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AN INVESTIGATION INTO THE IMPLEMENTATION OF TOTAL QUALITY ENVIRONMENTAL MANAGEMENT (TQEM) FOR SUSTAINABILITY IN LIBYAN FOOD INDUSTRY

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بِسْمِكَ اللّهُمَّ

In the name of Allah, we start

DEDICATED To

The memory of my father and mother

My Wife

My children (Mohammed and Saad)

ACKNOWLEDGMENTS

I would like to acknowledge the many people who have helped, supported, and encouraged me to complete my PhD thesis.

Abstract

Environmental and quality management have become an important part of businesses all over the world. This involves changes in understanding and practice at all levels of the organisation and requires the training of the workforce, recognition by senior management that the workforce can contribute and are essential to gaining quality enhancement, and also that customers are important stakeholders, who must be satisfied with all aspects of the operation. There has been an increasing demand for the manufacturing industry to implement sustainable production policies. To meet this demand, environmental management plays an important role as part of the total quality management system of the company. To enhance the environmental management, the total quality management system must be successfully implemented.

This research investigates the implementation of total quality environmental management (TQEM) in the Libyan food industry (LFI). This study aims to develop a framework for TQEM implementation to solve problems concerning quality and the environment in the LFI, in order to achieve a better level of environmental and quality management and to develop modern managerial techniques. In particular, this investigation helps the LFI to increase its environmental protection and to achieve a high quality in its services and production.

Interviews and questionnaires were conducted for this research. Semi-structured interviews were conducted with 16 managers in the LFI as the first phase of the research in order to study the current situation, the barriers to, and motivations for, the implementation of TQEM in the LFI. The questionnaire that was circulated was designed to investigate the TQEM issues, national environmental factors, barriers to, and motivations for its implementation in the LFI. The questionnaire was conducted with managers at three levels (top, middle, and low) and oriented sampling was used with employees from three companies in the LFI.

The findings indicate that the LFI does not make sufficient efforts to improve its environmental performance and quality. Further, it was found that the LFI is still at a quite low level of achievement for Environmental Management System (EMS). The national environmental factors for the need to implement TQEM in the LFI were identified, through this research, as technical capability, organisational culture, human resources, competition, government policy, and social responsibility. The barriers to implementing TQEM in the LFI that were identified through this research are: the lack of top management commitment, the misunderstanding of TQEM, insufficient training at all levels, a lack in achieving a knowledge of customers' needs and satisfaction, the lack of support for employees' participation, the lack of information systems, and the lack of government environmental control. The motivations for implementing TQEM in the LFI that were identified through this research, including cost savings, increased production efficiency, the reduction of waste and pollution to the environment, the reduction of energy consumption, the reduction of natural resources' consumption, and improved environmental performance.

Based on the findings of this research, a framework and processes for TQEM was developed. The key objective of this TQEM framework designed to help the LFI to get started and to move step by step towards a TQEM culture. This will pay attention to the standards of work and environmental protection that are expected from the LFI, including agreed TQEM objectives, the sharing of relevant information, training programmes, and performance criteria. Some recommendation to aid the LFI's preparations for TQEM implementation have also been derived from this research.

List of Publications

1. Saad, A., Su, D., Marsh, P., and Wu, Z., 2016. National Environmental Factors for Implementing Total Quality Environmental Management in the Libyan Food Industry, *British Journal of Economics, Management & Trade,* Vol. 11, No. 4, Pp 1-18.

2. Saad, A., Su, D., Marsh, P., and Wu, Z., 2015. Investigating Environmental Management and Quality Management Issues in the Libyan Food Industry, *British Journal of Economics, Management & Trade,* Vol. 9, No.3, pp. 1-16.

3. Saad, A., Su, D., Marsh, P., and Wu, Z., 2014. Total Quality Environmental Management toward Sustainability: Need and Implementation in Libyan food Industry, *Key Engineering Materials,* Vol. 572, Pp 84-89.

4. Saad, A., Su, D., 2012. Barriers of Implementing Total Quality Management in Libyan Food Industry), Second Annual ADBE Research conference and Festival in the NTU, 28 June 2012.

5. Saad, A., Su, D., 2011. The Investigation of Implementing Total Quality Management in Libyan Food Industry), Third Annual ADBE Research conference and Festival in the NTU, 07 July 2011.

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ABBREVIATIONS USED

TQM	Total Quality Management
EMS	Environmental Management System
TQEM	Total Quality Environmental Management
JIT	Just In Time
LFI	Libyan Food Industry
MLI	Ministry of Libyan Industry
SPSS	Statistical Package for Social Science
GEMI	Global Environmental Management Initiatives
CGLI	Council of Grate Lake Industry
ISO	International organisation for standardisation
LCCA	Life Cycle Cost Assessment
SD	Sustainable Development
LCA	Life Cycle Assessment
TC	Technical Committee
SAG	Strategic Advisory Group
EPE	Environmental Protection Agency
FCA	Ful Cost Accunting
LCM	Life Cycle Management
RM	Risk Management
RA	Risk Assessment
EIA	Environmental Impact Assessment
PDCA	Plan, Do, Check, Act
SME's	Small and Medium-Sized Enterprises
TQC	Total Quality Control
Deming Prize	DP
MBNQA	Malcolm Baldrige National Quality Award
EFQM	European Foundation for quality Management
JUSE	Japanese Union of Scientists and Engineers
LNQS	Libyan natinal Quality Standards
DQM	Dubai Quality Model
MCQ	Multi Choice Questions
ANOVA	Analysis Of Varance
SPC	Statistical Process Control
SD	Standrad Deviation
TPM	Total Productive Maintenance

CHAPTER ONE: INTRODUCTION

1.1 Research Background

Organisations are facing challenges to seek competitive advantages so as to survive in a rapidly changing worldwide business environment (Khadour, 2010; Granly and Welo,2013). Many seek to achieve this by optimising their performance and their ability to deliver high-quality products punctually, reduce waste, enhance the recycling of materials, minimise operating costs, protect the environment, conserve resources, and to promote economic feasibility. Such tasks can be achieved through the adoption of new working philosophies relating to environmental and quality management (Khadour, 2010 and Liu et al., 2015). These philosophies are beneficial to organisations in a number of ways, such as changing environments that threaten food security and economic growth, increasing efficiency and productivity, helping companies to develop new ways of working with customers and suppliers, and improving employees' confidence, skills, and performance. Moreover, these contribute to increasing their competitiveness, and offering better methods with which to improve the quality of the goods and services they provide. Furthermore, any industrial company or governmental or service organisation can create a new environmental and quality culture (Hsieh, 2012; Weingarten and Pagell, 2012; Liu et al., 2015).

In the body of the literature on environmental and quality management, significant focus and investigation has been directed towards the implementation of such philosophies in developed countries (Karapetrovic and Willborn, 1998; Hassan, 2006; Curkovica and Sroufe, 2007; Salomone, 2008; Karapetrovic and Casadesu, 2009; Morath and Doluschitz, 2009; Tarı´ and Azorı´n, 2010; Khadour, 2010; Bernardo et al., 2011; Hsieh, 2012). In contrast, only a few studies exist concerning the advancement of ideas such as these in developing countries (Gosen et al., 2005; Irhoma et al., 2014; Saad et al., 2015). However, these countries have suffered from poor cost management, high storage risks, low productivity levels, and are burdened by less developed technologies, the combination of which consequently resulting in negative environmental effects (Madu, 1997, Ajinah, 2009, Saad et al., 2014). This therefore demonstrates the need to give greater consideration to environmental protection and increased efforts to improvement products and services. Such measures would result in an increase in the

generation of revenue, and enable them to control and be more accountable for the future production impact (Graisa and Al-Habaibeh, 2011).

In this context, some of the studies in developing countries have been conducted in the Arab world (e.g., Oman: Alsabahy 1999; Saudi Arabia: Ajinah 2009; UAE: Seraphim 2006; Libya: Hassin 2009; Najeh and Kara 2006; Youseef 2006; Irhoma et al., 2014; Saad et al., 2014). However, these have mainly been country specific, small scale research contacts veracity cannot easily. In these countries study of total quality environmental management (TQEM) within companies has largely been neglected. Such as, considering some studies within a Libyan context, Youseef (2006) studied five oil companies through investigating just eight critical success factors and found that they have a low level of implementation of total quality management (TQM). Youseef established a framework that was limited to the Libyan oil sector in applying TQM. In a similar, Najeh and Kara (2006) have developed a roadmap for the adoption of TQM in the Libyan oil industry that is based on the identification of some quality factors and they produced a model that was based on their findings that they suggested should be used for effective implementation in the Libyan oil industries. Hassin (2009), studied the Libyan electrical power provision and developed an implementation strategy to introduce TQM into this industry through investigating nine critical success factors. The effect has been to increase the quality of production. However, until now, investigations have neglected environmental management and the impact on the environment of such industry production. In this respect, the approach in such developing countries is using a method that is no longer followed in the practice of TQEM, and which has become the norm in those countries.

TQEM combines the two management concepts of TQM and EMS, bringing the two approaches together so as to support a company's business. In so doing, TQEM aims to resolve the conflict between the independent operation of EMS and TQM, which can lead to competitive decisions within organisations as they seek to achieve quality and cost efficiencies whilst minimising their environmental impact. TQEM provides a mechanism for more effective interaction between TQM and EMS. The integration of environmental management and quality management has therefore become a popular topic for research and practice (Hsieh, 2012).

Similarities between TQM and EMS practices with regard to their managerial tools and underlying philosophies have been noted (Curkovic et al.2000; Rusinko, 2005; Curkovic et al., 2008). TQM programs and practices have been a major focus of operation management research, (Wiengarten and Pagell, 2012). The critical linkages between environmental management and quality management have identified and connected, since environmental management requires active management and should be integrated into all aspects of the manufacturing process, from design to production, delivery, usage, customer service, and, ultimately, post-use (Klassen and McLaughlin,1996; Sroufe and Curkovic,2008). It would therefore be expected that the TQEM system would be universally embraced, but for most firms it has not achieved the same acceptance as have TQM and just in time (JIT). One reason that TQEM has not been adopted is that managers find it difficult to assess the impact of TQEM investments, (Curkovica and Sroufe, 2007). This Research focuses on the EMS pillar of TQM. It explores the interaction as regards operational performance. Implementing TQEM in the Libyan food industry (LFI) might increase environmental management protection, such as the reduction in waste, pollution prevention, and an increase in the recycling of materials.

1.2 Research Problem

Although the problems of environmental protection and improving product quality have received significant attention in many countries, LFI appear to have been somewhat slower in modernising concepts that combine environmental and quality management. According to the reports produced by the Ministry of Libyan Industry (MLI) (2008, 2009, 2010) the problems faced by that this sector have arisen from the lack of employees' confidence skills and productivity, and the implications that these have in terms of production quality in the Libyan industrial sector. These reports shows that Libyan industry has suffered from a number of problems act as barriers to their progress. This has meant that Libyan products are less able to compete with foreign products in both local and international markets. In Libya, the level of implementation has suffered from a decline in production efficiency as well as inefficient management. Some sectors have received investigative treatment, such as the Oil, Electricity, and Cement industries, while others have been neglected, such as the food industry.

The Libyan government has put a great deal of interest and focus on the food industry because this sector represents approximately 25% of the total size of Libyan industry and

provides jobs for more than 15% of the total Libyan industry's workforce. Undoubtedly, this makes the food industry in Libya an extremely important entity and, consequently, it is one that requires further development and better organisation.

Although LFI have suffered from several problems in relation to their products and process, this current research focuses on the elements of quality in production and the environmental issues that arise from industrial production. This selection is justifiable because TQEM implementation in the food industry is quite important in many respects. For instance, TQEM aims to ensure that the impact of production on the environment is minimised while returns are improved, (Morath and Doluschitz, 2009). Implementing TQEM can help an organisation to reduce environmental damage. In future, since Libya's once-closed market has been opened, the domestic companies will have to improve their products' quality and protect the environment in order to face competition from newcomers in this market. Here, because of the importance of the food industry in Libya, as a sector, this research will investigate TQEM and its implementation in this context.

In order to study TQEM in the LFI it is necessary to explore the current problems and need for the research in this sector. Hence, in aiming to pave the way towards conducting the major fieldwork for this research on the Libyan food industry, the researcher went to Libya (July, 2010), to undertake a provisional view on the population and information resources. He:

1. Gathered evidence in order to ensure that there was still a need for research in the TQM and EMS field.
2. Explored the Libyan food industry in order to identify any relevant issues or problems.
3. Identify Libya's companies' sizes and their intentions about participating in this research.
4. Determined a responsible organisational unit for quality and operation in these companies.
5. The researcher conducted several face-to-face informal interviews with managers at the three managerial levels in these companies, as well as the employees in the quality and operations departments. These interviews established the argument of this research, and enabled him to explore the contemporary TQEM implementation within the Libyan food industry sector.

The researcher obtained company documents and reports which provided information on the current situation in the Libyan food industry. Consequently, the researcher has gained a general understanding of the situation in the food industry in Libya, and it can be said that the situation as described in the government reports (MLI, 2008, 2009, 2010) remains. This sector is still suffering from a number of problems. They have suffered from a decline in production efficiency and display a high rate of employee turnover. This could influence their ability to meet international standards, and also, to be able to compete with foreign imports into the market.

