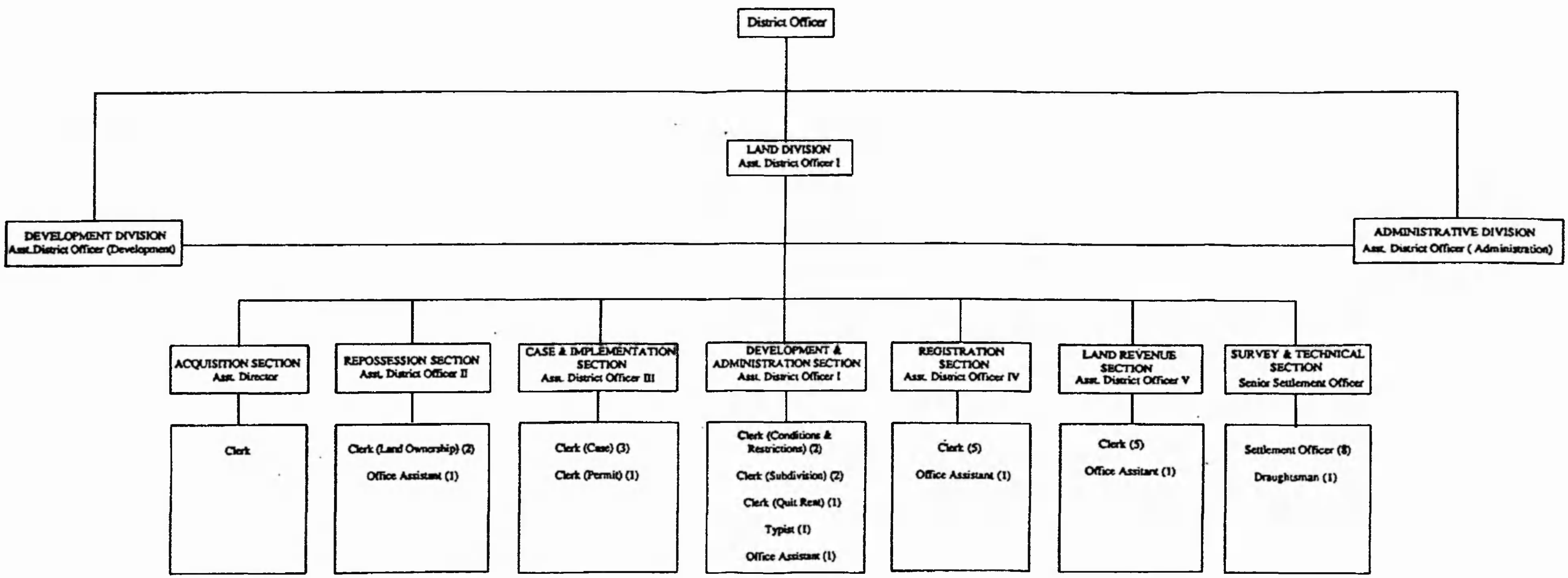
PULAU PINANG PERAK NEGERI SEMBILAN MELAKA PAHANG TERENGGANU SELANGOR

APPENDIX 2B

ORGANISATIONAL CHART LAND AND DISTRICT OFFICE,
KOTA BHARU, KELANTAN



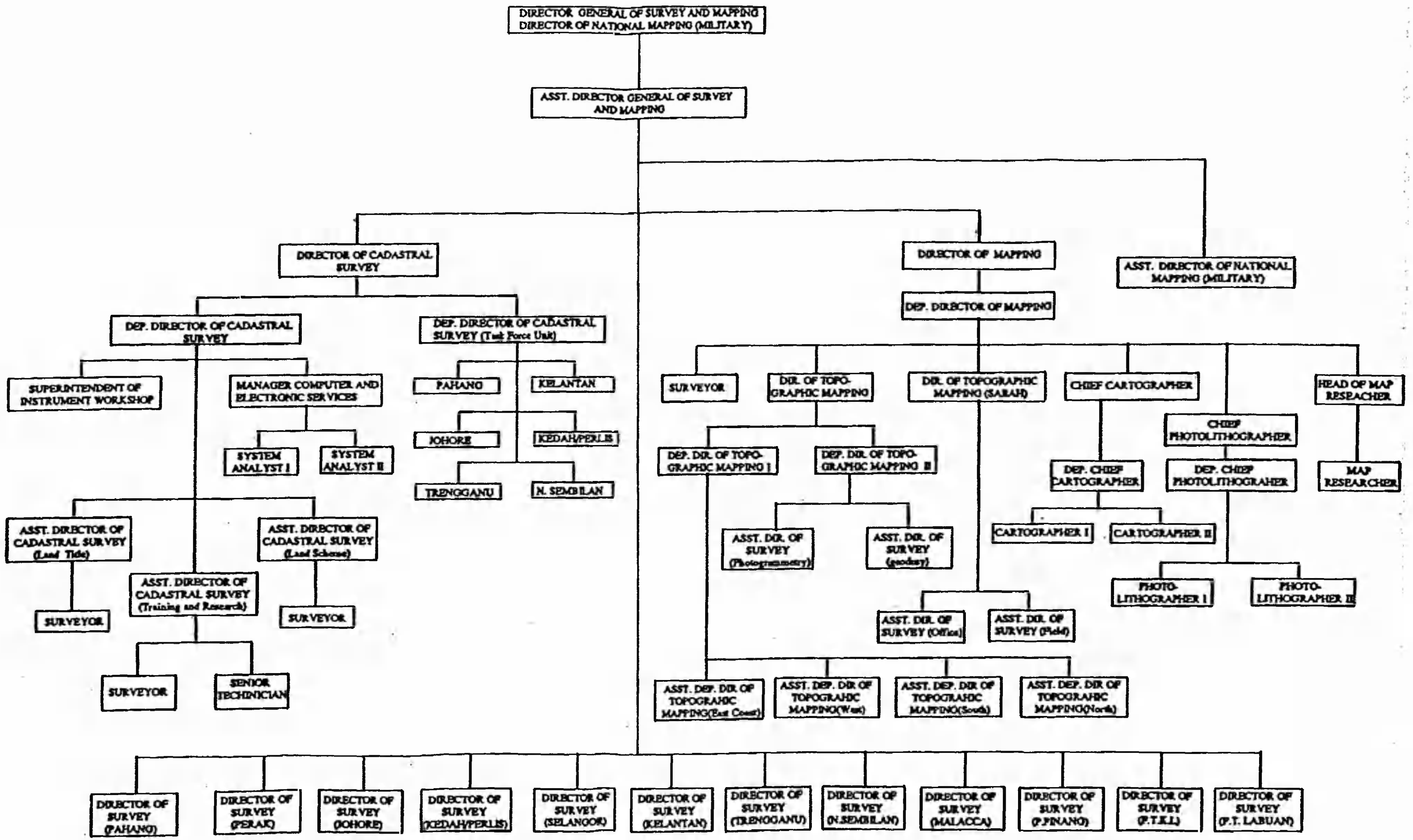
APPENDIX 2C

Table 2.1. Number of District and Land Offices (including Land Offices at Sub-District) in Malaysia as at the end of July, 1987.

State	No. of District Offices	No. of Land Offices (including Land office at Sub-District	Approx. no. of Titles
Perlis	1	1	48,000
Kedah	11	11	346,400
Penang	5	5	185,300
Perak	9	17	612,970
Selangor	9	9	300,000
Negri Sembilan	7	7	247,000
Malacca	3	3	155,000
Johor	8	13	594,000
Pahang	10	10	240,640
Trengganu	7	7	251,740
Kelantan	9	10	546,340
Fed. Territory			
a) Kuala Lumpur	1	1	160,000
b) Labuan	1	1	18,000
Sabah	19	23	200,570
Sarawak	27	9	311,470

APPENDIX 2D

ORGANISATIONAL CHART - DEPARTMENT OF SURVEY AND MAPPING MALAYSIA



APPENDIX 2E

ORGANISATIONAL CHART OF CADASTRAL DIVISION
SURVEY DEPARTMENT MALAYSIA

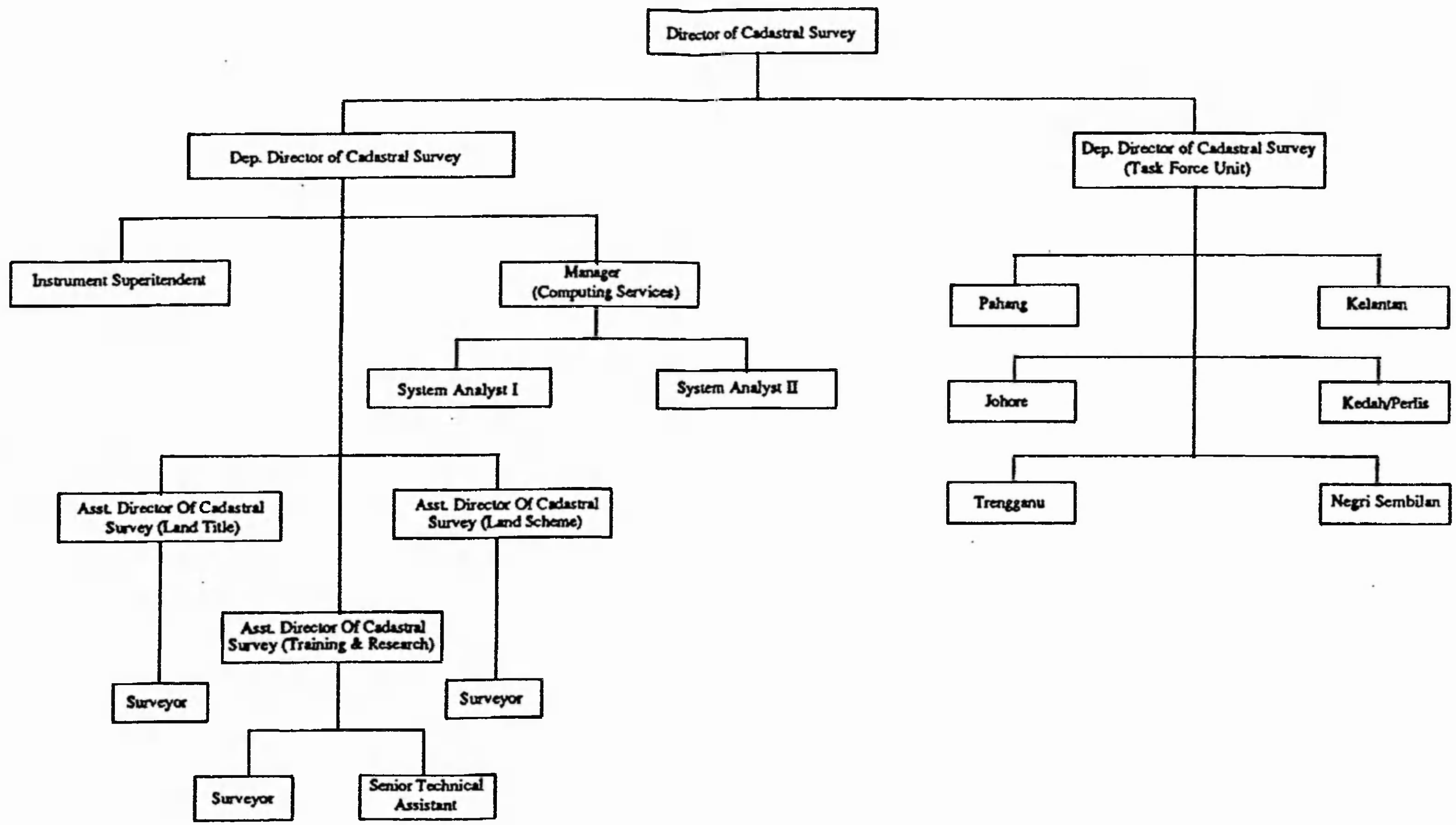


Table 2.2. Cadastral survey procedures and the various offices involved in the Malaysian cadastral machinery.

STAGE	OFFICE		ACTION
1.	LAND OWNER		Requisition for Survey (R.S.) at the Land Office.
2.	LAND OFFICE (Registration & General Administrative Divisions)	a)	Transaction occurs. R.S. is prepared and sent to Survey Dept. Transactions involved at Land Office: alienation, subdivision, partition, amalgamation, partial land surrender, partial land acquisition, etc.
3.	LAND OFFICE (Registration, Administrative and Land Revenue Sections)	b)	Title actions. Settlement, place markers, issue Land Office No., collect survey fees, set land rent, terms of possession, conditions and restrictions.
4.	CADASTRAL SURVEY OFFICE (Registration (Section)	a)	Register and open file. Examination and registration of the R.S. received from the Land Office.
5.	CADASTRAL SURVEY OFFICE (Field Tracing Section)	b)	Preparation of instruction for survey. Preparation of field diagrams and tracings, instruction for surveys to field surveyors and other information e.g. owner of adjacent land lots, bearings and distances, size of land, land use, etc.