Based on this initial research investigation into the LFI, the researcher believes that a proposed framework should be built to facilitate the implementation TQEM in Libya. This would help address deficiencies noted above. Accordingly, there is a need to pay attention to the managerial methods that are developing in Libyan companies in different sectors. This may call for an examination of the acceptability of implementing TQEM in the Libyan business environment in order to improve its outcomes and to support the competitive position of Libyan companies. Over all, the TQEM approach has attracted the researcher's attention to investigate the implementation of TQEM and to learn about the managerial practices that are, in effect, barriers to adopting this approach. Additionally, the researcher seeks to explore any positive aspects that may encourage the implementation of TQEM in the LFI. This research seeks to answer the following questions:

1. What is the importance of integrating EMS and TQM into TQEM to improve the LFI's performance in moving towards sustainability?.
2. What are the expected national environmental factors, barriers, motivations for implementing and sustainability TQEM in the LIF?.
3. What is the proposed framework for implementing TQEM in the LFI?.
4. Which practical suggestions and recommendation are proposed to aid the LFI's preparations for TQEM implementation?.

1.3 Research Aims and Objectives

This research sets out to investigate total quality environmental management toward sustainability, its needs and implementation in the LFI. The current research aims to investigate the TQEM implementation in the LFI and to develop a framework for TQEM, which will

facilitate its implementation. The overall aim is to solve problems concerning quality and the environment that face these firms, to help them to achieve a better performance and to support their competitive position in the market. The research objectives include:

1. To explore the current situation in the LFI in comparison with other competitors in the Libyan market.
2. To identify the environmental and quality management issues for the integrating TQEM in the LFI.
3. To identify the national environmental factors relevant to the implementation of TQEM to sustainability in the LFI.
4. To identify the barriers to the implementation of TQEM for sustainability in the LFI.
5. To identify the motivations for the implementation of TQEM for sustainability in the LFI.
6. To identify the impact of national environmental factors, the barriers, and the motivations for the implementation and sustainability of TQEM in the LIF.
7. To propose a framework and processes for the implementation of TQEM in the LFI.

1.4 Rationale of the Research

Applying TQEM in this sector clearly has an effect on the improvement, support and enhancement of the competitive position of companies (Morath and Doluschitz, 2009, and Psomas and Fotopoulos, 2010). Accordingly, this research was conducted in a strategic productive sector (the food industry sector) in Libya.

Furthermore, as Libya moves from a traditional, closed economy to more modern collaborative methods, this will be a good opportunity to begin shifting the management methods of the key industrial sectors into more modern managerial thinking that is based on participation between all of the organisation's units. This should to create a better level of environmental and quality management and develop modern managerial techniques that can improve the quality of production and the protection of the environment. This study, appears to be the first which investigates the implementation of TQEM in Libya, in general, and the LFI, in particular. The level of such implementation in Libya has suffered from a decline in production efficiency and, also, from inefficient management. The researcher developed a framework for the improvement of the organisational performance of the LFI and the implementation of TQEM in this sector.

1.5 Research Methodology

In order to conduct the investigation of the research outlined above, the methodology that was adopted is as follows:-

1.5.1 The Literature Review

The literature review provides the context for the research and demonstrates why it is important. In this stage of this research, there is a need to build a theoretical context for the thesis and to determine which previous works have made a significant contribution to the understanding of the subject: TQEM.

1.5.2 Data Collection Methods

Two types of data were used in this research: secondary and primary. Secondary data are available and are used in order to obtain the necessary information that will be related to this study, such as a company's documents and reports. Primary data will include two main methods: interviews and questionnaires. Both qualitative (interviews) and quantitative (questionnaires) approaches were used to collect the data. Discussion on the data collected was used to develop a framework for the implementation of TQEM in the LFI.

1.5.3 Interviews

The researcher used interviews to study the current situation in the LFI and to identify the barriers and motivations for the implementing of TQEM. These interviews were conducted with the general managers and the managers of quality and operations departments in the LFI. This interview can provide practical assistance to the current situation in these companies in implementing TQEM, and can also provide a better understanding of the framework proposed.

1.5.4 Questionnaire

In this study, a questionnaire was used to obtain information about environmental and quality management issues, the national environmental factors, the barriers and motivations resulting from the implementation of TQEM in the LFI. The respondents are the managers at the three managerial levels, employees in three companies. A statistical package for social science (SPSS) was mainly used as a method through which to analyse the results of the questionnaire.

1.6 Novelty and Contribution to Knowledge

There is a noticeable gap in the TQEM research between the developing and the developed countries. There is thus a need to fill this gap and to consider the case of the developing countries in TQEM research. The literature has indicated that future research should study TQEM (Hasan, 2006; Juan and Jose, 2009; Bernardo et al., 2009; Khadour, 2010; Hsieh, 2012; Wiengarten and Pagell, 2012). For this reason, the current research seeks to contribute to the body of knowledge in TQEM, and since there is a lack of literature on previous studies, this one will use the case of a developing country (Libya).

Libya provides a suitable study area since it is looking to enter the global market as a producer. As its own domestic market is also opening up to foreign imports, its home producers will have to compete with those from the developed countries who have considerable price economies, higher quality and higher environmental standards from their full integration of TQEM into production. As yet, therefore, there is little acceptance in Libyan companies of the advantages that TQEM can bring, nor is there the acceptance of environmental responsibility in relation to production. To become a viable participant in the global market place, Libyan companies will need to adapt and change to come into line with the modern global standards that are being set by the developed world. The LFI, in particular, is likely to become one of the first in the country to wish to trade globally, so this provides an excellent opportunity for such a study. Adopting TQM and EMS at the same time results in cost saving, defect reduction, efficiency improvement, and environmental/quality improvement (Khadour, 2010). Using such systems leads to the improving of the corporate image; the gaining of marketing advantages; adaption to the requirements of customers and other stakeholders (e.g., the government and local communities) and the possibility to enter new markets (Berthelot and Coulmont, 2004; Benito, 2005). However, these possible benefits to company performance have not, as yet, led Libyan industrial companies to undertake the implementation of such production systems. While a number of authors analyse how to integrate these management systems (Karapetrovic and Casadesu, 2009), little research has, to date, been conducted in the developing world context and, as Bernardo et al., (2011) suggest, more research is needed on this issue.

This study contributes to proposals for ideas and insights for LFI managers through which to develop their implementation of TQEM while also considering environmental management and quality issues. The research also studies the national environmental factors, barriers and

motivations of TQEM implementation when they are compared with previous studies, and it seeks to reveal additional factors, barriers to and motivations for implementation that might have been neglected from previous studies. It is intended that this research will provide ideas and insights for LFI managers to encourage them to see the benefits that TQM and EMS can bring to them, and how the integration of TQEM will be of most benefit. Rather than seeing such production innovation as an unnecessary cost, it is intended to bring a more positive acceptance of this philosophy and also to provide a framework for them to use in order to develop their TQEM implementation, while also considering environmental and quality issues. By proposing a framework for the implementation of TQEM, while taking into account the current situation in the LFI, the framework will assist the LFI to overcome the difficulty in implementing TQEM due to the lack of any appropriate framework.

As the gaps in the TQEM research are identified, above, this research contributes to existing knowledge by facilitating both an understanding and the encouraging of the implementation of TQEM in the LFI sector. This framework will assist Libyan companies to increase their environmental performance and to improve the quality of their products and services. In addition, it supports their capacity to overcome the challenges and changes all over the world. It can also be used by the top management in order to face the significant changes in their management philosophy, attitudes and behaviours. It is intended to help Libyan companies to get started and to move gradually towards TQEM implementation so that the country can enter global markets. The framework will be developed based on the TQEM frameworks that have been advanced and examined in the literature, using the data produced from the first phase of the fieldwork.

1.7 Research Structure

The thesis is divided into eight chapters:

The first chapter is an introduction, which consist of the research background, the research problem and questions, the research's aims and objectives, the justification of the rationale, the methodology, novelty and contribution to knowledge, and the thesis' structure.

The existing literature is reviewed in Chapter Two – TQEM, TQM, and EMS, are discussed. An overview of the TQEM Integration and the linking of TQM with EMS is given. The barriers

and motivations of EMS and TQM are explained. The TQEM, EMS, TQM and sustainability, are addressed. Relationships between EMS and TQM are discussed.

Chapter Three – Conceptual framework – using the relevant literature, which was discussed in the previous chapter, the conceptual framework of this study is identified. This chapter, and also, described a set of broad ideas and previews the research concepts in order to make them easy to relate them to each other.

Chapter Four – Research Methodology – will deal with the research, in general, and the methodological questions that relate to the study, in particular.

In Chapter Five – Data Analysis by interviews –this chapter consists of the qualitative data that is derived from the semi-structured interviews conducted with managers in the LFI.

In Chapter Six – Data Analysis by questionnaire – consist of analysis of the data collected.

Chapter Seven – The research discussion and findings and the proposed framework are offered.

Chapter Eight- proffers the conclusions, outlines the thesis' contribution to knowledge, and suggests the possibilities for future work.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Organisations have devoted much time and money to achieving better performance through reducing operating costs, delivering high quality goods and improving productivity. However, it has been recognised that the separating of TQM & EMS functions could be counterproductive in achieving effective resource allocation (Granly and Welo, 2013). This has led to the development of TQEM by the merging of the two management concepts of TQM and EMS in order to create the new philosophy of TQEM. This brings together the two management concepts of TQM and EM so as to support the company's business and, in so doing, it aims to solve the previous competition between EMS and TQM (Khadour, 2010). It is hoped that TQEM will provide a solution for an effective interaction between EMS and TQM.

An EMS provides a structured approach to the planning and implementation of environmental protection measures. It is a tool for managing the impacts that an organisation's activities have on the environment (Griffith and Bhutto, 2008; Agyekum et al., 2012; Saad et al., 2015). Environmental management is brought into the company's operations every day, in order that long term planning and other quality management systems become integrated into the whole management system. To implement an EMS, an organisation has to assess the environmental impacts it makes, set targets to reduce these impacts, and formulate a plan to go about achieving those targets. The main function of environmental management is to encourage a business to start planning its environmental improvement and pollution prevention measures from within the organisation (Bernardo et al., 2009 and Hsieh, 2012).

The adaption of TQM enables companies to fully identify the extent of their operational activities and to increase customer satisfaction with a reduced resources consumption (Hellsten and Klefsjo 2000; Thorpe et al., 2004; Tang et al., 2005; Oakland et al., 2006). This, in turn, will help to improve the efficiency and productivity of quality (Wiengarten and Pagell, 2012). Since, as Heras et al., (2001) note, it improves sales and achieves higher profit, it also assists in reducing customer complaints. It also plays a significant role in improving the competitive position of organisations.

In the competitive environment, quality is now seen as a comprehensive view of production and not as a mere function of the production management and operations. It has become a competitive strategy and a basis for a comprehensive management philosophy, and it is embodied in legislation and practices. TQM provides auditable documentation and management systems that are linked to business and customer needs, which helps organisations meet the needs of their stakeholders systems (Wiengarten and Pagell, 2012). EMS provide a systematic, planned and documented approach to managing the impact of the organisation on the environment. By combining TQM and EMS they therefore form part of TQEM in that they provide the tools with which to improve performance through achieving a higher quality of production, lower wastage, higher efficiency, cost benefits and less impact on the environment (Saad et al., 2015).

This chapter highlights an overview on the TQEM and sustainability, EMS, and TQM. Thus, the historical background and the concept of EMS and TQM movement will be identified. Further, in this chapter the researcher will discuss the environmental management techniques and the environmental impact assessments. Barriers and motivations of implementing TQM and EMS, and the relationships between EMS and TQM will be reviewed.

2.2 TQEM and Sustainability

The concept of TQEM was suggested by the Global Environmental Management Initiatives (GEMI 1991) and the Council of Great Lake Industries (CGLI, 1993). TQEM consists of four paradigms:

> *"(a) Total: which involves the entire organisation, supply chain, and/or product life cycle, (b) Quality: designed to drive up quality through 'zero defect' definitions, (c) Environmental: strategic environmental management approach (d) Management: The system of managing through steps such as Plan, Organise, Control, Lead, Staff, provision and organise".*

As defined by the International Organisation for Standardisation (adapted from ISO: 8402, 1994), *"TQEM is a total applied systems approach and an integral part of a high level strategy"* .

TQEM means that the firm will be better equipped to develop a philosophy of continuous improvement, rather than other less ambitious strategies that are based on simply meeting certain requirements (Khadour, 2010). Since the term 'sustainable development' came to our attention in 1987 with the publication of the Brundtland Report, it has taken some time to be taken on by policy makers and then finally to filter down from national to individual business level. However despite its long journey, it has now been taken up and is being incorporated into the thinking, planning and operations of firms worldwide (Agyekum et al., 2012). The concept of environmental responsibility is now part of the thinking of all firms wishing to successfully participate in global commercial systems.

With the introduction of TQEM, it is now seen as being essential to also bring sustainable development (SD) into all planning and production, and rather than being seen as an individual and separate 'add on', it is clear that to be effective it must be incorporated into thinking, with TQEM as part of the same philosophy. The TQEM criteria for integration within a sustainable context, are essential elements in this debate (adapted from Hassan, 2006; Khadour, 2010; Hsieh, 2012) as follows:

• **Strategic management**: The company evaluates its corporate mission, vision and culture against the environmental goals, so that they can identify conflicts and bring all of their practices into line with their goal of achieving sustainability and TQEM. Both proactive and reactive strategy planning takes place to bring on board sustainability planning in a strategic approach in order to create an environmental management system.

• **Economic management:** With the goal of encouraging and performing green accounts, and balancing the economic and environmental sustainable designs within the EMS, investments in cleaner technology and production practices will have to be evaluated so that balance can be made between economic and environmental goals via EMS. This is usually achieved using the Life Cycle Cost Assessment (LCCA) tool.

• **Supply chain management**: It is important to manage the supply chain by looking at the life cycle assessments of products. This requires access to large amounts of information from both ends of the supply chain, which itself requires close co-operation and integration between the different participants in the supply chain. It is also important to develop and improve products

within the philosophy of environmental management, which itself requires an increased focus on co-operation between partners in the supply chain.

• **Production management:** To achieve the best environmental outcome and practices, investment in cleaner and more sustainable technology is required, along with the optimisation of production processes from an environmental point of view. This is becoming an increasingly important part of the management system.

• **Product management**: The introduction of Life Cycle Assessment (LCA) and LCCA as early as the design phase of products may be considered to be a key element of environmental management. The corporate environmental profile and the environmental profile of products are also becoming important in marketing.

• **Health and safety management**: health and safety issues should be integrated into environmental management activities.

• **Energy management**: this is usually effective in companies, but knowledge from this should be used to create an effective environmental management system.

• **Information management**: Valid information regarding sustainable performance is essential for efficient environmental/sustainable management and it should be incorporated into the corporate information system.

• **Quality management**: It is essential to have combined procedures for environmental and quality management and to embrace the principle of continuous improvement to achieve sustainability.

It is possible to incorporate TQEM into the LFI in the same management areas that are presented above. The main process is to identify and eliminate any waste, which equates to unwanted consumption of resources, and to generally look at all parts of the business and "do more with less and less" from waste, to transport, overproduction, quality, time and natural resources, while becoming closer to providing what consumers want (Khadour, 2010).

2.3 Environmental Management System (EMS)

The international organisation for standards (ISO) which was finalised in the Quality Management System (ISO 9000) in 1987. The success of this initiative worldwide has focused attention on environmental issues, and has contributed to the ISOs' decision to develop a set of standards that are directed to environmental management. The Strategic Advisory Group (SAG) was formed in 1991 by the ISO and, later, the Technical Committee (TC) 207 was formed in 1992. Their mission was to devise a set of standards for an environmental management system. As the ISO 9000 standards do not specifically address the performance of any product or service under consideration, the committee decided that, rather than address the standards they would look specifically at the process of production. TC 207 then established six sub-committees to oversee and guide the setting up and implementation of the set of standards. These included environmental management systems, environmental auditing, environmental labelling, environmental performance evaluation, life-cycle assessment, and terms and definition, along with a working group to look specifically at environmental aspects of product standards (Ting Peng, 2009; Agyekum et al., 2012; Saad et al., 2015). Governments have created administrative instruments for monitoring impacts on the environment but have based their standards on limits that are determined by the public (Jesson and Anderson, 1994). As a result, the first responses from businesses were reactive in nature, considering the standards to be imposed on them when their first requirements centred on compliance, risk mitigation and remediation (Hunt and Auster, 1990). As a result, most of their efforts were remedial rather than being proactive and preventative, with only limited use of the instruments. (Jesson and Anderson, 1994). The industry was thus not fully embracing the new measures or willingly building them into their practices in a positive way. I Instead of permeating all parts of the production process, environmental issues have been treated as discrete technical issues, which therefore need separate departments, dedicated staff, and their own policies and procedures (Hsieh, 2012).

The past decades have witnessed rapid economic growth worldwide, mainly through increased consumption. This has caused a deterioration in the environment through waste and over-consumption of natural resources. The results have included, in broad terms, global warming, depletion of the ozone layer, marine and river pollution, noise pollution, light pollution, acid rain and desertification (Ramlogan, 1997). Grunert (1993) suggests that as much as 40% of

environmental degradation has been caused by private household or residential consumption. Environmental degradation has now become a public concern in developed countries and has led to the rise of a green movement, which aims to preserve, or at least minimise, the human impact on the environment.

EMS was therefore thought up as a management tool to provide firms with the means to deal effectively with the environmental issues that have arisen as a result of their operations. EMS is effectively a voluntary, self-regulatory structure, in contrast to external requirements that are imposed on firms by government and other regulatory bodies. EMS is a framework through which an organisation protects, enhances, or reduces the impact of its activities on the environment by providing a system whereby it can set its objectives, measure targets, develop programs and activities, auditing, and evaluating its operation (Hsieh, 2012). EMS plans mostly revolve around a written environmental policy, with the requirement that employees receive education about environmental issues and concerns, that firms then conduct internal environmental audits, and develop systems to provide goals for internal environmental performance and associated indicators for their measurement (Savely et al., 2007; Chan, 2009; Chan and Hawkins, 2010). ISO 14001 has been most extensively adopted as one of the most widely used voluntary environmental initiatives. It was devised to be an international environmental management standard that would provide firms with a systematic framework for both compliance and continuous improvement in production. It is appropriate for a range of operations, including manufacturing and service provision, and it can also be used by government agencies (ISO, 2009).

2.3.1 A Brief History of EMS

The development of environmental management aimed to resolve environmental problems that are associated with industrial and business activities (Sroufe, 2003).There has been increasing pressure on industry to address not only the existing but also the potential environmental issues resulting from its production processes. This has progressively moved firms to consider broader environmental management and the effects on the environment that result from their decision making, rather than merely meeting regulatory requirements (Saad et al., 2015). This has had a significant effect on their own decision making. Etzion (2007) divided EMS's evolutionary processes into four main streams:

- **Industrial Environmentalism**

Corporate environmentalism was initiated in the 1960's around such issues as vehicle emissions and oil spills. In general, industry hoped that such problems were going to be solved by technological developments and did not integrate the idea of addressing the issues head on internally but, rather, treated them separately from operations and handed environmental management to areas along the production line of the organisation. The main focus was essentially on pollution control.

- **Regulatory Environmentalism**

The Environmental Protection Agency (EPA) in the USA was commissioned in 1970 to continue the development of environmental legislation. A regulatory framework and various structures were devised and embedded into organisations, but the result was that many organisational strategies became increasingly driven by government regulation and the approach of management became increasingly defensive. Organisations were reactive to the legislation rather than being motivated by genuine environmental concerns.

- **Environmentalism and Social Responsibility**

Between 1982 and 1992, the objectives of environmental responsibility developed from being concerned with regulatory compliance towards seeking economic efficiency. In this process, it was the costs of production that became key, but with increasing public scrutiny, concern over liability and the impact that meeting regulation requirements had on profits became more important than mere compliance with regulations.

- **Strategic Environmentalism**

In moving towards an environmental strategy, three main stages can be recognised. Firstly to prevent pollution; secondly, to carry out product stewardship, and, thirdly, to develop clean technology (Welford, 2001). Etzion (2007) made the suggestion that constraints on quality management could be used to meet the requirements of the strategy and that these should be both conceptual and empirical in nature. The implication of this is that companies' efforts to reduce the environmental costs of production might actually lead them to arrive at previously

undiscovered methods of increasing profits. This was a surprising finding, from the point view of regulatory environmentalism theory, but strategic environmentalism uses all of the information available about the costs and benefits of all parts of projects, thus taking a broader view.

In conclusion, the EMS evolution outlined above shows an increasing demand for a change in sustainable production practices . Driven initially by the need to meet regulatory requirements, businesses increasingly saw opportunities for improvement and cost saving through efficiencies and, at the same time, meeting with external approval, and reducing the costs of rectifying adverse environmental impacts. Over time, EMS became incorporated into the management decision making of organisations to gain economic benefits as much as to reduce the environmental impacts. Management was forced to look again at its practices and to anticipate possible environmental issues and liabilities that could adversely impact on the company, and this led to the development of environmental strategies in production that ranged from preventing pollution to manufacturing products with minimal environmental impact, to developing clean technologies to minimise impact. Over some 40 years, there was thus a fundamental shift in operational philosophy, which occurred as firms incorporated strategic environmentalism.

2.3.2 The Definition of EMS

In the last few years, the importance of an EMS has been recognised as being essential for organisations in all sectors of industry. EMS has brought great benefits for organisations, but it has also presented many challenges (Schoenherr, 2011). Most companies would accept that the environment is of concern to them. Indeed, most organisations seek to demonstrate their good environmental practice and to this end they engage in such activities as environmental reporting; providing end users' information relating to environmentally sound practices with their products; using certification such as ISO 14001 to demonstrate their environmental management system's standards, and making environmental policies available (Lawrence et al., 1998; Pagell and Fynes, 2012). Due to a general worldwide awareness of such global environmental problems as global warming and ozone depletion, management and control strategies have become the norm for companies since they aim to show that they are addressing the environmental issue so that they are well positioned to hold on to their global customers and also to be able to succeed in the more competitive and critical global economy (Meena,

2005; Haslinda et al., 2010). The purpose of EMS is to work towards minimising adverse environmental impacts throughout a company's operations. To enable companies to achieve this, EMS provides an organised approach for managing environmental issues. The main benefits of ISO14001 in the economic gain for companies, ranging over the cost savings of such elements as energy consumption, raw material input, management of waste, the reversal of environmental impacts and improved public image (Briggs, 2007; Mori & Welch, 2008). EMS work to help organisations improve their economic and environmental performance (Goh et al., 2006; Fortunski, 2008).

ISO14001:2004 defines Environmental Management Systems as:

> *"a framework that allows an organisation to consistently control its significant impacts on the environment, reduce the risk of pollution incidents, ensure compliance with relevant environmental legislation and continually improve its processes and operations".*

Another definition is given by the British Standards Institute (1994):

> *"the organisational structure, responsibilities, practices, procedures, processes and resources for determining and implementing environmental policy".*

Maier & Vanstone(2005) put forward the idea that an organisation actually benefits from having an environmental management system in place in several ways:

- It promotes a better understanding and awareness of the various legislative requirements which, in turn, leads to the development of compliance plans.
- It leads to the identification of potential ways to save costs through efficiency improvements.
- It provides a better understanding of production processes, so that greater control can be exerted which, in turn, can lead to a reduction in emissions and a lowering of the risk of pollution incidents.
- It enhances the public image of a company by enabling more detailed reporting and transparency, which is important as part of the public image of the company since other stakeholders, such as customers, insurers and local residents, feel they have access to the way the company operates and to its practices.

An EMS therefore formally lays out an organisation's commitment to environmental management and includes such goals as waste reduction, pollution control and energy and resource use. In setting objectives and targets which require a system of reviews of the company's environmental performance, along with clear policies, the EMS leads to companies being able to publish an environmental report. This then allows the documentation and comparison of the company's progress against both its policies and against the performance objectives and targets as laid out in the EMS.

EMS, as defined by Tibor and Feldman (1996, p.27) is:
"an aspect of an organisation's overall management function that determines and implements the organisation's environmental policy".

More specifically, in Hagler's model (1999), EMS can be viewed as: (1) review of current environmental opportunities; (2) objectives and targets setting; (3) action planning, and (4) monitoring.

Steger (2000, p.24) defined EMS somewhat differently as a *"transparent, systematic process known corporate-wide, with the purpose of prescribing and implementing environmental goals, policies and responsibilities, as well as a regular auditing of its elements"*.

Environmental management is seen as the management of the practices of an organisation to minimise the impact on the environment. The literature on environmental management shows some scholars defining it as a set of features. Thompson (2005) summarised environmental management responsibilities as including: (1) the minimisation of waste; (2) energy conservation and management; (3) the management of fresh water resources; (4) wastewater management; (5) hazardous substances management, and (6) involving stakeholders, such as staff, customers and communities, in environmental issues. Hart (1995) and Russo and Fouts (1997) developed classifications of environmental management activities under the headings of "pollution control" and "pollution prevention". "Pollution control" is focused on activities which aim to keep pollution levels within predetermined specifications, mainly to meet legal limits or norms. This hinges on the techniques employed for waste removal, its treatment and disposal, and, most usually, it specifies facilities to treat the waste or pollution after it has been generated. "Pollution prevention", on the other hand, is based on reducing pollution and preventing waste production before it has been generated, or at source. This therefore involves

implementing practices that will at best prevent, or at least reduce, the creation of pollution, using such measures as increasing raw material usage efficiency, energy and water with the intention of protecting natural resources by reducing the impact of production on them.

2.3.3 Environmental Management Techniques

There are several EM techniques that are discussed in the literature. The techniques outlined have strong relevance for the food industry. This is because they allow a LCA of production and processes by an organisation with the aim of introducing environmental improvements. A LCA provides a framework that consists of four separate components that are interrelated: defining goals, inventory analysis, an impact assessment for the operation, followed by its interpretation. The food industry, for example, might focus on one particular aspect of its production, such as quantifying the energy or raw materials required for production and comparing them to the environmental releases made throughout the whole life cycle of production (ISO 14040, 2006).