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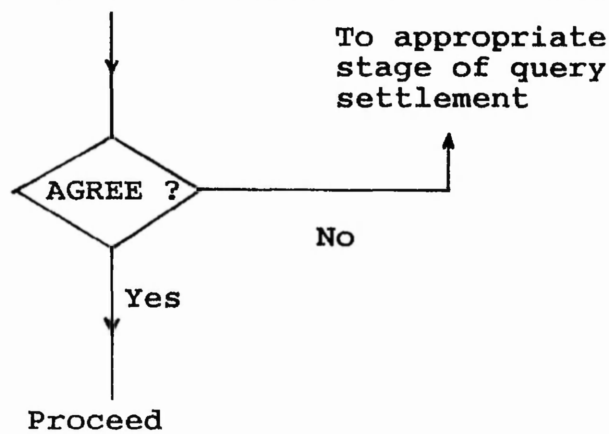
STAGE	OFFICE	ACTION
6.	CADASTRAL SURVEY OFFICE (District Survey Office)	c) Field officers. Execution of survey in the field, boundaries determined and demarcated, and survey data recorded in field book by field surveyors.
7.	CADASTRAL SURVEY OFFICE (Computing Section)	d) Computation and checking. Computation and checking of all field notes and computation of survey data (area and coordinates).
8.	CADASTRAL SURVEY OFFICE (Drafting Section)	e) Drafting. Drawing of plan and settlement tracings. Sent to Director of Survey for approval and certified. Send copies to Land Office for endorsement and approval.
9.	LAND OFFICE (Surveying and Technical Section)	Show parcel to land owner. (Settlement work)
10.	LAND OWNER	

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STAGE	OFFICE	ACTION
11.	LAND OFFICE (Administrative Division and Registration Section)	Endorsement and approval of settlement work and send back to Cadastral Survey Office.
12.	CADASTRAL SURVEY OFFICE (Drafting Section)	Prepare certified plan for issue to Land Office. Updating the cadastral sheets (Standard Sheets) and Registers.
13.	CADASTRAL SURVEY OFFICE (Registration Section)	Despatch titles and R.S. to Land Office.
14.	LAND OFFICE (Registration Section and Administrative Division	To surrender title to land owner. To record in the Register of of document of title.

APPENDIX 3A

Table 3.1. Annual progress of cadastral (title) surveys carried out by the states Survey Department in Malaysia and the amount of cadastral survey backlog (1953 - 1988)

Year	New Jobs Received in in the year (lot)	Work Completed in the year (lot)	Backlog (Remaining jobs to be completed) (lot)
1953	31,704	16,392	148,196
1954	39,745	23,197	163,924
1955	44,259	24,114	183,870
1956	52,672	33,567	203,046
1957	57,785	46,783	214,864
1958	59,664	49,688	224,831
1959	65,119	49,330	238,038
1960	69,492	43,485	265,118
1961	53,816	39,522	284,626
1962	54,155	35,052	286,735
1963	66,714	31,941	321,685
1964	53,641	44,497	322,451
1965	60,483	39,480	346,118
1966	57,347	39,530	316,108
1967	54,204	39,573	286,087
1968	65,306	39,545	295,752
1969	50,984	36,531	296,160
1970	57,728	37,411	313,478
1971	59,753	43,468	320,907
1972	49,156	52,937	316,389
1973	47,062	49,055	284,066
1974	41,590	38,543	287,188
1975	33,853	28,831	293,649
1976	40,718	34,183	296,468
1977	34,431	34,999	292,506
1978	35,608	34,999	283,347
1979	44,067	36,585	290,111
1980	36,392	41,783	281,194

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Year	New Jobs Received in in the year (lot)	Work Completed in the year (lot)	Backlog (Remaining jobs to be completed) (lot)
1981	57,877	47,908	281,539
1982	52,051	62,485	261,701
1983	45,740	70,551	231,383
1984	50,703	71,177	207,093
1985	52,094	62,019	192,661
1986	55,551	60,752	182,039
1987	61,873	62,320	176,775
1988	56,915	60,957	175,687

(Source: Annual Report (1953-1988), Survey Department Headquaters, Kuala Lumpur,Malaysia.)

Table 3.2. Progress of cadastral survey work carried out by Licensed Land Surveyors practicing in the state of Kelantan from 1960 - 1987.

Year	No. of jobs (lots)	Work completed (lots)	Annual progress (percentage %)
1960	81	81	100
1961	255	255	100
1962	482	482	100
1963	450	450	100
1964	106	106	100
1965	176	176	100
1966	122	122	100
1967	231	231	100
1968	370	370	100
1969	595	595	100
1970	484	484	100
1971	158	158	100
1972	264	264	100
1973	525	525	100
1974	1397	1395	99.9
1975	893	893	100
1976	558	551	98.7
1977	1055	1034	98.0
1978	1632	1573	96.4
1979	1831	1663	90.8
1980	2360	2340	99.2
1981	2779	2478	89.2
1982	2222	2135	96.1
1983	3035	2219	73.1
1984	5051	2772	54.9
1985	4105	2578	62.8
1986	2375	206	8.7
1987	1606	n.a.	-

(Source: Land Office, Kota Bharu, Kelantan, 1.3.1988)

Table 3.3. Quarterly progress report, 1987 - cadastral survey work carried out by licensed land surveyors practicing in Kelantan still under query.

Licensed Land Surveyor	Period (1987)	Number of query (lots)							
		Less than 28 days	28 days- 6 mths	6 mths- 12 mths	1 yr - 2 yrs	2 yrs - 3 yrs	3 yrs - 4 yrs	4 yrs - 5 yrs	More then 5 yrs	Total (lots)
Surveyor A	Jan-March	-	18	19	21	-	-	-	-	58
	Apr-June	-	55	19	21	-	-	-	-	95
	July-Sept	-	17	18	33	7	-	-	-	75
	Oct-Dec	-	98	30	18	33	7	-	-	188
Surveyor B	Jan-March	-	137	-	102	10	4	-	-	253
	Apr-June	-	-	-	102	10	4	-	-	116
	July-Sept	-	-	-	4	88	2	4	-	98
	Oct-Dec	-	10	-	-	4	88	24	-	126
Surveyor C	Jan-March	-	-	4	2	10	-	-	-	16
	Apr-June	-	-	4	2	10	-	-	-	16
	July-Sept	-	-	-	6	10	-	-	-	16
	Oct-Dec	24	-	-	-	12	-	-	-	36
Surveyor D	Jan-March	-	2	-	-	-	-	-	-	2
	Apr-June	-	26	-	-	-	-	-	-	26
	July-Sept	30	-	-	-	-	-	-	-	30
	Oct-Dec	-	19	-	-	-	-	-	-	19
Surveyor E	Jan-March	-	-	-	2	-	17	7	27	53
	Apr-June	-	-	-	-	-	17	7	27	51
	July-Sept	-	-	-	-	-	17	7	27	51
	Oct-Dec	5	-	-	-	-	17	7	27	56

(Source: Land Office, Kota Bharu, Kelantan, March 1988)

Table 3.4. The amount of backlog at the Computing Section of the Survey Department (including the checking and examination of Licensed Land Surveyor's work for the year 1976 - 1986.

Year	No. of backlog at the end of the year (lot)	No. of jobs received in the year (lot)	Work completed in the year (lot)
1976	34,002	13,965	11,978
1977	34,097	14,041	12,079
1978	43,271	16,147	14,021
1979	52,403	25,459	15,633
1980	61,551	34,749	24,400
1981	58,576	26,512	28,608
1982	64,563	37,134	35,978
1983	58,235	42,115	49,426
1984	65,669	60,160	49,088
1985	78,197	75,491	33,579
1986	90,693	90,802	35,051

(Source: Annual Report (1976 - 1986),Survey Department, Malaysia.)

Table 3.5. Annual progress of preparation of certified plan and the number of backlog at the Survey Department, Malaysia for the year 1975 - 1987.

Year	Annual Progress (lot)	New Jobs Received in the year (lot)	Backlog at end of year (lot)
1975	33,927	19,897	8,295
1976	33,898	18,901	8,012
1977	36,065	13,803	8,689
1978	33,948	34,337	9,671
1979	41,256	43,161	18,565
1980	48,647	46,536	15,493
1981	47,321	46,358	14,433
1982	53,532	59,119	14,431
1983	69,146	61,978	15,988
1984	61,479	64,974	18,565
1985	46,921	67,411	27,526
1986	46,378	69,903	35,403
1987	46,009	72,437	43,259

(Source: Annual Report (1975 - 1987), Survey Department, Malaysia)

Table 3.6. Lot numbers issued to licensed land surveyors practicing in Kelantan but certified plans not submitted to Survey Department - as at 31.12.1986.

Surveyor	Year															Total		
	1973	1974	1975	1976-1977	1978		1979		1980	1981	1982	1983	1984	1985	1986			
	B	B	B		A	B	A	B	A	A	A	A	A	A	A	A	B	A+B
Dato' Ayub b. Saud [Syarikat Jurukur Ayub b. Saud]	2	-	89	-	-	32	-	-	2	-	-	4	3	23	51	83	123	206
Toh Eng Hu [Jurukur Maju]	-	-	-	-	-	-	-	-	-	-	-	-	275	19	108	402	-	402
Tan Gaik Leong [Jurukur Berjasa]	-	-	-	-	-	-	-	-	-	3	39	741	525	593	289	2190	-	2190
Raja Mohamad Raja Harun [Jurukur Malaysia]	2	-	-	-	-	-	-	-	-	-	-	94	30	-	220	344	2	346
Hj. Nordin Sabran [Jurukur Perunding]	-	-	-	-	-	-	-	-	-	-	-	29	11	28	13	81	-	81
Hj. Jalil b. Yunus [Jurukur Yakin]	-	-	-	-	8	-	7	-	-	-	-	5	-	-	10	30	-	30
Hamzah Salleh [Jurukur Perintis]	-	-	-	-	-	-	-	-	-	-	-	18	46+(3)	13	134	211(3)	-	211(3)
Poh Sin Bin [Jurukur Amanah]	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	14
Bertie Everet Fernandez [Jurukur Timur]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nik Hisham Nik Mansor [Jurukur Nik Hisham & Tong]	-	-	-	-	-	-	-	-	-	-	-	3	-	30	351	384	-	384
Haji Abdullah Taha [Jurukur Setia]	-	-	-	-	-	-	-	-	-	-	-	-	57	37	139	233	-	233
Ng Ah Sang [Jurukur Bumiraya]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	7	-	7
Yap Sze Pin [Jurukur Yap Sze Pin]	-	-	-	-	-	-	-	-	(4)	-	-	-	-	-	-	(4)	-	(4)

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Surveyor	Year																	
	1973	1974	1975	1976-1977	1978		1979		1980	1981	1982	1983	1984	1985	1988	Total		
	B	B	B		A	B	A	B	A	A	A	A	A	A	A	A	B	A+B
Fuad Salleh [Jurukur Fuad dan Rakan-Rakan]	-	-	-	-	-	-	-	-	-	89	2	-	-	4	48	52	-	52
Mokhtaruddin Wan Yusof [Jurukur Permata]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	3
Lim Fong [United Survey]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	2
Md. Hussin Ismail [Jurukur Teguh]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	2
Dato' Paul Foo [Jurukur Pusat]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	18	-	89	-	8	32	7	-	2+(4)	82	41	894	947	747	1377	4115(7)	149	4254(7)

Note:-
[ ] Name of survey company
( ) Number of survey blocks (for perimeter survey) where lot numbers are not supplied by Survey Department
A Jobs obtained through the Board of Licensed Land Surveyors Malaysia
B Jobs not obtained through the Board of Licensed Land Surveyors Malaysia

(Source: Survey Department, Kota Bharu, Kelantan, March, 1988)

Table 3.7. Average time taken to finalise five different types of land applications.

Types of land application	Average time taken by various organisations			
	Land Office (days) (a)	Other Depts. (days) (b)	State Director of Lands and/or Exec Com. (days) (c)	Total time taken for approval (days) (d)
State Land	167	375	22	564
Change of conditions	170	86	45	301
Prospecting permit	256	99	74	429
Mining lease	123	82	65	270
Renewal of mining lease	143	117	84	344
Total time taken by (a), (b) and (c)	859	759	290	1,908
Average time taken by (a), (b) and (c)	172	152	58	382
In terms of percentage	45	40	15	100

(Source: **Kamarudin Rani**, 1973, *Land Administration in Peninsular Malaysia*, Seminar, Pentadbiran Tanah Negara Semenanjung Malaysia Ke-2, Jabatan Pentadbiran Tanah Negara, Malaysia, pp 18).