Using such tools can have benefits for companies that range from reducing the administrative load, assisting organisations in their decision making process about implementing environmental improvements, and planning their operations as they seek to achieve better environmental performance (Irhoma et al., 2014). However, in practice, an imbalance can occur between the different interests of the firm in terms of their impact, so that the interest of one element is favoured, while others may be overlooked or even excluded. This criticism is often levelled at EM techniques in general (Agyekum et al., 2012) and, clearly, if this does occur, then EMS techniques will lose some of their value as tools for forming alternative policies. The following table highlights the main techniques and role in integrating EMS.

Table 2. 1 Environmental Management Techniques

Environmental Management Techniques	Description
Life Cycle Assessment (LCA)	A cradle to grave approach to analysing the use of energy and materials and the environmental impacts of the product throughout its life-cycle. It allows an in-depth understanding of the utilisation of energy and resources as well as the environmental impacts which, in turn, allows the environmental performance of the product to be analysed.
Full-Cost Accounting (FCA)	Links the internal environmental costs (arising from regulatory compliance, etc.) with the external environmental costs (for example, use of non-renewable resources, waste disposal sites, clean-up operations) within an environmental accounting process. This result is a measure of the economic consequences in terms of environmental performance of production and can be shown in the accounting systems.
Life-Cycle Management (LCM)	LCM brings the philosophy of life-cycle thinking into a company's operations and product management. This can be done both up- and downstream and can be viewed qualitatively and quantitatively. Usually, the two streams are not normalised to a functional unit, as in life-cycle assessment. This method can then be applied to operations and product systems to manage and assess risk, as well as other opportunities, through the entire product life cycle. Mostly this is used along with a cost matrix.
Risk Management (RM)	RM offers a structure with which to guide operations so that risks and interruptions to the business are minimised.
Risk Assessment (RA)	RA evaluates risk associated with exposure to chemicals of ecosystems and all organisations, including humans. This provides a quantitative and qualitative identification of risk.
Auditing	Auditing checks compliance of the organisation's operations against regulatory requirements, its own internal polices, or any other standards relevant to the industry sector or in international practices. It provides information for third parties and the organisation itself about its management and equipment performance.
Environmental Impact Assessment (EIA)	EIA evaluates the effects, which may be both positive, beneficial, or negative, on the environment of the construction and operation of proposed development. It assesses the impact of the land use change on the environment and its people. This technique compares all the impacts, both beneficial and negative, of all the alternative courses of action available to the operator over the short, medium and long term.
Plan, Do, Check, Act Cycle (PDCA).	Plan: what you want to accomplish over a given period of time and what you need to do to get there. Do: what you plan on doing. Check: the results of what you did to see if you achieved your objectives. Act: once in possession of information, if it is considered to be successful, then put the plan into action by standardising it as part of the production practice. If it does not yet meet your requirements, then continue to seek improvements.

Source: Khadour, 2010 and Azorı́n, 2010

2.3.4 Environmental Impact Assessment (EIA)

EIA is a tool which assists in enabling sustainable development. By focusing on preventive mechanisms through identifying the risks that might possibly arise, and their effects, as early as possible (Fitzpatrick and Sinclair, 2009), and considering possible alternative methods by use of which to implement a project, EIA can work to minimise the impacts of operations and provide environmental protection. The process involves identifying potential risks, whether they be the environmental, social or health impacts of the proposed activity (Glasson et al., 2005) and it is therefore inter-disciplinary. Having identified the possible risks, EIA aims to measure objectively, both the damage that might be caused as well as the benefits derived from the implementation of a new activity. It then provides decision makers with full information on possible effects. Since it attempts to consider the planned activity from all possible angles and attempts to remain an objective survey of potential outcomes, we might suggest that the development of environmental standards from such a survey includes a complex set of independent measurements which can be used as a tool for sustainable development (Therivel and Morris, 2009).

The purpose of an EIA is to identify the possible consequences of an activity, which may be positive or negative. Through analysis, this allows decision making on whether the planned activity should be implemented, as well as helping to decide on the conditions of implementation (Therivel, 2010). The environmental effects caused by industrial activities are wide and various, both in terms of their risk to the environment and in terms of their scale. Not all activities require an EIA, but by using the format of an EIA to consider any activity, it can be seen that they fall into three different categories:

- Activities whose effect is insignificant. They cause no long-term adverse effects on either the environment and/or human health. Such activities do not require an EIA.
- Activities which may cause adverse effects on the environment and/or human health, but this risk is dependent on the way the activity is implemented, either at the chosen site or in using the selected technology. In such cases, an initial assessment of potential impact is needed, and, based on the results of such an assessment, a decision can be made as to whether or not a complete EIA is required.

- Activities which will have a significant effect on the environment and/or on human health are required to have a full EIA before implementation commences (Therivel and Morris, 2009).

The aim of the EIA procedure is to encourage firms to operate in an environmentally friendly way. This means using technology that minimises the negative impact on the environment, being reasonable in the exploitation of resources, but not preventing or significantly hindering the development of either the national economy or the industry. EIA is expensive to carry out. It is both a time and work consuming process, and so it is only to be carried out where significant impacts of industrial activity are likely or where there is the possibility of significant cumulative effects (Wärnback and Hilding-Rydevik, 2009).

If an early assessment identifies that the likely impacts will be insignificant or the choice of site for an operation is optimal, and will ensure the minimisation of impact on the environment, and also that the planned activities will not incite social protest, then a decision can be made not to apply the complete procedure of an EIA. In some cases, rather than undertaking a complete EIA, an assessment of the possible impacts on each environmental component may be undertaken. This may involve gathering additional information and performing individual studies prior to submitting the final project proposal. The data gathered allows project developers to make informed decisions of the best possible ways to move towards development in terms of the technological solutions, and most optimal use of technology, but also to devise impact reduction measures prior to implementation and to carry out environmental monitoring throughout the life of the project (Pubule et al., 2012).

2.3.5 Barriers to EMS

The barriers to taking up EMS must be recognised by firms in order to address them. Adopting an environmental management system is complicated and difficulties can be encountered at every stage. Any such difficulty, is, in effect, a barrier to implementation (Irhoma et al., 2014). They inevitably vary from one business to another, depending on the characteristics of the organisation, including things like size, business sector, or location of the business (Biondi et al., 2000; Gerstenfeld and Roberts, 2000). A review of the literature found no studies on

barriers that were specific to the food industry, although several studies were found in other fields (Chan, 2008 and Saad et al., 2014).

González (2004) noted that a lack of knowledge of the effective conservation measures within firms, along with limited staff availability, were key barriers which effectively prevented more participation in a survey of the directors of universities. They also identified barriers which act to prevent senior management in most universities from setting up conservation programmes, or selecting technologies and processes that would have the effect of minimising adverse impact on the environment. The barriers included such factors as, budgetary limitations, lack of knowledge of the new technologies available, limited institutional memory, an absence of performance measures and inadequate tools or knowledge to quantify environmental gains. Quazi (1999) also studied barriers to the implementation of ISO and EMS in Singapore, and he identified such factors as the complexity of ISO standards, the implications and effects of the legal requirements, a lack of incentives for implementation, the cost of implementation, a lack of management commitment, an absence of employee involvement, along with responsibilities among employees being unclear. Post and Altman (1994) also found significant barriers to trying to implement EMS in the resistance to organisational change. They came up with a two-part framework with: (1) industry barriers, and (2) organisational barriers. The first includes technical information, capital costs, the current set-up of operations, the pressures of competition and industry regulations. The second group, organisational barriers, include such factors as communication limitations, past practices, the attitudes of employees and limitations in leadership by the top management.

Irhoma et al., (2014) identified three types of EMS barriers in Libya (Resources barriers, leadership barriers, and political and external barriers). They indicated that the Libyan oil sector was suffering from many internal and external barriers and have no idea how to overcome them. This study noted that the Libyan oil sector has had to suffer political upheaval in recent times (the civil war and the uprising in Febuary, 2011).

All the studies above identified employees as being a major influence on both the adoption and effectiveness of EMS, in terms of their attitudes, involvement, knowledge and their understanding of their responsibilities. However, no assessment of how employees feel about EMS and its impact on them has, as yet, been carried out. A review of the literature strongly

suggests that successful implementation of EMS is dependent on several human resource factors, including top management support, implementation teams working between departments, the attitudes and involvement of employees. However, little literature exists on the impact of EMS on human resource factors in industry in general, though some studies exist which focus on employees and EMS in the hospitality sector. Most studies focus on the benefits of implementing environmental programmes or formal EMS, in which enhancement of staff morale and satisfaction are claimed as benefits (Poksinska et al., 2003; Rondinelli and Vastag, 2000; Granly and Welo, 2013). It is apparent therefore that many aspects of this issue remain to be explored in the academic and practical literature. These include how employees perceive both EMS and the positive / negative impacts of EMS on their jobs and working lives. There is a need for more qualitative and empirical studies in this area of EMS and the relationships of the specific organisational stakeholder – the employee, as these human resource factors may hold the key to EMS success, especially in the food business environment (Siu-wa, 2009).

2.3.6 EMS Motivations

As Glasson et al. (1999) have noted, various tools have been developed to assess, predict, and therefore to aim to prevent anthropogenic environmental damage. Among these are the EMS which are considered to be a key tool for organisations which have, or may have, an impact on the environment at any point in their product life cycle. Due to the fundamental importance of EMS, many different studies of the different motivations for the implementation of EMS have been conducted in a range of contexts worldwide, some of which are discussed below.

ISO 14001 offers a number of motivations for organisations' pursuit of certification. Compliance with regulations, along with increased market opportunities, active responsiveness to customer expectations, and a reduction of costs, as well as cost reductions and enhanced reputation (Granly and Welo, 2013). However, it must be noted that these are suggested by those promoting the adoption of the standard and so may not represent the actual reasons that firms decide to certify. Kirkland and Thompson (1999) studied the relevant literature and carried out a survey and analysis of some thirty-two Canadian companies, and surmised that, as a result of a lack of communication of practical experience, the expectations and benefits cited in the literature differed from the actual practical application of environmental management.

Many studies have been carried out worldwide to try to determine what motivates an organisation to implement an EMS. Quazi et al. (2001), in studying Singapore companies, managed to identify eight motivations that could be possible. These ranged across cost savings, responses to customer expectations and employee welfare which would directly benefit the company to enable the company to meet environmental regulations and to follow environmental office practices, concern over trade barriers, to increase the firm's competitive advantages , to top management concern. Surveying 300 Electronic and chemical industry companies, they only included 4 of the originally identified 8 motives, these were:

"*top management, employee welfare, compliance with environmental regulations and, following head office environmental practices*".

A Greek study by Evangelinos and Halkos (2002) made an assessment of the motives within Greek companies for the implementation of EMS. They firstly considered a set of 101 companies that were already implementing an EMS, and also looked at another group of 356 organisations which had taken the decision not to engage with an EMS. Of the four motives that were included in the survey, three were confirmed in those companies that had decided to implement an EMS. These included top management concerns, the recognition that there were opportunities for the company coming from its activities in respect of sensitive environmental issues and concerns. Hillary (1999) carried out thirty-three surveys of the implementation of EMS in UK small and medium-sized enterprises (SME's). He noted various expected benefits, both internal and external, which were the motivations for implementing an EMS. The internal benefits fell into three classes: firstly, those classed as organisational benefits, which would benefit the organisation itself, for instance by improving work and safety conditions, but also by improving the quality of the environmental information available. Then there were the cost savings and human resource benefits, which had a financial impact on the company, including employee motivation, awareness and upskilling with qualifications. The survey noted that, generally, routes of communication, knowledge, skills and attitudes in the workforce all improved. These factors were therefore seen as a driver or motivation for an organisation to take it on board. There were three main categories of external benefits. These included the commercial benefits to the firm, such as bringing in new customers or gaining some competitive edge, general environmental benefits with such features as improving their environmental performance, having better legal compliance; and, a better public image due to

improved communication. Since they were perceived as being benefits to the firm, many of these then acted as motivators for implementing an EMS (Hillary, 1999).

A similar study was carried out by Morrow and Rondinelli (2002) in five German small and medium-sized firms, acting in the domestic gas and energy arena, who had all registered their EMS under ISO 14001. The findings showed that the most relevant motivations were increased efficiency, improved documentation and record keeping, legal compliance, competitive advantage, improved image, enhanced employee awareness, improved environmental performance, and cost savings, in descending order of importance.

2.3.7 EMS and Sustainability

There are three EMS research streams that relate to sustainability: sustainable development and industrial ecology, strategy and corporate social performance, and environmental technology and innovation (Hassan, 2006; Khadour, 2010; Agyekum et al, 2012).

- **Sustainable Development and Industrial Ecology**

Bringing the concept of sustainable development into an organisation to underpin environmental management could mean that environmental management is like an ecosystem in an organisation. This ecosystem allows waste products from one industrial process to serve as the raw materials for another, thereby reducing the impact of the industry on the environment (Green et al., 2007).

- **Strategy and Corporate Social Performance**

The early research into business management strategy proposed that production should lead to enhanced socioeconomic welfare, with resources being utilized for broad social ends, rather than the more narrow interests that are focused on the goals of the firm (Khadour, 2010). This has led to measuring the environmental impact as a key indicator of corporate social performance (Hassan, 2006).