Table 3.8. Number of document of title not finalised at Land Offices throughout Malaysia from 1955 to 1981.

Year	No. of backlog at year end (lot)
1955	183,870
1956	203,046
1957	214,864
1958	224,831
1959	238,038
1960	265,118
1961	284,626
1962	286,735
1963	321,685
1964	322,451
1965	346,118
1966	356,458
1967	366,827
1968	401,030
1969	404,469
1970	422,086
1971	437,484
1972	447,248
1973	423,191
1974	438,234
1975	446,961
1976	441,544
1977	466,441
1978	422,752
1979	433,904
1980	439,107
1981	444,262

(Source: Annual Reports (1955-1981), Survey Department, Malaysia.)

APPENDIX 31

Table 3.9. Progress of Requisition for Surveys (R.S.) at Land Offices throughout Malaysia from 1955 to 1981.

Year	No. of R.S. finalised by Land Office and forwarded to Survey Department i.e. progress (lot)	No. of R.S. not finalised by Land Office i.e. backlog (lot)
1955	24,114	89,797
1956	33,567	89,536
1957	46,783	87,155
1958	49,688	90,148
1959	49,330	83,045
1960	43,485	88,100
1961	39,522	88,039
1962	35,025	79,124
1963	31,941	82,182
1964	44,497	76,194
1965	39,480	83,556
1966	39,379	97,200
1967	39,167	110,740
1968	45,984	105,278
1969	38,842	108,309
1970	38,901	108,608
1971	37,901	116,577
1972	42,767	130,859
1973	42,959	139,046
1974	32,448	151,046
1975	27,329	153,312
1976	43,843	145,046
1977	32,333	142,346
1978	32,525	140,129
1979	33,204	143,793
1980	33,352	153,301
1981	33,454	162,669

(Source: Annual Reports (1955-1981), Survey Department, Malaysia.)

APPENDIX 4A

Table 4.1. Annual title survey backlog (lots) at State level (1986 - 1988).

State	1986	1987	1988
Johor	30,783	23,413	17,512
Kedah/Perlis	24,635	26,954	28,037
Kelantan	26,879	20,772	17,575
Malacca	1,912	2,033	3,618
N. Sembilan	18,639	20,342	21,669
Pahang	33,217	30,898	32,011
Perak	16,069	18,233	19,899
P. Pinang	1,447	3,157	2,621
Selangor	6,873	11,389	13,995
Trengganu	19,193	18,601	17,715
K. Lumpur	1,530	757	550
Labuan	862	226	485
Total	182,039	176,775	175,687

(Source: Annual Reports, 1986-1988, Department of Survey and Mapping, Kuala Lumpur)

Table 4.3. Overhead costs of Cadastral Survey (PUKN 105 - 82) - Land Scheme Survey, Kelantan.

Particulars - Survey Department File No: PUKN 105 - 82
Land Office File No: KPT 7/11/52
Type of survey: 125B (Land scheme survey, Kelantan)
Mukim: Jeli Tepi Sungai
Relief: Hilly
Area: 81 Hectares
No. of lots: 45

Type of activity	Time taken (days)	Cost per day M$	Total cost M$
1.Field tracings			
a) preparation	2.3	56.92	130.92
b) checking	0.8	56.92	45.54
2. Field work			
First visit	18.25	380.65	6946.86
3. Computation - 1st	10.0	56.88	568.80
- 2nd	2.0	56.88	113.76
4. Clerical	2.0	56.88	113.76
		Sub-total	M$ 7919.64

Note: The work was submitted to the office and was later found out to have some queries and thus a re-survey was required.

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......contd (Table 4.3.)

Type of activity	Time taken (days)	Cost per day M$	Total cost M$
5. Field work			
Second visit	35.75	405.25	14487.69
6. Computation - 3rd	2.0	56.88	113.76
- 4th	2.0	56.88	113.76
7. Drafting - prep.	16.0	56.88	910.08
- check	5.7	56.88	324.22
		Sub-total	M$ 16006.39

Total overhead costs of carrying out such a survey (in Malaysian Ringgit) = M$ 7,919.64 + 16,006.39

= M$ 23,926.03

Table 4.4. Overhead costs of Cadastral Survey (PUKN 221 - 82) - Land Scheme Survey, Kelantan.

Particulars - Survey Department File No: PUKN 221 - 82
Land Office File No: KPT 7/12/21
Type of survey: 125B (Land scheme survey, Kelantan)
Mukim: Jedok, Tanah Merah
Relief: Undulating and hilly
Area: 39 hectares
No. of lots: 19

Type of activity	Time taken (hrs)	Cost per hr M$	Total cost M$
1. Field tracings			
a) preparation	16.0	11.12	177.92
b) checking	5.5	11.12	61.16
2. Field work -			
First visit	28 days	360.03/day	10080.84
3. Computation - 1st	23.0	8.73	200.79
- 2nd	12.75	8.73	111.31
4. Clerical	2.5 days	53.82/day	134.55
5. Drafting - prep	7 days	56.88/day	396.16
- check	3 days	56.92/day	170.76
		Sub-total	M$ 11335.49

Note: The work was submitted to the office and later found out to have some queries and thus a re-survey was made.

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......contd (Table 4.4.)

Type of activity	Time taken (hrs)	Cost per hr M$	Total cost M$
6. Field work			
Second visit	6.5 days	380.66/day	2474.29
7. Computation - 3rd	3 days	56.92/day	170.76
- 4th	0.5 day	56.88/day	28.44
8. Drafting			
(for query work)	4 days	53.82/day	215.28
preparation -	6 days	53.82/day	322.92
check -	5.5 days	53.82/day	296.01
9. Checking - 1st	11.5	8.73	100.40
- 2nd	3 days	56.92/day	170.76
10. Clerical	1.5 days	56.88/day	85.32
		Sub-total	M$ 3864.18

Total overhead costs of carrying out such a survey (in Malaysian Ringgit) = M$ 11,335.49 + 3,864.18

= M$ 15,199.67

Table 4.5. Overhead costs of Cadastral Survey (PUKN 218 - 82) - Land Scheme Survey, Kelantan.

Particulars - Survey Department File No: PUKN 218 - 82
Land Office File No: 7/12/18
Type of survey: 125B (Land scheme survey, Kelantan)
Mukim: Jedok, Tanah Merah
Relief: Undulating and hilly
Area: 56 hectares
No. of lots: 37

Type of activity	Time taken (days)	Cost per day M$	Total cost M$
1. Field tracings			
a) preparation	11.5 hrs	8.73/hr	100.40
b) checking	4.0 hrs	8.73/hr	34.92
2. Field work -			
First visit	17 days	380.66/day	6471.22
3. Computation - 1st	15 days	56.92/day	853.80
- 2nd	3 days	56.92/day	170.76
4. Clerical	3 days	56.88/day	170.76
5. Drafting - prep	11 days	56.92/day	626.12
- check	3 days	56.92/day	170.76
		Sub-total	M$ 8598.74

Note: After the work was submitted to the office and all the checking and plan drawing were carried out, the survey was found to be in error and a re-survey was made.

contd......

......contd (Table 4.5.)

Type of activity		Time taken (days)	Cost per day M$	Total cost M$
6. Field work				
Second visit		2 days	383.01/day	766.02
7. Computation	- 3rd	2.7 days	56.92/day	153.68
	- 4th	2.0 days	56.88/day	113.76
	- 5th	1.5 days	57.49/day	86.24
8. Drafting				
(for query work)		4 days	53.82/day	215.28
9. Clerical		1.5 days	56.88/day	85.32
		Sub-total	M$	1420.30

Total overhead costs of carrying out such a survey (in Malaysian Ringgit) = M$ 8,598.74 + 1,420.30

Table 5.1. Configuration of IBM 1130

Description	Capacities	No. of Units	Price M$
1131 CPU	8K Words (16 Bytes)	1	n.a.
2310 Disk storage	1M words	1	144,082
1133 Multiplexer control		1	92,446
1403 Line printer	340 lpm	1	89,320
1442 Card read punch	300 cpm	1	48,433
083 Card sorter		1	24,178
029 Card punch		10	115,500
059 Card verifier		10	116,570
Total			M$ 630,529

Table 5.2. Configuration of EAI PACER 100

Description	Capacities	No. of Units	Price M$
CPU	16K Words	1	
PERTEC 7820-9 mag. tape controller and drive	600 ft/800 bpi	1	
ASR 35 System teletype		1	
430/200 On-line flat-bed plotter with acc.	size 54" x 76"	1	
Cost of above items inclusive			308,027
SR300 Card reader	300 cpm	1	17,100
Gradicon Digitizer with mag. tape output		1	58,824
Interfaces & Misc. Acc.			29,010
Total			M$412,961

Table 5.3. Configuration of EAI Pacer 100 (Upgraded 1975)

Description	Capacities	No. of Units	Price M$
PERTEC 7820-9			
Mag.tape drive	600 ft/800 bpi	1	
430/200 off-line	size	1	
flatbed plotter with	54" x 76"		
accessories			
Cost of the above items			288,750
Additional 16K memory	16K words	1	62,980
1272 Twin disk drive	4.4M bytes	1	86,130
Tektronix 4010/EAI	35 lines x	1	53,760
graphic display ter.	72 char.		
Tektronix 4010-1/EAI	18 sec/copy	1	21,320
1421 hard copy unit			
1611 Line printer	1100 lpm	1	86,680
Interfaces & misc.			
accessories			8,590
Total			M$608,210

Table 5.4. Configuration of EAI PACER 100 (Upgraded 1981)

Description	Capacities	No. of Units	Price M$
1508 Card reader	1000 cpm	1	61,500
Alphanumeric display		1	24,000
terminal			
Total			M$85,500

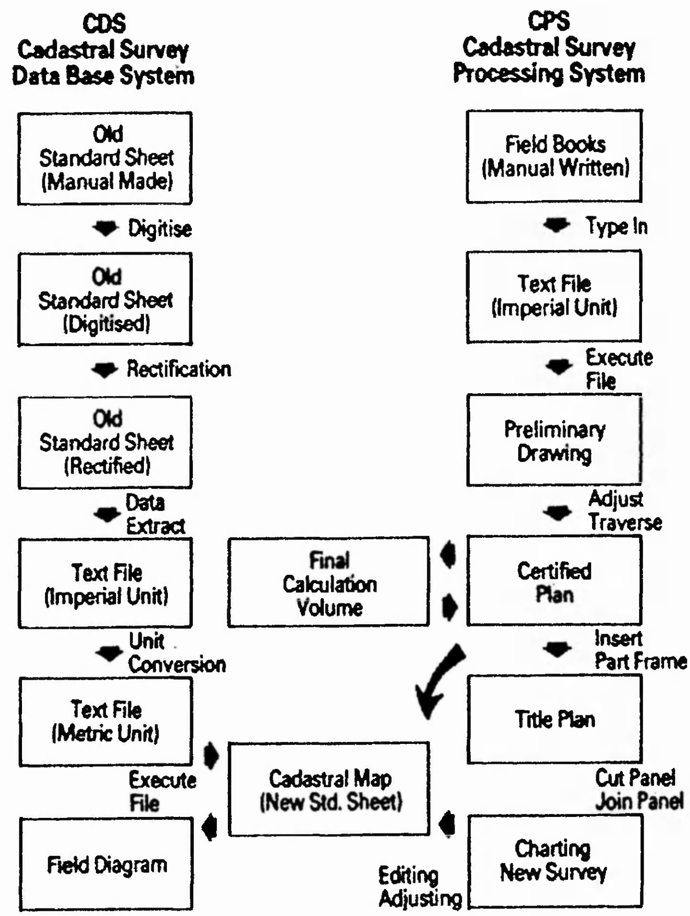

Figure 5.1. Workflow of CDS and CPS

(Source: Abdul Majid Mohamed, 1985, *Proposed LIS in the Malaysian Context*, The Surveyor, Vol.20, No.1, pp 30)