- **Environmental Technology and Innovation**

Technological innovation has been seen as the basis of significant, sustained, long-term improvements in environmental performance (Hart, 1995; Welford, 2002; Hassan; 2006). The environmental technologies were defined as: "*being any equipment, practices, product designs*

and delivery systems that can limit or reduce negative impacts on the natural environment". Environmental technologies can serve a number of functions in driving down operating costs, thus creating competitive advantages, and reducing long-term risks, (Khadour, 2010). The authors argue that being an instigator of environmental technologies can have a positive impact on firm-level financial performance (Hassan, 2006).

Environmental management practices have become an integral part of the operations managers and researchers who are moving towards sustainability management practices. Lubin and Esty (2010) concluded that the introduction of all areas of management that are underpinned by goals of sustainable development are embedded in company approaches. They concluded that sustainability is currently developing in a similar way to quality management, which was itself seen as a megatrend in the 1980s and 1990s and still continues to have importance today.

2.4 Total Quality Management (TQM)

Evans and Lindsay, (2001) believe that the whole idea and practice of quality started in ancient times but the modern ideas of quality began to develop with industrialisation and, in particular, with the appearance of the theories of Fredrick Taylor in the early 20th century in the USA. Furthermore, during recent decades, quality has become of key importance to organisations and this has driven many companies to engage with quality issues at a high level and to develop a new management philosophy and the practice of TQM. This has been used to underpin the organisation's quality strategies (Saad et al., 2015). This philosophy, based on TQM, has generated significant interest in several economies across the world (Najeh and Zaitri, 2006). Rather than being a cost to any organisation, good production and high quality have come to provide a competitive advantage for firms (Douglas and Judge, 2001).

The next subsection discusses the relevant literature on quality management and it is divided into six sections. The first two provide a brief historical background of the quality movement, and the concept of quality. Further, Section 2.4.3 presents a definition of TQM and Section 2.4.4 demonstrates Models of TQM implementation, while Section 2.4.5 considers TQM and ISO 9000. Section 2.4.6 discuss the barriers to implementing TQM. Section 2.4.6 discuss TQM and sustainability.

2.4.1 The History of Quality Management

Garvin (1988) divided the process of quality improvement into four stages: inspection, statistical quality control, quality assurance, and TQM. In this context, the most important stages, will be reviewed, from inspection to TQM.

- **The Inspection Stage (1920-1940)**

The function of this stage was to determine whether the products met the target standards in order to exclude the defective units. This stage was therefore described as a detection stage, or firefighting, which means that inspection happens only after the appearance of the defects (Hammons and Maddux, 1990).

- **Quality Control (1940-1960)**

Scientific means of quality control were used for the first time in the early 1920s when Radford published his book on the control of quality in manufacturing in 1922. This book can be considered as the departure point for viewing quality control as a separate entity or function within production and it developed as a department within the organisational structure in its own right, thus being responsible for quality control (Costin, 1994).

- **Quality Assurance (1960-1980)**

This stage began with the idea of total quality control (TQC) which was introduced by Feigenbum (1956). He focused on the principle of comprehensiveness in the practice of total quality control, which begins with the stage of product designing, and ends when the product reaches its final stage in the hands of the customer, who is satisfied with it at point of use. Accordingly, this stage focuses on the comprehensiveness concept and coordination among the management programmes, so it helped towards the development of the TQM concept.

- **TQM Approach (1980 until now)**

TQM is considered to be a new managerial concept; it arose in the USA in the 1980s as a result of low product quality when compared with their Japanese competitors. TQM is seen as a method giving organisations higher reliability (Abrahamsson, 2007), and so is a set of strategies that do not merely deal with issues and problems, but which improve organisational efficiency. Management theories have been developed over time, with previous theories being revisited and reworked into new approaches so that they have gradually evolved into better practices.

Abrahamsson (2007) likened this to a pendulum with glue swinging over earlier theories of management and picking up the parts that were felt to be useful, carrying these forward while leaving behind the less useful parts.

It was important to meet the customers' expectations and needs, both within and outside organisations, and it was necessary for all parties to cooperate in order to achieve these goals. As a result, quality management has now become a major force, contributing to the growth and success of organisations in both the national and international markets. Belle (2000) has also highlighted the role of quality management or, rather, he has recognised its important role in construction. Figure 1.2 shows the Historical Development of Quality Management in each of the decades since the 1920s.
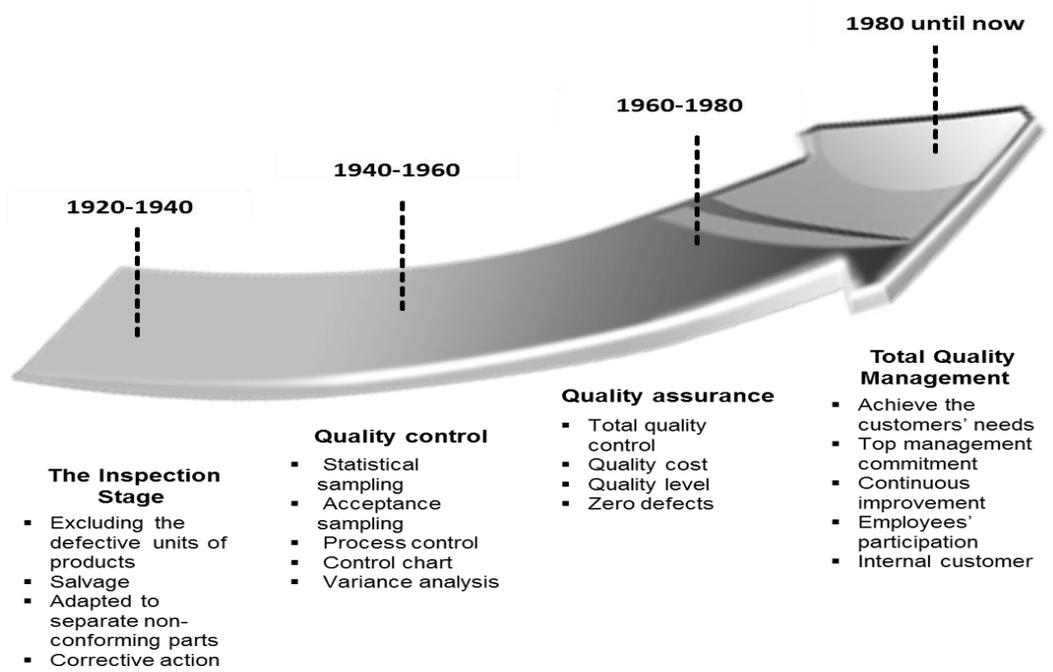
Figure 2. 1 The Historical Development of Quality Management, author (2013)

2.4.2 The Definition of Quality

Quality has been defined in several ways: *"excellence, value, and conformance to specifications"*. Deming (1986), however, has defined quality as *"meeting or exceeding customer satisfaction with the product or service"*. One major advantage of such a definition is that it encompasses all of the others in one way or another (Knouse, et al, 2009). Straker, (2001), said:

"Philip Crosby's definition is easily toppled. if requirements are wrong, then failure is guaranteed." He also added: "Though Juran takes a step further down the value chain, to the use of the product or service, he still presupposes that we can fully understand how the product will be used, which is a great challenge (and not always possible)".

According to Straker (2001)*: "Quality at its simplest level, answers two questions: "What is wanted?' and 'How do we do it?"* Juran (1988) defined quality as fitness for purpose and use. He classified five categories of fitness for use: quality of design, quality of conformance, availability, safety, and field use.

Ishikawa, (1985) makes a distinction between a narrow and a broad definition of quality:

"Narrowly interpreted, quality means quality of product. Broadly interpreted, quality means quality of work, quality of service, quality of information, quality of process, quality of division, quality of people, including workers, engineers, managers, and executives, quality of system, quality of company, quality of objectives, etc".

Taking the ideas from the above definitions, the current work concludes that, quality is defined, in its comprehensive meaning, as the criteria or number of requirements. Consequently, it needs continuous effort to develop and achieve the continuous improvement of performance in order to meet the customer's requirements and expectations. Quality is also the criterion that measures the degree of business achievement in a definite time and in a way that meets the customer's needs and expectations.

Harvey and Newton (2004), pointed out that it is difficult to define quality, because the concept is both a personal and social construct. They argued that quality is a perception. This is supported by Watty (2003), who argued that quality is not an absolute but is relative to each person's views and experiences and is context specific so that the criteria for selecting the attributes to measure are based on individual values and judgements. With these definitions in mind, if businesses ignore the quality of their products, they may pay a high price in lost time and increased costs, as well as lost customers, which may ultimately cause the project to fail.

2.4.3 The Definition of TQM

The understanding of quality in production has changed during the last 40 years. In the 1970s, it focused on inspection techniques for the identification of defective units, post-production. In the 1980s it turned to statistical process control and the catching of defects at the source, along with the evolution of the concept of quality assurance so as to do the right things correctly the first time. During the 1990s, quality management became one of the main issues for many companies and was embedded as TQM. It has been generally adopted throughout the world (Saad et al., 2015). There is a general consensus that TQM is a way of managing an organisation in order to improve its overall effectiveness in competing globally (Tsang and Antony, 2001). The benefits are found in having fewer defects, enhanced leadership skills; reduced costs, enhanced business competitiveness and a resultant increase in both market share and profit. There is also an associated effect in improved skills amongst employees and the achievement of greater customer satisfaction (Oakland, 2000; Dale, 2003; Mosadegh, 2006).

Most authors' definitions accept the notion that it is the customers who define quality, and so the term TQM is a body of practice that is defined by both quality theorists and practitioners in order to produce a quality product. TQM is, therefore, also a philosophy that will enable an organisation to consistently meet the needs of its customers, and this is accepted worldwide by manufacturing executives as a strategic concept for organisational survival (Nwabueze, 2001). However, many authors continue to produce their own definitions of the term. TQM therefore has many definitions, of which one of the most widely used is that presented by Oakland (2003):

> "*A comprehensive approach for improving competitiveness and flexibility through planning, organising and understanding each activity, and involving everyone at each level. TQM ensures that the management adopt a strategic overview of quality and focus on prevention rather than inspection*".

It can be noted, here, that; TQM is an approach that aims at continuous improvement so as to increase the competitive advantage, efficiency and flexibility of the organisation as a whole (not of individual parts). TQM is an approach that adopts the philosophy of mistake prevention, rather than of mere mistake detection. TQM can be defined in relation to the production as a company culture is characterised by reaching customer satisfaction through continuous improvements (Dahlgaard and Park 2006).

Brah et al. (2002) define TQM as:

> "*A set of guiding principles and practices, as well as a philosophy, which address not only the management of quality but also the quality of management.*".

Hellsten & Kldfsjo (2000), however, define TQM as:

> "*A continuously evolving management system consisting of values methodologies and tools, the aim of which is to increase external and internal customer satisfaction with a reduced amount of resources*".

It can be seen that this definition of TQM presents it as an approach that is aimed at creating an organisational culture which depends on both internal and external customer needs. To develop employees and to help them to be creative, and to be innovative through creating a culture between management and the workforce by working together, which helps to respond to the needs of customers' (internal and external) requirements and expectations.

TQM has defined by Dale (2003) as:

> "*A management approach that ensures mutual co-operation of everyone in an organisation and associated business processes to produce products and services that meet and, hopefully, exceed the needs and expectations of customers*".

Slack et al. (2007) has defined TQM as:

> "*TQM is a holistic approach to the management of quality that emphasises the role of all parts of an organisation and all people within an organisation to influence and improve quality; heavily influenced by various quality gurus it reached its peak of popularity in the 1980s and 1990s*".

In conclusion, from the review of TQM's definitions, above, these definitions focus on four shared elements: that TQM is a process of continuous management which is interested in developing employees; the use of quantitative ways to measure quality; and it focuses on customer satisfaction both inside and outside the organisation. The strategy on which TQM depends has also to achieve excellence everywhere in the organisation through creating the climate for employees to participate and through doing the job perfectly in the defined time, at the first attempt and always in order to realise continuous improvement so as to satisfy both the customers and employees. TQM becomes the basic cultural value of the organisation in order to give the customer high-quality products and services. The word 'customers' not only

refers to the buyers or users of products or services. It also refers to the customers inside the organisation, throughout the production process, who receive the product in production from the previous process or department. Hence, TQM includes all of the individuals who are related to the product or service inside and outside the organisation (customer relationship, the internal and external importer). Quality management happens through working with the customer, through approaching him so as to know his needs and expectations, and these inform the decisions of the organisation, thus making it customer driven.

2.4.4 Models of TQM Implementation

Evans and Lindsay (2001) also assert that quality awards have been developed by many countries in order to raise both productivity and quality awareness and to establish the exchange of information in the culture and encourage organisations to adopt quality and productivity improvement. Companies that adopted successful quality strategies in their operations have received recognition and have provided role models for other businesses in that country.

Awards are generally made annually in well run organisations that have also shown considerable improvement and high standards in both management practices and in their quality and systems achievements (Tan, 2002). The national quality awards vary in terms of the categories of award for different company sizes; specific awards for the manufacturing and service sectors; awards for not-for profit organisations; awards for different levels of excellence in TQM attainment. Tan (2002) shows that the management of the awards is usually done by government statutory bodies with examiners or judges chosen from both public and private business sectors. However, these models do not provide the solution to all problems and all models have limitations (Psomas and Vouzas, 2014). The main purpose of the present section is to discuss the models that are adopted by organisations in TQM implementation. The most common models, which will be further examined, are: the Deming Prize (DP), the Malcolm Baldrige National Quality Award (MBNQA), and the European Foundation for Quality Management (EFQM).

- **Deming Prize**

The concept of quality in production gained popularity from the time that the Japanese Union of Scientists and Engineers (JUSE) was established in 1946. They invited Deming to share his work on statistical process control and it was this that triggered the devotion to quality control

that has become embedded in Japanese industrial culture (Kathawala and Elmuti, 1991). So admired was his work that, in 1951, JUSE created the Deming Prize to honour his contribution to quality improvement and its impact on Japanese industry. The prize was accepted nationwide and the improvements in manufacturing quality elevated Japan's status in world quality (Zairi,1996).

The annual Deming Award is divided into two prizes, one is awarded to organisations, divisions and small enterprises that have achieved distinctive performance improvement, while the second is awarded to recognise outstanding contributions by individuals in the area of research and education (Evans and Lindsay, 2000).

Ghobadian and Woo (1996) have shown that the Deming Application Prize has a checklist containing ten primary factors:
1. Policies;
2. The organisation and its operations;
3. Education and dissemination;
4. Information gathering communication and its utilization;
5. Analysis;
6. Standardisation;
7. Control/ management;
8. Quality assurance;
9. Effects;
10. Future plans.

In considering organisations for the prize, their corporate quality control practices are assessed for whether they are practised systematically and effectively throughout the organisation (Ghobadian and Woo, 1996).

The review process is a lengthy and thorough one, and applicants need to be approved by JUSE consultants in order to be considered. In 1989, Florida Power and Light were the first company outside Japan to gain the award (Porter, 2004).

- **Malcolm Baldrige National Quality Award (MBNQA)**

The late 1970s and 1980s witnessed the dramatic slowing down of productivity in the American manufacturing sector. However, their foreign competitors, the Japanese, were well-known for the high quality of their products, so the focus on quality in American organisations evolved as several industrial and government leaders attempted to improve their position in the 1980s. These leaders saw that there was a necessity to do business in an ever growing, and more demanding, competitive international market, and so the United States Department of Commerce created the Baldrige Award in 1987 as a standard of excellence that would help US organisations to achieve world- class quality (Kathawala and Elmuti, 1991). Importantly, the goals of the award include the promotion of awareness of the relationship between quality and competitiveness, raising the understanding of the level of quality that is necessary so as to achieve world class recognition, and to encourage world class organisations to share information about quality (Bemowski, 1995).

- **The European Foundation for Quality Management (EFQM)**

The importance of self-assessment in improving organisational performance was first recognised in Europe after America had successfully introduced the Baldrige Award (Oakland, 2000). In 1991, the European Quality Award (EQA) was set up by the EFQM in partnership with the European Commission and European Organisation for Quality. The purpose of the award was to improve awareness of the importance of quality to the competitiveness of business and its resulting importance with increasing globalisation of markets as well as to the level of the standard of living of Europe's citizens (Evans and Lindsay 2001) and to also support, encourage and recognise the development of effective TQM by European organisations. Thus, EFQM has two declared missions:

> • To accelerate the acceptance of "quality improvement" as a strategy for attaining global competitive advantage
>
> • To stimulate and assist the development of "quality improvement" activities on a wide front (EFQM, 2003).

The award process is similar to both the Deming Prize and the Baldrige Award using customer needs and satisfactions, business results, processes, leadership, people satisfaction, resources, policy and strategy, and impact on society as its criteria.

The three different models of quality award discussed above provide a framework for evaluating TQM in an organisation. The models also provide a mechanism for identifying the intangible and tangible processes which can impact on the TQM and the end results of the organisation.

In conclusion, quality awards have been developed by many countries to stimulate an improvement in production and the quality of production and service, and also to assist in raising awareness of productivity and quality and to encourage the exchange of information on practices. These are generally made annually and are managed by government statutory bodies using both public and private businesses. The world recognised systems are operated by Europe, the US and Japan and they set the standard for assessing quality and practices within organisations.

2.4.5 TQM and International Organisation Standardisation (ISO) 9000

As part of the drive by organisations to improve the quality of their operations, there has been a move to introduce standards and guidelines for operation. Firstly, along with TQM organisations sought to improve their performance to reduce costs and provide better quality assurance for their products for their customers, both internal and external. ISO 9000 is an internationally recognised quality assurance and management system that will support an organisation to exceed any problems of quality. Paul James (1996) divided ISO 9000 into four types:

1- ISO 9001, a model for quality systems in design and development.
2- ISO 9002, a model for production and installation.
3- ISO 9003, for final inspections and tests.
4- ISO 9004, for quality management and quality system elements' guidelines.

The interest in quality, and the increasing worldwide interest in the implementation of TQM philosophy, and the attempt to provide what is needed to achieve success in this respect, led to the appearance of the acknowledgement of the importance of continuous quality development and the need for international standards that determine the quality of establishments (Rableitt & Bergh,1994). To meet these orientations and international interests, ISO 9000 was published in the second half of 1987, which came as an expression of the international interest in quality that depended on the basic idea that the quality of service enjoyed by a client is the result of

the quality of all activities, works, and raw materials (James, 1993). ISO 9000 is a series of standard features that determine the basic requirements of quality management systems in factories and services establishments. These standards are not the features of the product or service, for they include a number of elements and requirements which give the sample that ensures quality (Mcqueen, 1993). The existence of these requirements in any establishment having ISO 9000 means that this establishment is able to produce a high-quality product. This guarantees the fact that this establishment is registered with the ISO as an authentic provider that can be approached, in time of need, by companies as a high-confidence source (Rableitt and Bergh, 1994). ISO 9000, in this case, puts forward general guidance that helps organisations' administrators (managers) to put forward a perfect, document-supported system for quality management. The implementation of this system continues and it is reviewed from time to time. ISO 9000 includes the official operations and work requirements to guide employers. Its systems are divided into four levels or samples to guarantee quality when contracts with clients are made (Bounds, 1994).

There is a mixture between TQM concepts and ISO 9000. Some, especially amongst Libyan officials, believe that ISO 9000 and TQM mean the same thing , though these two are separate in meaning, content, and objectives. Each has its distinct conception, its basic elements, implementations, and distinguishing features as is shown in the following table:

Table 2. 2 The Comparison Between TQM and ISO

Comparison	TQM	ISO 9000
Basic Objective	Training and employing personnel in the establishment and their commitment to continually satisfy the client and offer better quality	To develop and review the administrative ways, procedures and the quality documents, and to be sure that employees abide by the work procedures and objectives
Basic Elements	Quality board; quality betterment teams; cost measurement; the training so as to create a culture of total quality in the organisation.	Quality policy; ways and procedures of achieving the quality elements and features; a continuous review of each element; a definite site.
Features	Covers the whole organisation at all its levels, jobs and operations. It emphasises the fact that all employees, clients, and importers are committed to taking part.	Internationally recognised; evaluation happens separately for each element; helps in creating a basic or general framework that can build the quality system.
Quality Responsibility	The quality is the responsibility of all employees from the head of the organisation down to the last one.	The quality is the responsibility of the quality management or department only.
Time Required	Needs more than 3 years to implement.	To get the certificate, the organisation needs from 18 months to 2 years.

Adapted from Rableitt & Bergh, The ISO 9000 book (New York: Quality Resources, 1994).

It is clear from the table above that TQM includes ISO 9000 as one system of quality management, and ISO 9000 is the starting point towards TQM. ISO 9000 is a step forward and it sets out official procedures as it looks for the fact that employees are committed to doing their jobs. However, TQM tends to push all employees to satisfy the client; hence, it tries to deepen a quality culture that depends on the technical and social systems and administrative procedures which pay much attention to the consumer and the employees' needs, as well as all the parties related to the organisation. This makes a complete system. It is clear that ISO 9000 represents a part of TQM. In this case, it cannot be said that these are synonyms, for getting an ISO 9000 certificate is not an objective of the system as is the development of the organisation to attempt to meet the requirements of the TQM approach.

The 2000 version of ISO 9000 represents a fundamental the shift from quality assurance to quality management is represented by ISO 9000 version 2000, which represents a change from a compliance based approach to quality to a system that also evaluates management techniques. This is accepted as a change from a technical-practical approach to a management one. Heras et al (2002) suggest that ISO 9000 offers a sound assurance to customers of the quality of products and services.

2.4.6 Barriers to Implementing TQM

Total Quality Management (TQM) has been acknowledged to have positive benefits including, on a macro scale, assisting in national competitiveness (Shaari & Nariai, 2005), and on the micro scale increasing company performance, increasing the market share, financial performance, and enhancing customer satisfaction (Al-Nofal et al., 2010 and Valmohammadi, 2011). However others argue that TQM does not have such positive effects with as many as two thirds of quality programs failing to yield improvement in organisational performance (Sebastianelli and Tamimi, 2003). Others blame the poor implementation of TQM, and yet others cultural differences (Shaari, 2007), while some argue that a poor understanding of the real intention and the implementation of TQM has resulted in poor results (Shaari & Nariai, 2005).

TQM is a strategy that enables organisations to obtain a competitive advantage, and it results in a change in philosophy and a holistic approach to achieving continuous improvement in all areas of operation. As such it has been described as being people-focused and customer-driven,

based on measurement of performance and having a well-organised operational methodology (Rahman et al., 2011). However while there are clearly benefits to this approach, the results of the implementation of TQM are mixed. It is necessary to consider the barriers that impede its effectiveness in improving performance within organisations (Khan, 2011).

Despite having great theoretical promise and being enthusiastically received, in practice, TQM programmes are not easy to achieve and their implementation is often unsuccessful, and variances in their success are well documented (Psomas and Vouzas, 2014). Huq and Martin (2000) reported high failure rates (60-70%) of those TQM implementation, based on 36 reviewed articles. However, it is generally noted that the un successful TQM implementation are not due to basic flaws in the principles of TQM, or to the quality of the program, but are mainly due to ineffective TQM implementation. Huq (2005) suggests various reasons for the failure of TQM implementation, but mainly points to the inability of management to implement a system that embraces all the company's operations.

This section gives a general idea of TQM barriers, next the researcher will explore the barriers to implementing TQM in the Literature in the global, demonstrate the barriers to TQM in Arabic countries. Finaly, the barriers to TQM implementation in the Libya will be discussd.

- **Barriers to Global TQM Implementation**

There are many models to explain the global implantation of TQM, and failures are thought to be linked to inadequate implementation. Salegna and Fazel (2000) noted, from a survey of barriers faced by TQM and non-TQM organisations, that there are three main barriers to be faced by TQM implementation: insufficient time, lack of communication, and lack of employee empowerment. For non-TQM organisations, the barriers include the lack of employee motivation, insufficient time, and the lack of strategic planning for change.

Sebastianelli and Tamimi (2003) reveal five underlying barriers to TQM, namely:
- The lack of quality planning;
- Inadequate human resources development;
- The lack of leadership for quality;
- Inadequate resources for TQM;
- The lack of customer focus.

Oakland(2000) mentioned eleven barriers that are reasons to implement TQM-as experienced by many companies. These are summarised as follows:

- The lack of management commitment;
- The lack of vision and planning;
- Quality become constraining;
- Culture changes;
- There is the creation of a quality empire;
- Management did not change;
- The people were not involved.

Macdonald (1998) and Frederick Hau (2000) agree with Oakland (2000). He summarised those barriers into seven critical points:

- A lack of management commitment;
- The world quality became constraining;
- A culture change;
- Quality management became bureaucratic;
- The people were not involved.

The major proponents of TQM (Deming, Juran, Feigenbaum, Crosby, Taguchi, and Ishikawa) have recognised the barriers to its implementation and have suggested several ways to overcome these and there are developed frameworks for effective implementation (Rao, 1996). Black (1993) proposed a model for TQM implementation in the service sector, with practical tools for program assessment, which is helpful, although the current study is mainly focused on the manufacturing sector.

While noting the barriers to the implementation of TQM, Ebrahim, et al. (2005) consider top management commitment to be the most critical barrier, as top management is the main controller of the production process, so that only if they are fully committed to TQM implementation, will there be a real chance of the barriers being overcome or even eliminated. Without such commitment, there will be (1) poor planning, (2) workforce resistance, and (3) a failure to change organisational philosophy (Ebrahim, et al 2008).This view is reinforced by Boon (2006), who noted that the main reasons for the failure of TQM were:

• Lack of top management commitment;

• Lack of an understanding of TQM implementation;

• Inadequate understanding of TQM measurement;

• Lack of understanding of continuous improvement;

• Ignoring the importance of customers' needs and satisfactions.

According to the discussion above, a summary of the major barriers to implementing TQM are therefore:

• Cultural issues;

• Lack of top management commitment;

• Lack of customer satisfaction;

• Lack of employees' empowerment;

• Insufficient training for all staff;

• Weakness of supplier relationships;

• Quality management becoming bureaucratic;

• Poor communications;

• Lack of support for employees; participation;

• Quality management became bureaucratic;

While it can be seen that there are important barriers to the implementation of TQM, including such factors as cultural change it is a top management commitment, which is seen by many to be of fundamental importance (Prajogo and Sohal, 2004; Irhoma et al., 2014; Saad et al., 2015), and they argue that the lack of top management commitment is the single main reason for the failure of TQM implementation. Masters (1996) also noted that the lack of top management commitment is a major factor that leads to ineffective TQM implementation. However, Doyoung (1998) went further and summarises, saying that due to the necessity to have total organisational commitment to the implementation of TQM, it is essential that the company fully understands what it takes to succeed and to achieve high performance.