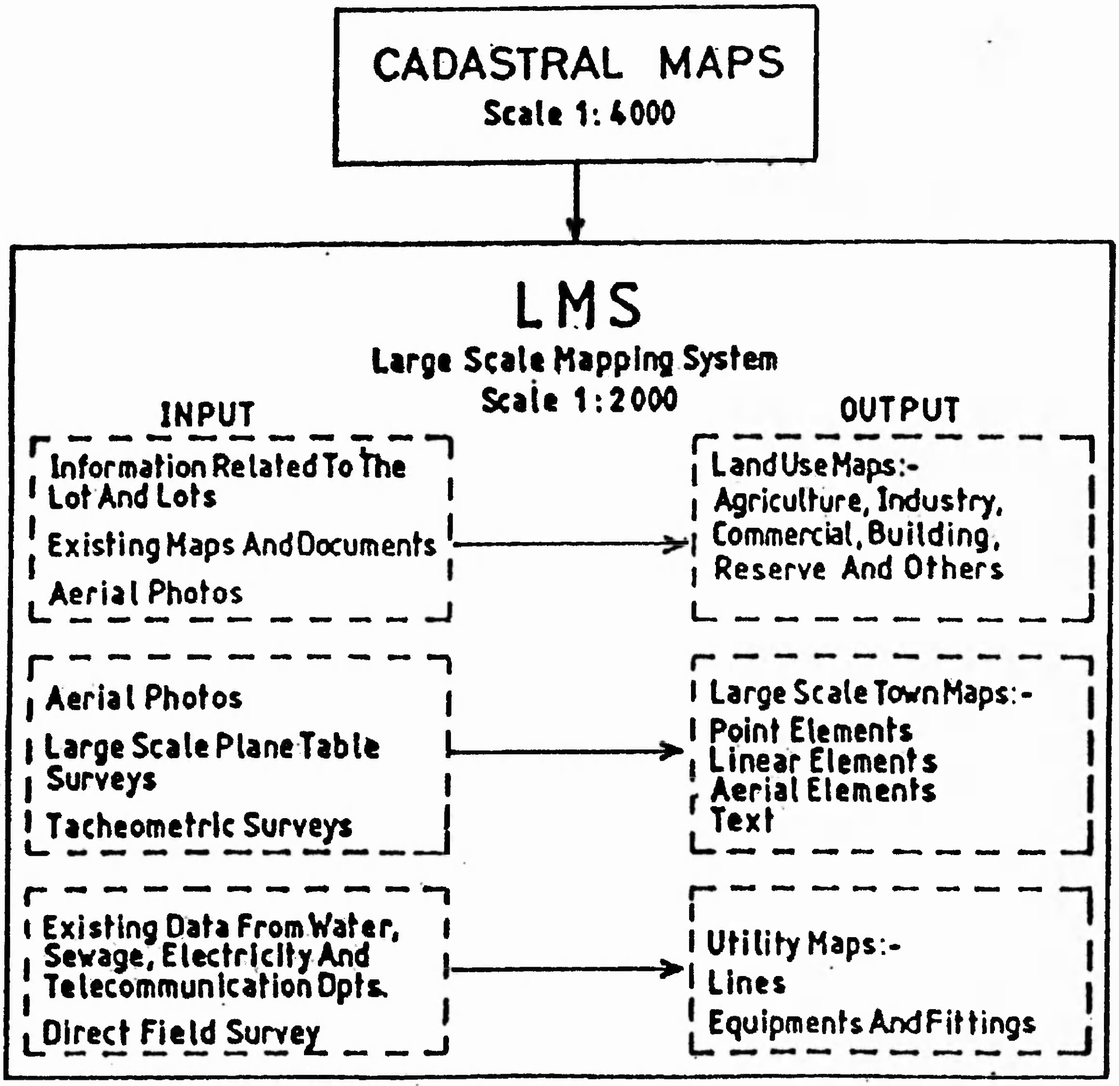

Figure 5.2. Workflow of LMS

(Source: Dept. of Survey and Mapping, Kuala Lumpur, May 1986)

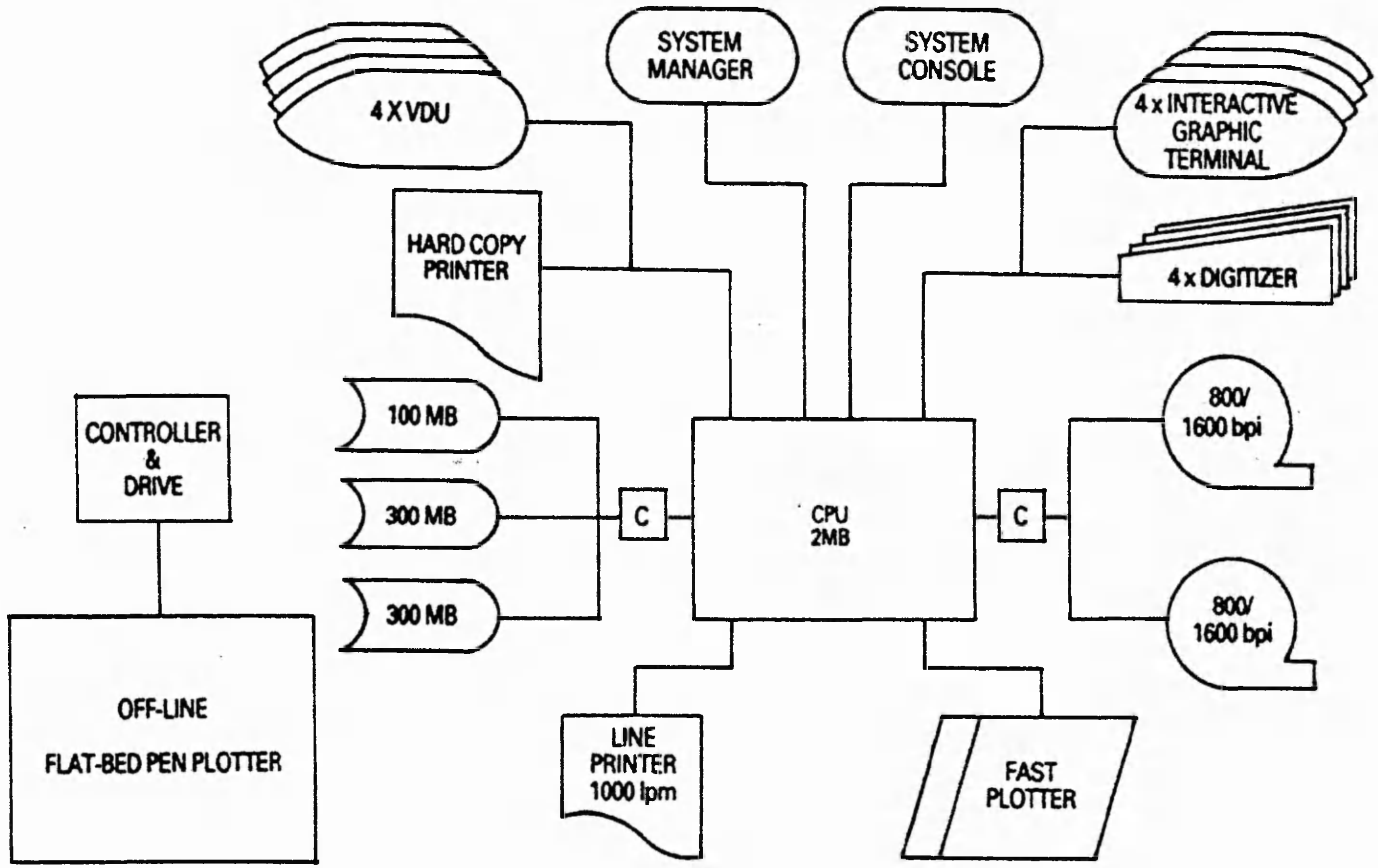

Figure 5.4. CALS Configuration at the Johore State Survey Dept.

(Source: Dept. of Survey and Mapping, Kuala Lumpur, May 1986)

APPENDIX 5E

List of Government Departments and Statutory Bodies which form the main users of land-related data and can be involved directly towards the formation of the Malaysian Land Information System (LIS).

FEDERAL GOVERNMENT DEPARTMENTS

1. Department of Survey and Mapping
2. Federal Lands Department
3. Town and Country Planning Department
4. Economics Planning Unit, Prime Minister's Dept.
5. Lands and Mines Department
6. Engineering Corp, Royal Army
7. Department of Geological Survey
8. Department of Mines
9. Department of Forestry
10. Ministry of Science
11. Department of Agriculture
12. Department of Valuation
13. Police Department
14. Health Department
15. Public Works Department (PWD)
16. Department of Irrigation and Drainage (DID)
17. Malaysian Highway Board
18. Telecommunication Department (TELEKOM)
19. National Electricity Board (NEB)
20. Urban Development Authority (UDA)

STATUTORY BODIES

21. Federal Land Development Authority (FELDA)
22. MUDA Agriculture Development Authority (MADA)
23. Kemubu Agriculture Development Authority (KADA)
24. Federal Land Consolidation and Rehabilitation Authority (FELCRA)
25. Malaysian Agriculture Research Development Institute (MARDI)
26. Rubber Industry Smallholders' Development Authority (RISDA)
27. Federal Agriculture Marketing Authority (FAMA)
28. Petroleum Nasional (PETRONAS)

STATE ECONOMIC DEVELOPMENT CORPORATIONS AND STATE AUTHORITIES

29. Johor Tengah Development Authority (KEJORA)
30. Kelantan Selatan Development Authority (KESEDAR)
31. Trengganu Tengah Development Authority (KETENGAH)
32. Kedah Development Authority (KEDA)

33. Pulau Pinang Regional Development Authority (PERDA)
34. Pahang Tenggara Development Authority (DARA)
35. Jengka Development Board (JENGKA)
36. City Hall, Kuala Lumpur
37. Sabah Chief Minister's Office
38. Sarawak Chief Minister's Office

EDUCATIONAL INSTITUTIONS

39. Research Centre, Universiti Sains Malaysia (USM)
40. Research Centre, Universiti Kebangsaan Malaysia (UKM)
41. Research Centre, Universiti Malaya (UM)
42. Research Centre, Universiti Islam Antarabangsa (UIA)
43. Research Centre, Universiti Utara Malaysia (UUM)
44. Research Centre, Universiti Teknologi Malaysia (UTM)
45. Research Centre, Institut Teknologi MARA (ITM)

OTHERS

46. Institution of Surveyors Malaysia (ISM)
47. Private survey companies
48. Engineering and Construction companies.

Cost breakdown of 3 survey jobs using manual booking.

(Reproduced by kind permission of the Chief Engineer, Planning and Transportation Division, Nottingham County Council)

18 Sheet Survey - Manual Booking

			£
SURVEY			
Surveyor (£11,300 p.a.)	6½ hrs.	x 17.15 =	111.48
Booker (£7,200 p.a.)	6½ hrs.	x 10.93 =	71.05
Chainman (£7,200 p.a.)	6½ hrs.	x 10.93	71.05
			£ 253.58
Preparation			
Surveyor	½ hr.	x 17.15	8.58
Punching			
Job Scheduler (£6,000 p.a.)	4 hrs.	x 9.11 =	36.44
Running & Plot			
Surveyor	1½	x 17.15 =	25.73
Check Plot & Re-run			
Surveyor	1½	x 17.15	25.73
	27 man hours		350.06

12 Sheet Survey - Manual Booking

			£
SURVEY			
Surveyor	6½ hrs.	x 17.15 =	111.48
Chainman	6½ hrs.	x 10.93	71.05
			182.53
Preparation & Punching	½ x 17.15 + 3x9.11 hrs.		35.91
Running & Plot	1½ hrs.	x 17.15 =	25.73
Checking & Re-run	1½ hrs.	x 17.15 =	25.73
	20.5 man hours		£ 269.90

Waste Disposal Survey - Manual Booking

				£
Survey	Surveyor (9,500 p.a.)	8	x 14.42 =	115.36
	Chairman	8	x 10.93	87.44
Preparation	Surveyor	½	x 14.42	7.21
Punching	Job Scheduler	2	x 9.11	18.22
Running & Plot		1½	x 14.42	21.63
Check Plot & Re-run		1½	x 14.22	21.63
Contour & Re-run		1½	x 14.42	21.63
		23 man hours		293.12

2½ hrs. have been added to the survey field work as surveys usually consist of 1 day on a station traverse and 2 day detailing.

Cost breakdown of 3 survey jobs using data recorder and electronic theodolite.

(Reproduced by kind permission of the Chief Engineer, Planning and Transportation Division, Nottingham County Council)

18 Sheet Survey with Data Recorder & Electronic Theodolite

			£
SURVEY			
Surveyor	6½ hrs.	x 17.15 =	111.48
Chainman	6½ hrs.	x 10.93	71.05
			182.53
Preparation Running & Plot			
Down load	10 mins.	x 17.15	2.86
Data Prep. & Run Plot	½ hr.	x 17.15	8.575
	14 man hours		£193.97

Waste Disposal Survey
With Data Logger & Electronic Theodolite

			£
SURVEY			
Surveyor	5½ hrs.	x 14.42 =	79.31
Chainman	5½ hrs.	x 10.93 =	60.12
Preparation Running & Plot			
Down load	10 mins.	x 14.42 =	2.40
Data Prep. & Run Plot	½ hr.	x 14.42 =	7.21
	12 man hours		£ 149.04

Cost breakdown of 3 automated survey systems

(Reproduced by kind permission of the Chief Engineer, Planning and Transportation Division, Nottingham County Council)

NIKON DTM5 Electronic TOTAL STATION and NIKON DR1 DATA RECORDER I

Nikon DTM5 5 sec. Total Station Unit c/w battery, charger and carrying case	£8750.00
Nikon DR1 Data Recorder c/w 32K RAM cable, clip, mains unit case and software.	£1770.00
RS 232C cable	£ 98.00
Heavy duty battery	£ 272.00
Heavy duty charger	£ 210.00
BMF Tripod	£ 135.00
	£11235.00
Single Prism, Holder, Target Plate and Detail Pole	£ 475.00
	£11710.00

KERN (approximate comparison with Nikon System)

	£
E1 Electronic Theodolite, liquid crystal display angle reading to 2 sec.	6,185.00
DM 503 Distance Meter	3,995.00
Alphacord 64 Field Computer with 644 capacity and software	2,543.00
Power Supply and Charger	860.00
RS 232C cable	76.00
Detail Pole	138.00
Reflector	337.00
Tripod	213.00
	£ 14,347.00

GEODIMETER 440 and HUSKY HUNTER

Geodimeter 440, comprising:	£13,176.00	
Instrument unit Two internal batteries Charging converter Carrying case and harness Atmospheric correction disc Instruction manual Tribrach with optical plumb Battery cable Tool kit		
6Ah Battery	£	285.00
Battery charger 220V AC for charging convertor or heavy duty battery	£	55.00
Wild GST20 tripod	£	187.00
Husky Hunter complete with batteries and charger	£	956.00
Tripod Bracket (Husky)	£	95.00
Cable	£	105.00
Moss/440 Software	£	300.00

__N.B.__ If Husky Hunter is purchased from Geotronics the software will be provided f.o.c.

ACCESSORIES FOR DETAILING/SETTING OUT

Telescopic range pole, 2.5m graduated in metres and feet	£	93.00
Tiltable prism holder with target	£	96.00
Super prism	£	229.00
		£15,577.00

MODERN TRENDS IN SURVEYING

by
Wan Muhd Aminuddin Wan Hussin
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Introduction

Computer developments in electronic instruments such as data recorders, processors, plotters and interactive graphics terminals have allowed automation of many of the surveying processes. Since then, surveying procedures and techniques are re-defined to allow full advantage to be taken of new instruments being produced to provide greater automation. These changes have not only improved the existing methods of recording and processing of survey data but also provide the opportunity of automating many manual survey tasks such as adjustment, contouring and volume analysis.

More and more sophisticated surveying instruments (e.g. electronic distance measuring devices (EDM), electronic theodolites with automatic data collectors and remote transmission by telephone via satellites) and powerful tools like micro processors, graphics screens, and high density storage media are being produced whilst prices have plummeted. Computers nowadays are within the financial capabilities of even small survey companies and are now becoming standard survey equipment like theodolites and levels. Computers are gradually being used to process field data, produce fair drawings and digital ground models (DGMs) and various other tasks virtually without any human involvement.

Human attitude

Different people respond differently to changes and land surveyors are no exception. Some land surveyors have objected to changing from previous fields techniques based on field book recording and hand plotting. It is also understandable that many of the aged staff are not as supportive to the introduction of an automatic surveying approach as compared to the much younger generation. Even some engineers prefer to remain with simple cross-section design techniques rather than the new computerised concepts. Whether they like it or not, automated techniques are going to effect everyone in the surveying and mapping profession.

The traditional surveying approach is very much going to restrict future surveying practices. Great advantages in automation and accuracy can only be achieved by the adoption of new computerised concepts which form part of the natural advancement of the land surveying profession. The profession is being revolutionised by computer technology to an extent greater than many other professions and in a very short period of time.

The introduction of automated approach in Malaysia as embodied in the Computer Assisted Land Surveying Systems (CALS) and the Computer Assisted Mapping Systems (CAMS) at the Department of Survey and Mapping are going to effect everybody in the industry. Such automation will not be appreciated until both projects are in operation at full scale. Some of the staff routines will be altered in the near future but must be taken in orderly steps and phases. This approach must be adopted so that the staff can adjust to the new systems gradually in a controlled manner.

The demand for conventional map making which is based on craft skills is already decreasing. Cartographic staff will find it hard to accept that such skills are no longer an asset. Such a change will have the greatest impact on the staff and a clear picture of future trends is hardest to define.

Data handling

The techniques having by far the greatest impact on surveying are the various forms of data handling such as storage, sorting, manipulation, retrieval and display.

The way in which survey data is acquired and stored will actually influence the process of data manipulation and future handling. Whether stored in raster or vector form, survey data is voluminous (although raster maps require more data storage capacity than vector maps). A tremendous amount of money is needed for storing such volumes and the cost effectiveness of the system must be justified.

Digital mapping systems enable information to be presented in various forms; graphical (plans) or digital. The ability for the data to be manipulated, interrogated and presented in whatever way is best makes mapping at the touch of a button possible. Survey attributes such as road classification, width, condition and so on can always be included in the database.

Fast retrieval and display of maps, plans and other survey records form the essential requirements of an automated digital system. With new techniques in screen design and the relatively low cost powerful graphics workstations, the quality of graphical displays continue to improve in terms of definition and colour.

Electronic data collectors

Traditional field book has a lot of physical advantages to offer. It is light, compact, cheap, easily obtained and relatively resistant to water and other environmental factors such as humidity, extreme field temperature and sunlight. It is also resistant to other influences such as magnetic field, waves and static electricity. Above all, no maintenance is required.

For any survey work, the prime factor to be taken into account is the speed at which the field data is recorded and processed. Such speed cannot be achieved with the use of traditional field booking. However, with the advent of electronic data collectors, field booking should not be totally scrapped but used as a supplement to it.

Electronic data collection forms an integral part of a survey system that consists of the marriage of field instrument, data collector and office computer. This method of data collection is most appropriate when they are used with electronic total station and the survey data is downloaded to a computing system housed in the office (or in the back of the car) for processing and plotting. Whether that marriage works or not depends on how smoothly and efficiently the individual parts work together i.e. the flow of data measured by field instrument, to temporary storage in the data collector, and to the final and permanent storage in an office computer.

Data collectors may either be interfaced with the automatic or semi-automatic field equipment. Even without automatic equipment, they are invaluable when used as hand-held, manual input recorders.

With the earlier data collectors, only numerical data with no annotation could be recorded. The instrument was not only basic but had a very small memory capacity. Nowadays, modern data collectors have the capability to include alphanumeric characters in the form of codes (point coding), identification comments (e.g. strings) and other remarks.

Field recording using data collectors simplifies and speeds up the process of data collection and at the same time removes a primary source of error in the survey process. Many of the new versions also feature removable data storage which means that where necessary the reduction of survey observations can be carried out away from the survey site. Such storage in the form of versatile solid-state data packs can be removed and replaced by an empty one when full. One advantage is that the data collector can be kept in the field all the time and only the plug-in modules are sent to the office for processing.

Like any other automated systems, there are always advantages and disadvantages. Advantages of an electronic data collector are reduced field measurement and office computation time, standardisation of field codes, and virtually no tranposition and computation errors. Data can also be stored in a single format by using the systematic approach to measuring and data recording. By using such a standard routine, fewer mistakes are made in the field.

The main disadvantage of such a system concerns the staff. Labour force will be reduced unless an outlet for increased output is accommodated. Such a displacement will obviously cause problems but will introduce greater responsibility and higher levels of social interaction to the remaining staff.

Effect on management

Changes due to automation will certainly have an effect on the organisational and management structure of the establishment. Expertise will be needed in the fields of system design, programming and electronic maintenance. A small elite group will be created for the running of the system and also responsible for the development, implementation and modification of the system.

The most common reason for introducing modern techniques and instrumentation in surveying is to improve efficiency. Where survey process is labour intensive (although cheap), automation is more favourable. Output will be increased with less people. Things will happen more quickly and production control becomes more complex and demanding. The final product will be improved and less susceptible to errors.

Working conditions may also be improved. Computers demand a more controlled environment than is often considered necessary for human beings. With modern instrumentation and a good working environment, staff will be much more attracted to the organisation.

System implementation and consideration

It is important to have the full co-operation and understanding of the staff involved in order to achieve a successful operation of any automated system. All members of the staff (and not just the big bosses) must be convinced of the benefits and efficiency of the new system.

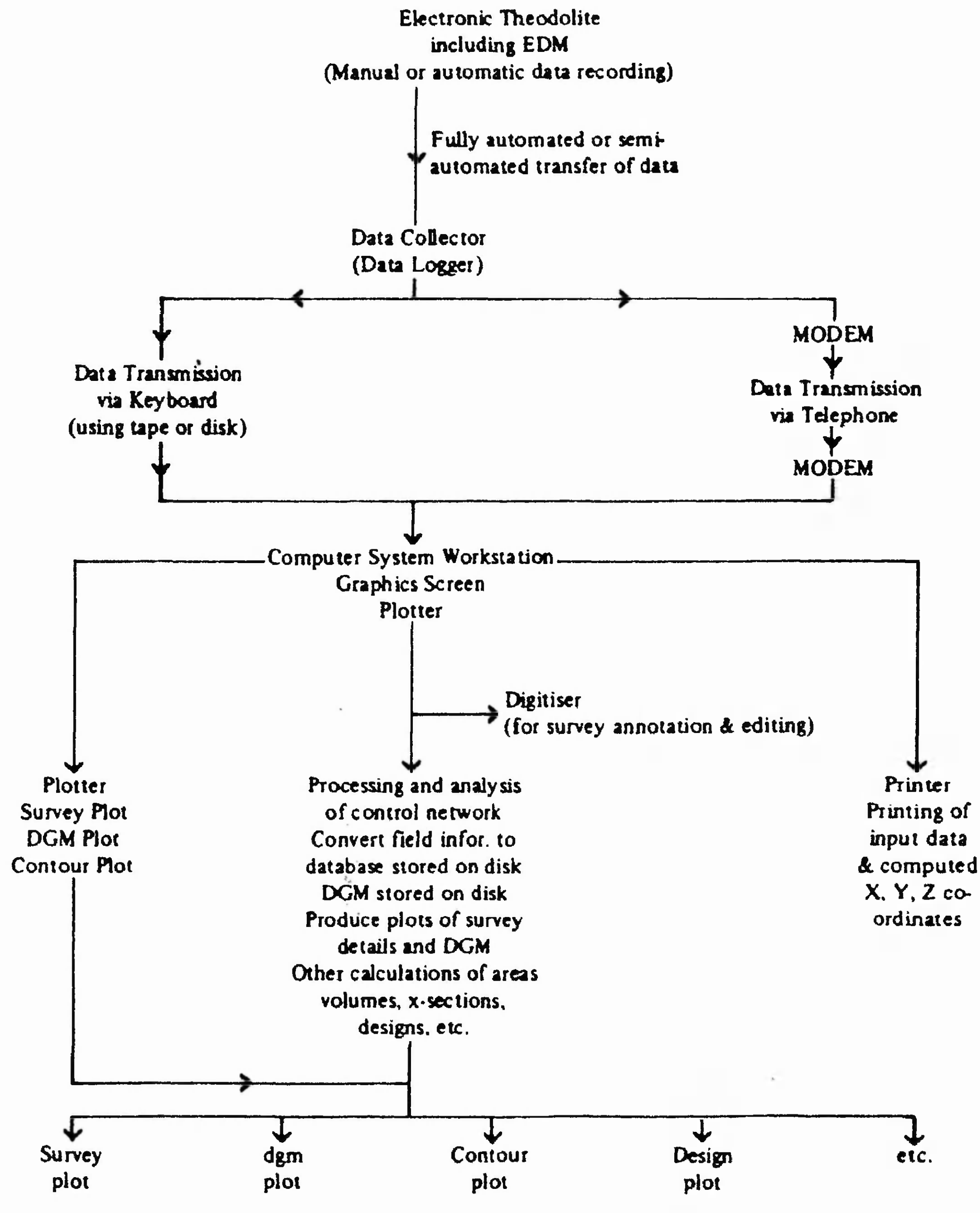
Various studies have been made on the effects of using automated instruments in surveying. Many agree that most of the survey data is of a much higher degree of accuracy. Productivity in the field and the office have improved by a factor of three over the traditional manual methods. The time taken by surveyors to carry out surveys has now become even more significant. But above all, the ability to carry out survey rapidly, to produce "instant" plan drawing, and the chance to use survey data for further analysis have been the most significant benefits of automated surveys.

Before making any decision to buy an automated survey system, it is important that there is sufficient work to justify the purchase of this expensive instrument. For example, there must be sufficient survey work to justify the acquisition of a total station. A correct system must be chosen because once committed to a particular system, it will prove very costly to switch to another. Thus, it is always advisable to approach manufacturers and suppliers, or other surveyors who may have the same system for the loan of the instrument for field trials.