Clearly, researchers are in part in agreement with the importance of top management's commitment to exact any real change and to effectively implement TQM, but other barriers must also be overcome, including changing the culture and practice both within organisations

and in their stakeholders, notably in their suppliers and customers. However, fundamentally it is down to the approach by top management to be willing and able to influence such changes of culture that enable TQM to be implemented and to be successful. This in itself requires a deep understanding of TQM and what it means to all areas of the business and also the benefits it will bring. Only with total commitment within an organisation will such a system be successfully installed and operated, and it is down to top level management to guide the change of attitude and the approach that is necessary in order to guide such a change.

- **Barriers to TQM Implementation in the Arab Countries**

TQM has been implemented with good results. However, several companies have experienced substantial problems in developing countries because of a number of barriers to TQM implementation (Ali, 2006). The critical role that management could play in improving their organisations was seen in the Arab world. However, there are very limited management initiatives and approaches in these countries and, mostly, such innovations fail in the implementation stage of an ISO 9000 quality assurance system (Jannadi and Al-Saggaf 2000: AI-Khalifa et al, 2000; Kadasah et al., 2000). Indeed, the study by AI-Khalifa and Aspinwall (2000) was the first empirical study on quality and TQM issues in the region. This was based on Qatar. It focused on examining the quality awareness and understanding of quality management issues within organisations without any structured approach to quality management in the country.

Zairi (1996) recognised that ISO 9000 registration was becoming an essential prerequisite for exporting to the European Union and this led several organisations in the region to undertake registration and to begin to assess their quality systems according to the ISO 9000 standards. Most of the Arabic countries participated actively in discussions, and had access to all the relevant documentation in the process of building the new ISO 9000 version 2000. Also noted that the general belief in the Arab world was that ISO 9000 registration would bring a miraculous improvement in competitiveness, although he stressed that this was a misconception and ISO 9000 is only a license to practice and therefore only one facet of the TQM philosophy, albeit an essential one, but it is insufficient on its own".

While some Arab countries are fairly industrialised, with a reasonable skills base, technology and infrastructure, often their industrial and export structures are not attuned to technology updating, and therefore their technological effort is weak. Often they do not have a well-developed internal culture and social life, which therefore impacts on the effectiveness of management within the organisation (Youssef 2006). Oakland (1995) identified that a good understanding of TQM is essential to enable its proper implementation, but Al-Kalifa and Aspinwall (2000) notes that in one study in the Arabian Gulf only 9 of 95 respondents had a good knowledge of TQM and its purpose. The majority of the respondents showed an awareness of the subject, but only 40 % seemed to understand it, and looking more broadly at different industrial sectors it was in the oil companies that the understanding of TQM was highest, followed by services and then by manufacturing companies, and small and medium companies showed a lower understanding of the philosophy than did larger ones. It is probable that the lack of understanding of TQM and a lack of quality management models and approaches in the region might be linked with the push for ISO 9000 certification since local firms, seeing the popularity of ISO among foreign companies operating in the region, and realising the need to find mechanisms to help their survival in today's highly competitive market, are considering implementing ISO 9000 standards to improve their international trade, particularly with the European Union (AI-Zomany, 2002).

There are a few models that are solely based on the (EFQM, Malcolm Baldrige) such as, in Egypt, Morocco, the Libyan National Quality Standrad (LNQS) and the Dubai Quality Model (DQA) of the United Arab Emirates. However, within Arab organisations, Amar and Zain (2002) showed that employees' attitudes are one of the greatest barriers to improving quality, and many firms found it very difficult to change employee attitudes in this area, believing that it is an added cost and so it could not be embraced by the workforce in general. Looking specifically at Saudi Arabia, Ajinah, 2010 identified the barriers as:

- A lack of understanding of the TQM concept;
- A lack of encourage employees' suggestions and participations;
- Not enough training for the employees;
- Inadequately assessing the customers' needs.

In conclusion, the largest barrier to implementing TQM in Arab countries is a lack of understanding of TQM, both throughout the workforce and within management, and a lack of top management commitment, as was generally found to be the case worldwide. However, in the Arab world, negative attitudes to the implementation of TQM were found, with the belief that it would bring extra costs and unacceptable commitment by employees. Little training has been provided and the lack of top management leadership in this area has failed to change cultures. However, management sees the need to improve the quality of practice and to bring production in line with ISO 9000 in order to gain the competitiveness seen in their foreign company counterparts working in the Gulf countries. The understanding is there that TQM can effect change and increase competitiveness as standards increase, but the will to change is lacking, both in top management and therefore as a culture throughout the organisations.

- **Barriers to TQM Implementation in the Libyan Industry**

TQM give organisation many benefits, but its implementation in the Libyan industries has faced difficulties (Hokama, 2008). The Libyan food industries are one type of the most important sector in Libya; success in implementing TQM programs in this sector has been very minimal and the barriers to the implementation of TQM programs are the focus of this research. This research intends to identify the barriers to the implementation of TQM in the LFI.

Libyan organisations, as with most other emerging economy organisations, are generally run with a lack of experienced managers, whose main interest is to guard their own existence at any cost. This means that the organisational culture is not so much focused on serving the public's needs but on serving the political and organisational leaders at the top of the organisation to ensure their support or protection when needed. As a result Libyan companies have done little to implement TQM and top management commitment and support is lacking, so there has been little encouragement for the implementation of TQM. Today, therefore, Libyan companies are seeking to develop managers and employees capable of designing and enacting changes which will improve the quality of operation and will impact significantly on the quality of products and services (Ministry of Libyan Industry, 2010).

While Libya has shown considerable improvements in its production practices in the past ten years, several studies (e.g., Najeh and Zaitri, 2006; Sayeh, 2006; Youssef, 2006; Hokoma and Khalid, 2008; Hassin, 2009; Hokoma et al., 2009; Graisa and Al-Habaibeh, 2011; Abd Rahman, et al., 2011; Irhomma et al., 2014) show that it is facing a number of barriers and difficulties that prevent its products from being sold in global markets.

There is not yet evidence that Libyan industry is able to produce goods of the required quality to successfully compete in such international markets. According to the researchers above, the barriers are:

- A lack of understanding TQM;
- A lack of top management commitment;
- Inefficient training in improving the quality;
- Low salary for all employees;
- Little encouragement for employees and their suggestions;
- A lack of resources;
- The organisation's bureaucracy;
- A lack of organisational cultural;
- A lack of customer focus;
- A lack of planning for quality.

Egnaibor, et al., (2002) have revealed that Libyan organisations' failure to implement TQM can be attributed to a range of factors:

- A lack of top management commitment;
- Little encouragement human resource management;
- Lack of organisational culture;
- Inadequately of innovation support;
- Insufficient training for employee;
- Research and development;
- Failure to identify makes up customer satisfaction;
- Lack of documentation & quality manuals;
- A lack of understanding of TQM.

In conclusion, from the studies in Libya, above, there appear to be no other studies concerning TQM in the LFI that focus on barriers to the implementation of TQM in Libya or ones that

propose possible solutions. For the current study, the implementation of TQEM will be examined in the context of Libya, and a consideration of whether the key barriers found in previous studies remain will be made. Alongside this, relevant solutions will be sought to enable the proposal of a way forward to implementing effective TQEM in such Arab countries. A framework is needed if the LFI is to face global changes that will have an impact on the development of Libya's industry. The LFI should adapt to these changes to take advantage of the opportunities and avoid any dangers that they present by taking some serious steps towards achieving these goals.

2.4.7 TQM and Sustainability

TQM's effectiveness and organisational performance can be measured by using a self-assessment framework of quality management, such as the European Quality Award (EFQM which have been developed to analyse processes, leadership, personnel management and business results, (Psomas and Vouzas, 2014). Sustainable development concepts are by their very nature, transformative, but it is necessary to be up to date and on track with implementing new approaches that are compatible with its philosophy (Agyekum et al., 2012). TQM provides the most recent and accepted approach to enabling this. How TQM can be a benefit to industry has been explained by Valmohammadi (2011). He set out to explain TQM in terms of the behavioural, ethical economic and power sharing ideology in which the society thrives. TQM as being much more than a tool kit or bag of techniques, but rather as the ideal condition that evolves from adopting the values. By putting Quality at the centre of its operations and planning and embedding it into the whole philosophy of operation, a company seeks to ensure the long life of the organisation. Since quality is defined by the customer, the environment in which it works is dynamic.

TQM and SD are very close, with their strong focus on ethical values and their continuous learning process in order to adapt to a changing environment. TQM can combine concepts of strategic management and sustainability and also be a platform from which to take the organisation forward (Khadour, 2010). As the complexities of organisations have grown along with their interaction with the environment, TQM provides the organisation with essential and trusted tools, such as the idea of team working, which has become a necessity rather than a mere choice, as the conventional methods of individual working and assessment have been moved aside in order that TQM concepts can be fully taken on board (Mehra et al., 2001).

Bagheri and Hjorth (2006) have proposed that the adaptability of an organisation is vital and comes from the need for continuous learning. From the environment to whether an organisation will survive in the long term, TQM is at the heart of decision making. TQM is therefore a philosophical concept, and will underpin the ethos and thinking of all parts of the business.

2.5 Relationships Between EMS and TQM

A company instigating an EMS will have undergone a philosophical as well as practical shift in thinking and operation and will be considering its organisation both in parts and holistically. This has striking parallels with Quality Management (Pun, 2006) and therefore EMS and TQM complement each other and, with increasing frequency, have been introduced together (Bernardo et al., 2009). EMS and TQM have also become strategic business issues in developing countries during the last ten years and the business benefits are being recognised. There are a number of links between improved environmental performance and the environmental management of operations and quality management. The TQM philosophy of prevention, or "right first time", has also changed with the development of the belief that prevention is cheaper than cure. The same philosophy is adopted by environmental management. So, quality management is seen as a way to enhance environmental performance by companies. This is noted by Klassen and McLaughlin (1993), as being a step towards environmental management excellence.

The implementation and integration of EMS and TQM systems has been analysed previously. Such implementation can be carried out in different ways in terms of the order of operations (Karapetrovic and Willborn, 1998): by establishing the TQM system first and then adding on the EMS system; by setting up the EMS system first and then developing the TQM system; Whatever the choice, it is necessary for the firm to decide on what level of integration they desire between the management systems. A continuum can be recognised from low integration, with two independent systems at one end, to full integration of the management systems at the other, where the two act seamlessly and can be considered as a single system. Firms will therefore fall between these two extremes, each showing its own level of integration. They are always striving to move towards integrated total environmental and quality management (TQEM) and are, therefore, beyond mere integrated systems for quality and environmental standards. Having TQEM will mean that a company will be better set up to develop a

philosophy of continuous improvement. They will be more advanced than those who merely have strategies to simply meet certain requirements (Tarı and Azorı´n, 2010). The integration of EMS and TQM has therefore become an important and popular focus of both research and practice (Zeng et al. 2005; Zutshi and Sohal, 2005; Griffith and Bhutto, 2008; Bernardo et al., 2009; Khadour, 2010; Hsieh, 2012).

2.6 Chapter Summary

Environmental management is a relatively new concept in operational terms, that requires firms to assess the environmental impact of their operations and act to prevent it at source. This requires assessment at the planning stage in order to anticipate and plan for any possible unwanted environmental impact. EMS was embedded into operational practice as a systematic framework through ISO 14000 to pre-empt impacts rather than forcing firms to meet regulatory requirements.

TQM seeks to improve the efficiency and productivity of through increased quality of production. This began in the early 20th century, and has evolved to be of key importance in all production today. It was in the 1980's that the operational philosophy of preventing errors to improve profitability took hold, and the introduction of international standardisation through ISO 9000 was important in making TQM an industry standard of assurance of quality of product and its production.

The chapter two of the theoretical part for the study have discussed. In this stage the researcher, discusses the relevant literature review on TQM and EMS to determine which previous work makes a significant contribution to TQEM implementation. Thus, the researcher identified the concept of TQEM, historical background of the EMS, and TQM movement. Further, the environmental management techniques and their impact assessments are discussed. Also, barriers and motivations of implementing EMS and TQM, sustainability and the utilization of TQEM, EMS and sustainability, TQM and sustainability, and TQEM and Sustainability were discussed, and relationships between EMS and TQM were reviewed. The next chapter presents the conceptual framework of the current research, including the method for effectiveness implementation TQEM in this study.

CHAPTER THREE: CONCEPTUAL FRAMEWORK FOR TQEM IMPLEMENTATION

3.1 Introduction

Based on the review of the TQEM, EMS, and TQM literature from both academic and practitioner sources in Chapter 2, this chapter aims to build up the theoretical framework for the empirical study for potential implementation of TQEM in the context of Libya. Douglas et al., 1994: 300 have stated that *"strong theoretical and conceptual frameworks are needed, integrating constructs from the different research traditions and disciplines"*. Such a framework is designed to serve as a guideline for the objectives of the current research, which necessitates focusing on specific variables and determining their statistical impact on the implementation of TQEM.