One of the greatest problem is the back-up service facility. It is important to check the availability of after-sales and repair facilities, hardware and software maintenance, and the compatibality for future upgrading of the system.

The following flow diagram illustrates the application of modern technology to surveying. Data entry may either be through the keyboard or telephone from remote data collectors and then validated and edited in the normal way. Computation of co-ordinates and levels of all points are carried out from any kind of field observation such as tachy, chain and offset, EDM, etc. Traverses are calculated and adjusted using least squares (variation of co-ordinates). Grid may be plotted at any angle with anotations, and other points with (or without) codes, levels or string features may be included. Detail points may be presented in the cartesian coordinates system (X,Y,Z) and with the coding system, those points which define a specific feature (e.g. house, road, tree, hedge, etc) may be recognised. Output may either be graphical (contours, spot heights, details, title and annotations) or record (printout of original field data).

AUTOMATED SURVEY SYSTEM



Conclusion

Land surveyors must be encouraged by whatever means to use the capacity and the presence of automated instruments. Many survey jobs could be automated and the chance must be given, especially to the public sector, to actually use the available resources. The idea is not to eliminate the traditional skills and many survey methods but to make skill more productive and to do work that was previously beyond their resources.

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RECOMMENDED CROPS IN AGRO-ECOLOGICAL REGIONS
(To be used in conjunction with Appendix 6B)

Region	Suitable Crops	Marginal Crops*
1.	Rice, mango	Maize, sugar-cane
2.	Sugar-cane, cassava, durian, mango, tobacco, maize	Rubber, coffee, groundnuts
3.	Rice, durian, mango, maize coconut	Oil palm, tobacco, sweet potatoes
4.	Tobacco, maize, coffee, mango, durian	Groundnuts, rubber oil palm, rice
5.	Oil palm, coconut, coffee, mango, rice	Durian, citrus
6.	Coffee, citrus, durian	Rubber
7.	Oil palm, coconut	Rubber, banana, rice
8.	Cassava, maize, groundnuts, durian	Rubber, cocoa, oil palm
9.	Cocoa, coconut, cassava, coffee, maize, rice, oil palm	Mango, durian
10.	Rubber, oil palm	Cassava, banana, durian, cocoa
11.	Oil palm, cocoa, coconut, coffee	Sweet potatoes, durian, rice
12.	Rice, cocoa, coconut, mango, citrus, rubber, durian	Maize, groundnuts coffee
13.	Oil palm, cocoa, coconut, coffee, banana	Sweet potatoes, sago, rice
14.	Oil palm, cocoa, banana	Rubber, cassava, pepper, sweet potatoes
15.	Oil palm, cocoa, banana, pepper, rubber	Cassava, sweet potatoes, durian, papaya

contd..........

.........contd.

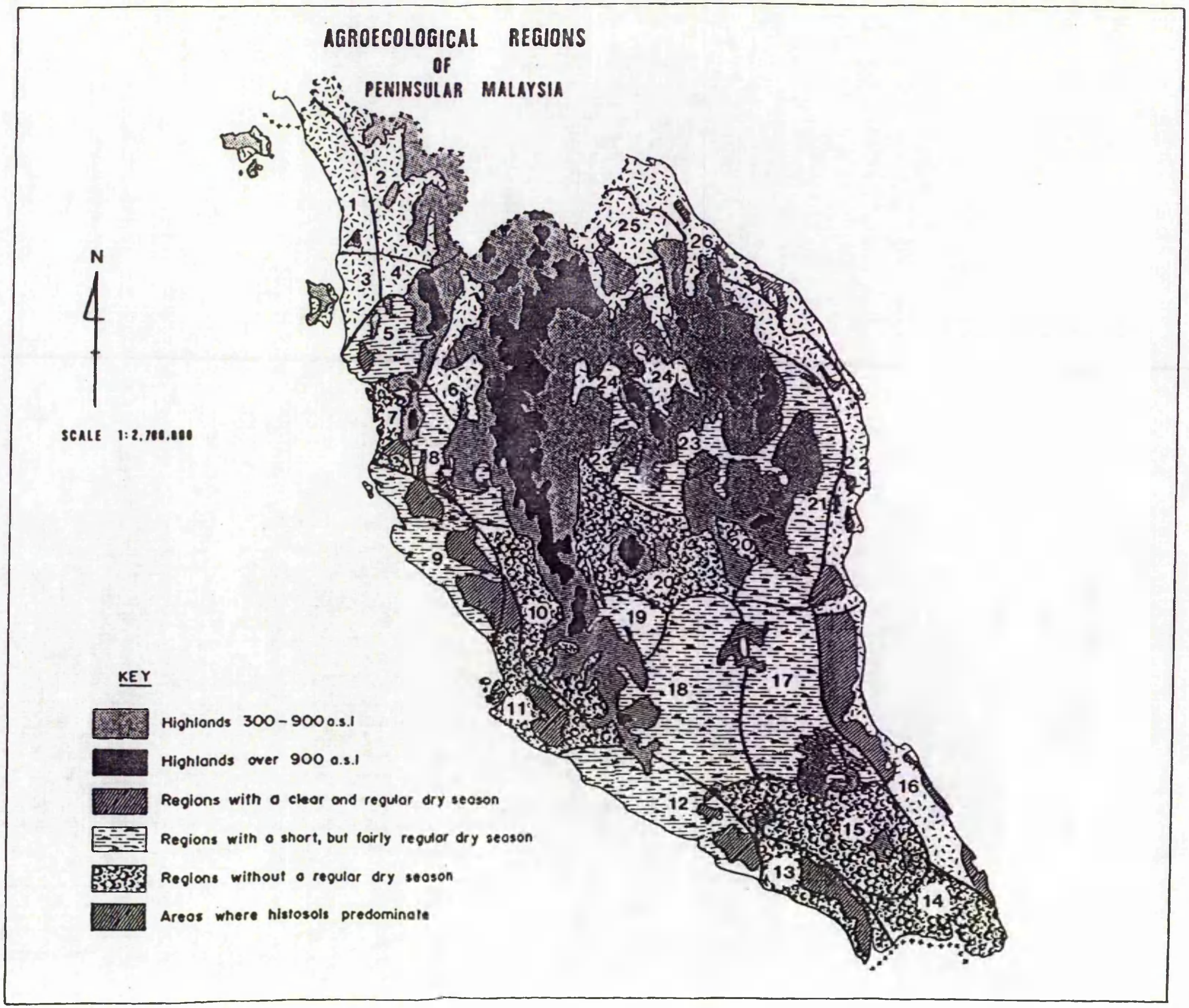
Region	Suitable Crops	Marginal Crops*
16.	Rice, coconut, cocoa	Rubber, maize, oil palm, groundnuts
17.	Rubber, oil palm, cocoa, papaya, durian, cassava	Maize, cocoa
18.	Coffee, oil palm, durian, citrus, rubber, cocoa	Mango, cassava
19.	Cocoa, durian, citrus	Rubber, oil palm
20.	Rubber, durian, cocoa, maize, groundnuts	Banana, sweet potatoes
21.	Oil palm, coffee, durian, rubber, maize, groundnuts	Cocoa, citrus, sweet potatoes
22.	Durian, citrus, mango	[Rice]
23.	Coffee, citrus, durian, rubber	Cocoa, mango, oil palm
24.	Coffee, citrus, durian, rubber, maize, groundnuts	Banana, sweet potatoes
25.	Rice, mango, durian, coffee, maize, groundnuts, sugar cane	Tobacco, cassava, sweet potatoes
26.	Rice, durian, tobacco, sugar cane, maize, groundnuts	Mango, sweet potatoes

AREAS OF PROBLEM SOILS:

Peat:	Pineapple, coffee, cassava, sweet potatoes, oil palm, banana, papaya, maize
Sandy Accretion: *(Tanah Beris)*	Cashew, coconut, tobacco, Groundnut, sweet potatoes
Acid Suplhate Soils:	Oil palm, coconut, rice

*
Crops cultivated under less than optimum conditions but grown successfully in the region and promising high returns.

[ ]
Crops suitable only in small parts of a region (mainly along rivers).


AGROECOLOGICAL REGIONS
OF
PENINSULAR MALAYSIA
N
SCALE 1:2,700,000
KEY
Highlands 300 - 900 a.s.l
Highlands over 900 a.s.l
Regions with a clear and regular dry season
Regions with a short, but fairly regular dry season
Regions without a regular dry season
Areas where histosols predominate
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APPENDIX 6C

TABLE 8.2: LAND REVENUE COLLECTION - KOTA BHARU DISTRICT, KELANTAN (1985)

NO	AREA	AMOUNT TO BE COLLECTED $			AMOUNT COLLECTED $			BALANCE $		
(1)	(2)	CURRENT (3)	OUTSTANDING (4)	TOTAL (5)	CURRENT (6)	OUTSTANDING (7)	TOTAL (8)	CURRENT (9)	OUTSTANDING (10)	TOTAL (11)
1	LIMBAT	52,329.60 (100%)	7,349.40 (100%)	59,679.00 (100%)	44,311.70 (85%)	3,854.50 (52%)	48,166.20 (81%)	8,017.90 (15%)	3,494.90 (48%)	11,512.80 (19%)
2	KEMUMIN	99,215.50 (100%)	18,161.50 (100%)	117,377.00 (100%)	93,673.60 (94%)	17,710.40 (98%)	111,384.00 (95%)	5,541.90 (6%)	451.10 (3%)	5,993.00 (5%)
3	LUNDANG	76,202.30 (100%)	13,800.50 (100%)	90,002.80 (100%)	63,597.30 (84%)	12,183.00 (88%)	75,780.30 (84%)	12,605.00 (17%)	1,617.50 (12%)	14,222.50 (16%)
4	PANJI	86,922.00 (100%)	22,725.80 (100%)	109,647.80 (100%)	79,033.70 (91%)	11,217.40 (49%)	90,251.10 (82%)	7,888.30 (9%)	11,508.40 (51%)	19,396.70 (18%)
5	KOTA	41,693.10 (100%)	14,596.50 (100%)	56,289.60 (100%)	35,987.00 (86%)	8,734.30 (60%)	44,721.30 (79%)	5,706.10 (14%)	5,862.20 (40%)	11,568.30 (21%)
6	PENDEK	37,830.70 (100%)	8,384.30 (100%)	46,215.00 (100%)	31,919.20 (84%)	3,723.40 (44%)	35,642.60 (77%)	5,911.50 (16%)	4,660.90 (56%)	10,572.40 (23%)
7	KADOK	68,802.60 (100%)	11,623.00 (100%)	80,425.60 (100%)	55,038.00 (80%)	6,971.60 (60%)	62,009.60 (77%)	13,764.60 (20%)	4,651.40 (40%)	18,416.00 (23%)
8	BETA	35,349.90 (100%)	8,423.70 (100%)	43,773.60 (100%)	29,345.70 (83%)	3,808.10 (45%)	33,153.80 (76%)	6,004.20 (17%)	4,615.60 (55%)	10,619.80 (24%)
9	PERINGAT	99,241.30 (100%)	22,040.00 (100%)	121,281.30 (100%)	72,815.60 (73%)	12,319.50 (56%)	85,135.10 (70%)	26,425.70 (27%)	9,720.50 (44%)	36,146.20 (30%)
10	BADANG	39,969.75 (100%)	12,318.20 (100%)	52,287.95 (100%)	32,398.30 (81%)	5,016.50 (41%)	37,414.80 (72%)	7,571.45 (19%)	7,301.70 (59%)	14,874.15 (28%)
11	SERING	34,032.60 (100%)	8,703.60 (100%)	42,736.20 (100%)	26,986.10 (79%)	3,291.50 (38%)	30,277.60 (71%)	7,046.50 (21%)	5,412.10 (62%)	12,458.60 (29%)
12	BANDAR KOTA BHARU	677,143.20 (100%)	191,012.00 (100%)	868,155.20 (100%)	550,376.00 (81%)	58,279.90 (31%)	608,655.90 (70%)	126,767.20 (19%)	132,732.10 (70%)	259,499.30 (30%)
13	PANGKAL KALONG	127,600.40 (100%)	57,213.00 (100%)	184,813.40 (100%)	102,482.60 (80%)	31,514.90 (55%)	133,997.50 (73%)	25,117.80 (34%)	25,698.10 (52%)	50,815.90 (28%)
14	BANGGUL	71,036.00 (100%)	17,765.70 (100%)	88,801.70 (100%)	46,719.50 (66%)	8,474.20 (48%)	55,193.70 (62%)	24,316.50 (34%)	9,291.50 (52%)	33,608.00 (38%)
15	SALOR	59,376.20 (100%)	63,972.50 (100%)	123,348.70 (100%)	26,247.90 (44%)	3,401.10 (5%)	29,649.00 (24%)	33,128.30 (56%)	60,571.40 (95%)	93,699.70 (76%)
	TOTAL	1,606,745.15 (100%)	478,089.70 (100%)	2,084,834.85 (100%)	1,290,932.20 (80%)	190,500.30 (40%)	1,481,432.50 (71%)	315,812.95 (20%)	287,589.40 (60%)	603,402.35 (29%)

Table 7.1. Past graduates in land surveying - University of Technology Malaysia (UTM) 1976 - 1988.

Year	Diploma Course	Degree Course
1976	24	-
1977	27	-
1978	38	13
1979	38	9
1980	38	19
1981	66	16
1982	64	21
1983	102	29
1984	66	29
1985	41	41
1986	34	42
1987	24	28
1988	36	31

(Source: Faculty for Surveying, UTM, October 1988)

Table 7.2. Past graduates in land surveying - MARA Institute of Technology (ITM) 1974 - 1985.

Year	Diploma Course	Advanced-Diploma
1974	7	-
1975	10	-
1976	14	-
1977	7	-
1978	19	-
1979	22	-
1980	12	-
1981	17	-
1982	12	-
1983	15	-
1984	33	-
1985	36	22

(Source: Department of Land Surveying, ITM, April 1986)

Table 7.3. Future projection of number of graduates - University of Technology Malaysia (UTM) up to the year 2000.

Year	Diploma	Degree	Masters
1989	30	35	5
1990	30	35	5
1991	30	35	5
1992	30	35	5
1993	30	35	5
1994	30	35	10
1995	30	35	10
1996	30	35	10
1997	30	35	10
1998	30	35	10
1999	30	35	10
2000	30	35	10

(Source: Faculty for Surveying, UTM, October 1988)

APPENDIX 7B

Course Structure - Diploma in Land Surveying at the MARA Institute of Technology (ITM)

Subject	Code	C.H.	L	T	P	Cr
FIRST SEMESTER						
Accelerated English	ENL 099	20	-	-	-	-
Islamic Education	UIS 101	2	2	0	0	2
Mathematics	MAT 103	6	5	1	0	5
Technical Drawing	MEN 102	2.5	0	0	2.5	2
		30.5				9
SECOND SEMESTER						
Physic (M & O)	ENG 156	6	4	1	0	5
Physic (Electricity)	ENG 157	6	4	1	0	5
Physic (Heat)	ENG 158	5	3	1	0	4
Mathematics	MAT 151	3	2	1	0	2.5
Islamic Education	UIS 151	2	2	0	0	2
Surveying	SUR 193	6	2	1	3	4
English	ENL 213	5	2	0	0	2
		33				25
THIRD SEMESTER						
Mathematics	MAT 201	3	2	1	0	3
Engineering Surv. 1	SUR 245	7	1	1	4	4
Cadastral Surv. 1	SUR 245	6	1	1	3	4
Astronomy 1	SUR 248	3	2	1	0	4
Computations 1	SUR 246	3	3	0	0	3
Islamic Education	UIS 201	2	2	0	0	2
Cartography	SUR 242	4	3	1	0	3
		28				23
FOURTH SEMESTER						
Mathematics	MAT 251	3	2	1	0	3
Engineering Surv. 2	SUR 293	6	2	1	3	4
Cadastral Surv. 2	SUR 295	5	1	1	3	4
Astronomy 2	SUR 298	3	2	1	0	3
Computer Concept	CPT 209	4	2	0	2	3
Drafting	SUR 299	3	0	0	3	3
Islamic Education	UIS 251	2	2	0	0	2
		26				22

Subject	Code	C.H.	L	T	P	Cr
FIFTH SEMESTER						
Mathematics	MAT 302	2	1	1	0	1.5
Engineering Surv. 3	SUR 343	6	2	1	3	4
Cadastral Surv. 3	SUR 345	5	1	1	3	3
Geodesy 1	SUR 347	4	3	1	0	4
Computations 2	SUR 346	3	3	0	0	3
Photogrammetry 1	SUR 341	4	1	1	2	3
Land Laws & Regulatn.	SUR 344	3	3	0	0	3
Islamic Education	UIS 301	2	0	0	0	2
		29				23.5
SIXTH SEMESTER						
Mathematics	MAT 352	1	0.5	0.5	0	1
Topographical Surv.	SUR 390	6	1	1	4	4
Geodesy 2	SUR 397	4	3	1	0	4
Computations 3	SUR 396	3	3	0	0	3
Photogrammetry 2	SUR 391	4	1	1	2	3
Islamic Education	UIS 351	2	2	0	0	2
		20				17

Key:- Sem - Semester
C.H. - Contact Hours
L - Lecture
T - Tutorial
P - Practical
Cr. - Credit Hours
M & O - Mechanics and Optics
Surv. - Survey

(Source: Department of Land Surveying, School of Engineering, MARA Institute of Technology (ITM), Shah Alam, Selangor - March 1986)
(ITM Reference Number: SJSA/amr 060585)

LAND SURVEYING SOFTWARE

(Reproduced by kind permission of the Editor, Civil Engineering Surveyor, The Journal of the Inst. of Civil Engineering Surveyors)

TITLE	PRICE	COMPUTER	RAM	DESCRIPTION	SUPPLIER
TRAV LOCPT PLTPT	£600	Multi User Mini/Main-frame. 8" Dec RX02 Floppy disks or 9 track 800/160 magnetic tape		The package consists of three programs for traverse adjustment, locating surveyed points, and plotting them. Different symbols are used and gridding interval specified by the user. Levels are plotted against points and drawings can be rotated. Input: co-ordinates of start and end points, angles, length. Output: corrected co-ordinates, co-ordinates of all points, length of traverse legs and azimuths.	*Savoy Software Science Ltd, 136 Long Acre, London WC2E 9AE tel: 01-836 6863*
ESP-200 consisting of four volumes Vol. 1 Vol. 2 Vol. 3 Vol. 4	£8600 £2200 £2400 £3600 £800	IBM PC, Apricot, Hewlett Packard, IBM PC compatibles		The package is of 4 volumes. All can be used alone or as part of the package. The price includes all 4 volumes. Vol. 1 provides standard co-ordinate geometry system, visual check on data and a command memory. Vol. 2 provides a drafting program with different types of lines, plotting points marks, definable symbols and windowing facility. Vol. 3 is an earthwork program for designing roads and highways. Vol. 4 allows data transfer between ESP-200 and TOPOGRAPHY. Also provides communication with data collectors.	*INTEGER Software, 2nd Floor South, Tolworth Tower, Surrey KT6 7DW tel: 01-390 6747*
TOPOGRAPHY Option 1 Option 2 Option 3 Option 4 Option 5 Option 6 Option 7 Option 8 Option 9 Option 10	£960 £700 £560 £420 £680 £280 £280 £320 £480 £560 £360	IBM PC, Apricot, Hewlett Packard, IBM PC Compatibles		This is a Digital Terrain Modelling System and has 10 options, each can be purchased separately. These include contour mapping, profile and cross-sections, earthwork volumes, earthwork volume plotting, data transfer, digitised modelling from graphical information, interactive modelling for defining and editing modelled surfaces, slope shading, vectors providing a facility to plot arrows on downhill direction, and 3D plot which converts any 2D drawing into 3D surface.	*INTEGER Software as above*
Survey Observations and processing	£1500	Wang, IBM PC Mini computers		Supports field instruments including Aga, Kern, Wild and Zeiss. Control survey options include traverse intersection, resection and spirit levelling. Graphic representation of the data at all stages. Detail survey option includes radials from fixed or free stations, tape and offset and spirit levelling. Also forms a Digital Ground Model. Other features include colour graphics, grid transformation, different line and symbol definition. If the software is to be used by PC's then there is a fee of £1000 for system utilities and run time, and £750 for interactive graphic option if graphics is required.	*Eclipse Associates Ltd, Rockingham Drive, Linford Wood, Milton Keynes MK14 6NG tel: 0908-667799*
Surface Detail Modelling	£1300 £2500	Wang, IBM PC, Mini computers		The package can produce existing or edit proposed ground models from field data and be viewed on screen or plotted. The string concept is used and they can be moved, duplicated, joined, split and reversed. New strings can be created parallel to old strings. Other features include plan plotting and setting out information. For PC's an extra fee of £1000 is obligatory for system utilities and run time plus £750 if interactive graphic option is required.	*Eclipse Associates Ltd, as above*
Triangular Ground Modelling	£1500 £3000	Wang, IBM PC, Mini computers		The package converts a surface detail model into a 3D triangular ground model. Contours can be interpoloated and plotted. Other features include editing, curve fitting, line definition and boundary facility. For PC's extra fee of £1000 is obligatory for system utilities and run time plus £750 if interactive graphic option is required.	*Eclipse Associates Ltd, as above*

TITLE	PRICE	COMPUTER	RAM	DESCRIPTION	SUPPLIER
CONTROL		HP9845B		Consists of five programs and calculates the co-ordinate and height of surveyed points, correction for curvature and refraction. co-ordinate and height of a trilaterated station, correction for local scale factor, adjust traverses by three optional methods, editing and deletion of existing records, converts co-ordinates between the plane.	*E V.E. Tiltman & Partners, High Croft, Top Lane, Whatstandwell, Derbys DE4 5EN tel. Ambergate 2373*
SURVEY		HP9845B		Consists of eleven programs and features calculations of co-ordinates and heights of detail points from observations by EDM, stadia or self-reducing tacheometer, plotting of points with height and/or point number and/or correcting lines, point labelling, production of survey plans on the HP 7580, HP 7585 A1 and A0 plotters, symbols, text, purging of files, calculations of area of boundary, caters for HP digitisers, plot sections, etc	*As above*
Series 800	£1250	IBM PC, XT, AT, compatible machines	128k	Consists of five programs for field note data reduction, co-ordinate geometry, topographic survey using EDM and theodolite, creates and stores parcels and point to point plotting.	*N.A.P., Engineering Micro Software, 22A Ryders Terrace, St John's Wood, London NW8 tel: 01-328 3670*
SERIES 2000	£1895	IBM PC, XT, AT, compatible machines	128k	Reduces field survey notes to eastings, northings and elevations. Performs co-ordinate geometry function, reading and displaying 3-DS files created by the plot file, calculates course bearings and distances, plots horizontal curve skating stadia reduction, calculating distance, elevation and co-ordinates of rod station. Vertical curve design.	*As above*
POINTPLOT	£875	Apple II/IIe/IIc IBM PC with Quadlink board, Apricot		Plots points from EDM methods and stadia tacheometry. Data entry is manual or by GRE3 datalogger. Up to 30 traverse stations and 900 points (700 for tacheometry). Optional extras are a join-up program (£190); a traverse program (£395); contours program (£350); GRE3 data logger input module (£190). The whole system, computer hardware, plotter hardware and software is also available for £11915. [AREAS and VOLUMES program available 1986 (£350).]	*STL Software, 1 Leigh Way, Weaverham, Northwich, Cheshire CW8 3PR tel 0606-853570*
SysScan Land Surveying	af99	VAX II/7XX TM Family		Menu driven or directly, operates in user's own language and terminology, e.g. English, Italian, etc. Functions include intersection, resection, free stationing, tying in, polars, traversing, orthogonals, levelling, setting out, chaining, line cutting, area calculations, trigonometrical heighting, transformation, adjustments. Input from keyboard, AGA Geodat 124, KERN R48, WILD GRE3, Zeiss Mem/DAC 100.	*SysScan (UK) Ltd, Priors Way, Maidenhead, Berks SL6 2HP tel. 0628-39292*
Surveying Software	£800	Epson HX-20, Epson RX-80 printer	32k	20 programs on 3 micro-cassettes, menu driven, automatic running, loading and checking. Functions include traverse adjustments, survey calculations, alignment, processing of detail observations, schedules, total stations' storage from AGA or OMNI, remote terminal to a large computer. The complete hardware and software package available for £1750 + VAT.	*Longdin & Browning Surveys Ltd, Summer Field, Sketty Road, Swansea SA2 0LH tel 0792-202244*
Interactive Graphics/ Graphical data capture		Tektronix 6000 Family		General drafting package allows for compilation, manipulation, and presentation of data in the form of drawings or digital output. Input is through keyboard or digitisers. Functions include text, symbols, strings of straights, circle/arc, spline and transition. Calculates and adjusts co-ordinate geometry. Least square adjustment and co-ordinate transformation is also available.	*JTC Computer Systems Ltd Grosvenor Chambers, Market Square, Northampton NN1 2TF tel 0604-31137*
TRAVERSE	£70	ACT, Epson and IBM range		Compute or adjust open or closed traverse from field observation. Input field angles and output the WCB, scale factor and data checking. Output can be directed to the screen or any 80 column printer.	*Lymington Micro Science Ltd, 23 Ditchbury, Lymington, Hampshire tel Lymington 77473*

TITLE	PRICE	COMPUTER	RAM	DESCRIPTION	SUPPLIER
CP101	£450	HP9845, 200, 80 series, Apricot IBM PC, Prime Mini Computers		The package determines rectangular co-ordinates of stations and bearings of lines for closed, controlled, open and deviation traverses. Input consists of angles, line lengths, traverse type, and station sequence. Output gives survey errors, corrected co-ordinate and bearing. Option to plot traverse is available.	*GECS Ltd, Cunard Building, Liverpool L3 1EG tel: 051-236 1687*
CP104	£300	HP9845, 200 80 series, Apricot, IBM PC, Prime Mini Computers		This is an interactive program for reduction of tacheometric survey readings. Inputs level and x, y co-ordinates of stations and stadia and angle readings. Outputs staff station data and distance, reduced level and co-ordinates.	*GECS Ltd, as above*
POINTPLOT	$295 + shipping and sales tax	HP85, 86 HP dot matrix printer		POINTPLOT is a drafting system suitable for small offices. It uses survey data under the COGO application module to plot the survey points. The output includes point numbers, scale, grid ticks, rotation and alignment marks for fitting strips together.	*QSoft, 1078 Carol Lane, Suite 203, Lafayette, California 94549 tel. (415)934-4002*
GEODESY	£3600	IBM PC and compatibles		The package is for geodetic and co-ordinate geometry calculations and map production. Data preparation and program operation are interactive and menu driven.	*Data Technology Datech Ltd, Central Court, Knoll Rise, Orpington, Kent BR6 0JA tel: 0689-36231*
COGO-PC	£1995	IBM PC and compatibles		COGO-PC is a generalised co-ordinate geometry program. All points are stored in tables. 999 tables can be used on one disk and each table can contain up to 9000 points. The program commands include line intersection, curve and spiral intersections, and traverse adjustment. Pen plotting and screen plotting is available.	*As above*
COGOACAD	£120	IBM PC and compatibles	512k	This is an interactive program used to transfer COGO-PC data to AutoCAD DXF format. Points and figures created in COGO-PC program can then be used in AutoCAD. Attributes such as points, numbers, lines, bearings and distances can also be transferred.	*As above*
AUTOWORD	£120	IBM PC and compatibles		Allows drawing notes, schedules, legal descriptions, etc. produced on word processors such as Wordstar and others, to be inserted on AutoCAD drawing.	*As above*
COLLECT	£120	IBM PC and compatibles		This is an interactive program used to transfer data files collected with a Leitz SDR2 field data collector to COGO-PC file formats. Co-ordinates collected in the field can be passed directly to co-ordinate geometry calculation program.	*As above*
CONT	£995	IBM PC and compatibles		Inputs random x, y, z data to create a contour map. Data is entered manually, read from COGO-PC or from a user file. Points can be given names and the contour map can be displayed on screen or plotted on supported pen plotters or on an Epson printer.	*As above*
GEOPAK	£895	IBM PC and compatibles		Allows data to be transferred from an AGA GEODAT data collector to an IBM-PC, also calculates the co-ordinate of each point. The output can contain point numbers, point identifications, elevations and Northing and Easting.	*As above*
HASP DIGICAL IIS Survey System	£24950	HP Series 200 HP9120 3.5" D/drive. HP7475A Plotter, Epson printer, Houston 7024G A2 Digitiser	512k 540k	The price includes all the hardware plus installation/training (up to 4 days). The software consists of HPL/Binary operating system, field data processing, drafting and COGO, Digital Surface Modelling. Can communicate with Kern, E1, E2, Alphacord and R48, Wild tel, Zeiss Elta 2/3; AGA 140, 136, and Geodat. The software operation includes computation of traverse adjustments, plotting, contouring, sectioning, volume of cut and fill, editing the field data, triangulation, 999 user definable symbols, etc. Also can be used for programming in Basic, Pascal, Fortran 77, Forth, CP/M 68K.	*Survey & General Instrument Co Ltd, Fircroft Way, Edenbridge, Kent TN8 6HA tel: 0732-864111*

TITLE	PRICE	COMPUTER	RAM	DESCRIPTION	SUPPLIER
SURVEYCALCS	£65	as above		Menu driven. Features include calculation of resections, inter-sections, co-ordinate joins, polar to rectangular co-ordinate conversion, tacheometry reduction and solution of triangles. Output to screen or 80 column printer.	*As above*
SETTING-OUT CALCS		as above		Menu driven. Features include calculation of standard cut/fill batter rails, interpolation of road profiles, deflection angles for horizontal circular curves, deflection angles for horizontal transition curves, calculation of vertical curve levels. Output to screen or 80 column printer.	*As above*
System 9		Sun-3 Family (comes with system)		A digital mapping system with a data base for storage of map related data. Input data from land surveying, digitising, photogrammetry. The input data can be edited, updated and analysed. Output can be in digital form, in a format ready for transfer to another computer system (e.g. MOSS GENIO format) or in a graphical form on screen or on plotters. Can be a single or network workstation. Menu driven, touch-sensitive screen, help facility, windowing technique and macro facility. Applications include contour mapping, gridding, spot heights, volumes, traverse adjustment, resectioning, tacheometry, chain and offset.	*Wild Heerbrugg (UK) Ltd. Revenge Road, Lordswood, Chatham, Kent ME5 8TE tel 0634-64471/5*
MAP-200		DEC VT103 Dual RX02 floppy disk (minimum 2)	128k	Computer aided mapping and menu-driven software. Features include absolute orientation with least square adjustment. Manuscript preparation with different types of grid lines, symbols and annotation styles. On-line compilation with feedback, simultaneous graphical and digital output. Five digitizing/plotting modes in straight line, curved, continuous symbol and arc. Building squaring, hatching, area computation, spot level annotation and user definable line types, etc. An optional voice recognition unit is also available for blind parameters by means of voice-input	*Survey & General Instrument Co Ltd. Fircroft Way, Edenbridge, Kent TN8 6HA tel. 0732-864111*
GEOMAP		Tektronix 4054, LA-120 line printer, Tek 4907 Floppy disk system	64k	The software of basic system consists of computing software and graphic software. Computing software comprises modules for data input and batch calculations. Input can be keyboard, TC1/GLE1 or GRE3, for definition of traverses and input of fixed points. Batch calculations consists of traverses, detail points, mean values, and generation of graphic files. Graphic software consists of interactive graphics which uses COGO functions, graphic functions, display functions, digitizing functions and plotter function and system generation which generates symbols, characters, and from definition. Options are also available on contour interpolation, cross-sections, volume and network adjustment	*Wild Heerbrugg (UK) Ltd. Revenge Road, Lordswood, Chatham, Kent ME58TE tel 0634-64471*
MOSS	£10,000	Mainframe: IBM, UNIVAC/OS1100, CYBER/NOS, ICL 2900/DME, Dec 20. Mini-computers: DEC VAX/11, PRIME 50, DGMV, NORSK, Gould SEL 32, Harris		Creates digital models from aerial survey, digitising drawings and ground survey data. Accommodates all surveying methods, i.e. EDM to chain and offset. Provides traverse calculations and adjustment, setting out information, testing of accuracy for models, direct plotting from survey data, 3D plotting and photomontage, communicates with most data loggers. Applications also include highway, railway, dams, and airport design. Interactive and menu driven. Supports most digital plotters and graphic terminals	*MOSS Systems Ltd. Barclays House, 51 Bishopric, Horsham, W Sussex RH12 1QJ tel 0403-59511*
SURVPAK 300	£4000	HP-200, HP-300 series	768k	The basic system covers suite management and the essential survey operations, these include, projection definition, listing, deleting and editing the observations data, control observations entry, detail observation entry, traverse computation, bearing and distance from co-ordinates, least square block adjustment, standard plan plotting, drawing straight and curved lines, plotting co-ordinate stations with no. and symbol plotting	*DJ Herriott Ltd. Survey House, 69D London Road, Southborough, Tunbridge Wells, Kent TN4 0PA tel: 0892-44918/9*

TITLE	PRICE	COMPUTER	RAM	DESCRIPTION	SUPPLIER
MacSurvey (Land Survey)	£140	Apple II series, BBC-B, Epson Hx-20, IBM PC and compatible, Macintosh	32k	for trees, hedges, circles, cross hatching, gate, etc. There are also optional modules for data logger interface, stadia, tachy, Digital terrain modelling and contouring, calculations of areas, volumes and setting out information Land survey software consisting of twenty-three programs covering triangle solutions, tacheometry (stadia and 3D reduction, 3D plot), intersection and resection solutions. EDM slope reduction, 3D positions from EDM, traverse surveys, and adjustment, co-ordinate transformation, area solutions, earthwork and volume computations, circular curve design and setting out, reverse circular curves, transition and vertical curve design, observational error analysis, adjustment of observations, braced quadrilateral, matrix solutions, variation of co-ordinates Choice of 4 plotters for plotting. Choice of parallel or serial printers.	*Survey Software Suppliers, 16 Shillingworth Place, Bridge of Weir, Renfrewshire PA11 3DY*

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   Appendix A - Step 2.6 (Surveying of land by the Survey Dept. upon approval of alienation of of land), pp 309-310.

   Appendix C - Step 2.2 (Surveying of land by the Survey Dept. upon approval of sub-division, partition or amalgamation of land), pp 313.

   Appendix E - Step 2.1 (Surveying of land by the Survey Dept. upon approval of application of land for mining), pp 316-317.

   Appendix G - Step 2.1 (Surveying of land by the Survey Dept. upon partial acquisition of land), pp 320-321.

   Appendix H - Step 2.1 (Surveying of land by the Survey Dept. upon partial surrender of land), pp 322-323.

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   Appendix B - Step 2.3 (Surveying of land by a licensed land surveyor upon approval of alienation of land), pp 311-312.

   Appendix D - Step 2.3 (Surveying of land by a licensed land surveyor upon approval of sub-division, partition and amalgamation of land), pp 314-315.

   Appendix F - Step 2.3 (Surveying of land by a licensed land surveyor upon approval of application of land for mining), pp 318-319.

   Appendix J - Step 2.1 (Surveying of land by a licensed land surveyor for the creation of collector's right of way), pp 325.

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   Appendix C - Step 3.2(Surveying of land by the Survey Department upon approval of sub-division, partition or amalgamation of land), pp 313.

5. The strong performances of the agricultural sector in Malaysia is largely attributed to the strong increase in the output of palm oil, cocoa, sawlogs. coffee, fruits, meat and animal products while the output of padi, coconut, pepper, rubber, marine fisheries and aquaculture remained fairly constant.

6. **Zubir Yahya**, (1985), *Kelemahan Undang-Undang Tanah Sekarang Dalam Menghadapi Cabaran Pembangunan Dalam Sektur Pertanian,* Kertas Kerja No.5. Sem. Kanun Tanah Ala Malaysia, Kem. Kemajuan Tanah & Kemajuan Wilayah, K. Lumpur, pp 1.

7. Poverty is defined and measured on the basis of the prevailing standard of living in the country which is in accordance with the Malaysian conditions and cannot be really compared with other countries. Poverty has been conceptualised in terms of the ability of an average Malaysian household to consume sufficient goods and services, and it includes more than just food.

8. **Zubir Yahya**, (1985), *Ibid.*

9. **Zubir Yahya**, (1985), *Ibid,* pp 8.

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11. **Zubir Yahya**, (1985), *Ibid,* pp 10.

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13. **Zubir Yahya**, (1985), *Ibid,* pp 15.

14. *Ibid,* Appendix IIA.

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17. Town land has the meaning assigned by sub-section (2) of section 51 of the N.L.C. as - ....*land in any area of the state declared in accordance with the provisions of section 11 to be a town or, by virtue of sect. 442, deemed to be a town duly constituted as such under the provision.*

18. Mukim has the meaning - ....*any area duly constituted as a mukim under the provisions of sect. 11 or, by virtue of sect. 442, deemed to be a mukim so constituted.*

19. **Lee, G. B.**, (1985), *Ibid,* pp 7.

20 *Ibid,* pp 8.

21. **Greulich, G.**, (1983), *Title Insurance: A Pre-Cadastral Necessity*, FIG XVII Int. Congress Comm. 7, Sofia, Bulgaria, pp 701.9/3.

22. *Ibid.*

23. **Simpson, S. R.**, (1976), *Land Law and Registration*, Cambridge Univ. Press, pp 180.

24. *Ibid.*

25. *Ibid.*

26. *Ibid*, pp 181.

27. *Ibid*, pp 180.

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