In this chapter, Section 3.2 will identify the deficiencies in previous TQEM studies. The following Section 3.3 will build on previous studies of the implementation of TQEM, the environmental factors required to implement TQEM. Sections 3.4 and 3.5 will clarify the barriers and motivations for TQEM implementation in the Libyan context. Sections 3.6 and Section 3.7 shows the Research Framework and method for effective implementation of TQEM in current research. Section 3.8 will summarise Chapter 3 and introduce Chapter 4.

3.2 Deficiencies in Past TQEM Literature

The deficiencies of previous TQEM studies will be identified and the way in which the present study will address these will be discussed. The most significant problems with the development and implementation of TQEM are as follows:

- Both Klassen (2000) and Hanna et al. (2000) state that if TQEM is to become the norm, top management must be willing to accept companywide implementation and to champion such developments. However, Curkovic and Sroufe (2007) have shown that there is a sometimes a claim, amongst top level management, of ignorance of such practices.

- The implementation of TQEM has been shown to cause costs to rise in the short term (Hanna, 2000) and it is because of this that Cost Assessment was developed by Curkovic and Sroufe (2007).

- Sroufe (2003) showed that when a company becomes more efficient this gives it an advantage over its competitors, if it is more environmentally responsible. However, there are also many cases which contradict this assertion and which have even resulted in negative effects (Klassen and Angell, 1999). A new approach that ensures the quality and environment of the end product would therefore make the implementation of TQEM more credible.

- Angell and Klassen (1999) and Ahmed (2001) support the belief the TQEM issues in production should be considered in the design phase in order to reduce the amount of waste that occurs, since such waste occurs as a direct consequence of decisions made during design. Sroufe (2003) suggests that there is no appropriate management framework to account for the environmental impact of designs in the production and design process. This is a major shortcoming and has resulted in considerable reworking and duplication in conventional project implementation. With the incorporation of TQEM at the design phase, lead times will be shortened, delays, disputes and claims too will be diminished and, as a result, costs are reduced.

- Curkovic (2003) has shown that managers need frameworks or guidelines in order to better understand TQEM and what it can bring to projects. However, much of the information on TQEM is either found within a legal framework or has been gleaned from case studies or even from anecdotal stories (Curkovic and Sroufe, 2007).

These possible shortcomings will be addressed in the current study by considering managers' and employee opinions and TQEM implementation through the national environmental factors, the barriers, and motivations for the implementation of TQEM for the LFI. The ultimate focus of this study is the difficulty the LFI's managers face in both implementing and managing TQEM, due mainly to the absence of an appropriate framework. Curkovic and Sroufe, (2007) suggest that for TQEM to be given serious consideration by management a process is needed for integrating TQEM that includes both business and processes in the design of a project. However, there appears to be a lack of any easy-to-use TQEM framework (Khadour, 2010).

3.3 National Environmental Factors for Implementing TQEM in the LFI.

In regard to the frameworks found in TQEM literature (Hassan, 2006; Curkovica and Sroufe, 2007; Khadour, 2010; Hsieh, 2012; Muftah, 2013; Saad et al., 2014) have revealed that the environmental factors represent a critical determinant of the implementation of TQEM. None the less, these frameworks have gone some way to addressing this issue through changes to technical and organisational culture (Ali, 2006, and Wang et al., 2012). However, one overriding consideration is that the extent to which organisations can use TQEM is the level of technology within a company. Those that are technologically advanced can engage in continuing product and service improvement or in advanced process management, while those with low technological advancement concentrate on customer satisfaction in order to achieve a competitive advantage (Wang et al., 2012).

TQEM can be described as the development of an organisational culture, TQM and EMS are part of the culture of an organisation that is committed to customer satisfaction through continuous improvement. In such a culture, resources, material and equipment are cost effectively implemented and fully utilized (Balzarova et al., 2006; Hsieh, 2012; Irhoma et al., 2014). The environment for firms is dynamic, uncertain and complex, which can create difficulties of uncertainty for organisations. However, should any firm ignore or be unresponsive to such factors, it is inevitably creating the potential for problems which can diminish their competitive edge. Since competition is created within their environmental factors, as the pace of change accelerates the necessity for managers to change their products and services grows (Wee and Quazi 2005). They derive their knowledge of customer requirements and the performance of their products from observing the environmental factors and then they can respond to changes using the customer data they have gathered. Further, firms must move away from existing customer needs and seek to satisfy potential needs as market volatility, competitive intensity and technological volatility increase if they are to maintain a competitive advantage (Subramanian et al., 2009).

TQM and EMS literature, reveals that there are some environmental factors that deserve special attention in developing countries which are aiming to achieve organisational objectives and to consider the possibility to implement TQM and EMS (Curkovic et al., 2008; Twaissi, 2008; Tarì et al., 2010). In Libya, as a context, the implementation of TQM and EMS is relatively

new as the culture and environment are different from those in developed countries which have already implemented TQM and EMS (Youseef, 2006; Hassin, 2009; Muftah, 2013). The Libyan government has looked for opportunities for Libyan organisations to expand into emerging markets at the same time as expanding their share in existing markets (Sayeh. ,2006; Youssef 2006; Graisa and Al-Habaibeh, 2011). So, managers in Libyan companies are attempting to examine the extent of TQM and EMS factors, awareness, and the difficulties facing its implementation towards TQEM (Saad et al., 2014).

The Ministry of Libyan Industry (2010) stated that:

"*Government policy and organisational culture are important national factors. There are limited efforts towards the implementation of any new managerial methods in Libya and yet there is a desire to develop an industrial nation that has been on the agenda for the past 10 years. This has led to invest in industrial plans and to encourage in education and up skilling of all the staff and employees to develop their knowledge and to have the technical capability and organisational culture of operating the Libyan industry*".

According to Youseef (2006) Najeh and Zaitri (2006) and Busnaina (2011), because of the high competition in the Libyan market, the Libyan industry should pay attention to competition and organisational culture, and this is reflected in the overall planning of quality and environment management efforts. These researchers have identified no evidence at present of the ability of the LFI to consistently produce the quality and environment that are required to compete at the highest levels in world markets.

The idea here is that everything matters in TQEM implementation. Not only the product and the customer, but everything in the environmental factors, including the technology, organisational culture, competition, government policy, and human resource. Accordingly, the significant role of environmental factors for implementing TQEM in Libya can be realised, and this is also applicable to other developing countries. In the particular case of this current research, TQEM can be impacted upon by different factors (Khadour, 2010;Wang et al., 2012). The current research intends to investigate TQEM implementation by studying environmental factors from the same context (Libyan/Arab context) and to investigate the correlation between this variable and the others. The research also focuses on specific factors and determines their statistical impact on TQEM implementation. The national environmental factors appear to be

an appropriate framework to adopt in studying the impacting of the implementation of TQEM in Libya.

The researcher considers that one of the major problems is the lack of consideration of the relevant environmental conditions at a national level, together with the often perceived notion that management is both ignorant of TQEM's benefits and is unwilling to implement it. In addition, the researcher considers the connection between technology and TQEM implementation, together with the needs that he perceives to increase the quality of the products that the LFI produces, and other factors that relate to the competition of that industry. TQEM and EMS are both related closely to the business culture of an industry and there are a number of factors, dealt with in this research, which have an impact here, as well as the environmentally related problems and benefits that TQEM/EMS may offer. In this study, five national environmental factors of TQEM implementation in the LFI will be investigated:

- Technical capability;
- Organisational culture;
- Human resource;
- Competition;
- Government policy.

3.4 Barriers for Implementing TQEM within the LFI

The literature review of environmental and quality management (Khadour, 2010, Hsieh, 2012; Irhoma et al., 2014; Saad et al., 2014) considers top management to be responsible for the design of environmental and quality management and, consequently, responsibility lies with them for any problems that arise, just as design failure can be blamed for many of today's pollution and waste problems. However the importance of supplier relations should not be ignored as they play an important part in a TQM company and can be used to compel organisations whose policies or products fall short, in terms of environmental integrity, to change their practices or lose business.

Although there are common issues, the ideas of what the barriers of TQEM are constituted by differ from one author to another. The current study has been based on informal interviews with managers in the LFI that is under research, and an extensive study of previous research on TQM and EMS, and so combines empirical investigation and the seeking of LFI experts' opinions (Biondi et al., 2000; Gerstenfeld and Roberts, 2000; Levy and Dilwali 2000; González, 2004; Najeh and Zaitri, 2004; Sayeh et al., 2005; Youssef, 2006; Abd Rahman et al., 2011; Moftah, 2013; Irhoma et al., 2014). The argument of this study was established, and this method served to reflect the key, up-to-date aspects of TQEM implementation within the LFI.

Although the development of Libya has shown a little improvement in growth improvements in the past ten years, there are many studies (e.g., Najeh and Zaitri, 2006; Sayeh, 2006; Youseef, 2006; Hokoma et al., 2008; Hassin, 2009; Hokoma et al., 2009; Graisa and Al-Habaibeh, 2011; Ab Rahman et al., 2011; Saad et al., 2014) that show that this development is facing several barriers and difficulties that restrict Libyan products from being sold in global markets. It appears that the LFI suffers from the applicability of some of those barriers:

- Misunderstanding of the implementation of TQEM ;
- A lack of top management commitment;
- A lack of support for the employee's participation;
- Insufficient training for all levels of staff;
- A lack in achieving a knowledge of customer needs and satisfaction.

According to initial fieldwork, to implement TQEM successfully, management commitment is essential through its instilling of the philosophy of TQEM throughout the organisation. An educated management team needs to be aware of what is needed in terms of skills and behaviour. However, it is necessary to introduce the practices that are needed to ensure these skills are developed and to ensure that better practices are implemented (Mellahi & Eyuboglu, 2001). Training is therefore fundamental to the successful implementation of TQEM, so employees are helped to understand TQEM principles and to implement the practices. However, it is also recognised that it is a difficult task for management to communicate TQEM effectively throughout their organisations (Saad et al., 2015).

3.5 Motivations for Implementing TQEM within the LFI

The motivations considered have been compared with the opinions of Libyan managers and then modified to be suitable to the Libyan context. The motivations for implementing TQEM in the LFI are identified through the initial fieldwork with Libyan managers in the LFI, the preliminary investigation and, also, with reference to previous studies on TQM and EMS in Libya (Sayeh ,2006; Hassin, 2009; Hokama et al., 2009; Ab Rahman et al., 2011; Graisa and Al-Habaibeh, 2011; Graisa, 2011; Ahmed et al, 2013; Irhoma et al., 2014; Saad et al., 2014). From this, the researcher has been able to identify five motivations and has compared these with the opinions of the Libyan managers, then modified them to suit the Libyan context for the implementation of TQEM in LFI. It has also been possible to use these motivations as a theoretical framework by use of which to investigate the quality and environmental initiatives in the context of Libyan production. In this study, five motivations of TQEM implementation in the LFI will be investigated:

- Cost saving;
- Increased production efficiency;
- The reduction of waste and pollution to the environmret;
- The reduction of energy consumption;
- The reduction of natural resource consumption.

3.6 The Research Framework of Current Research

There is evidence of the adoption of environmental business practices. Klassen (2000), and Curkovic (2003) have considered such changes from the normative or legal perspective and there is some evidence that TQEM can be considered as giving potential competitive advantage and improved public relations (Hassan, 2006). Curkovic and Sroufe (2007) showed that, for most companies, compliance is a useful stance, since it allows the firm to do what is necessary to comply with the letter of the law by having a practice in place, but it is essentially a reactive position, because it means that the firm addresses environmental problems only after they have been created. This is criticised as being ineffective because it does not attack the causes, but merely the symptoms (Khadour, 2010).

The framework of the current research is adapted from the models presented by some of the literature on TQEM, TQM, and EMS (e.g., TQEM: Karapetrovic and Willborn, 1998; Hassan, 2006; Curkovica and Sroufe, 2007; Khadour, 2010; Hsieh, 2012; TQM: Najeh and Kara 2006; Oakland and Marosszeky, 2006; Seraphim 2006; Youseef 2006; Hokoma and Hussain, 2008; Ajinah 2009; Hassin 2009; Morath and Doluschitz, 2009; Bernardo et al., 2011; EMS: Benito, 2005; Salomone, 2008; Karapetrovic and Casadesu, 2009; Tarı´ and Azorı´n, 2010). The framework is based on three main considerations which arose from nationa environmental factors, barriers, and motivations which impacts on the potentiality of TQEM implementation in the LFI. The framework (Figure 3.1) illustrates the areas of these three dimensions as well as the impacts on TQEM implementation.

The conceptual framework also represents an interrelation of the theories involved in the research questions. Here, the research questions are closely related to the extent of the framework, because it is designed to provide clear links between the literature, the research goals and the questions (Youseef, 2006). Accordingly, this current research requires a framework that explains the possible connections between its key variables.

As the current research aims to: (1) to investigate the implementation of TQEM in LFI; and (2) to build a framework for TQEM, which will facilitate its implementation in the LFI, it seeks to answer the following research questions:

1. What is the importance of integrating EMS and TQM into TQEM to improve the LFI's performance in moving towards sustainability?.
2. What are the national environmental factors, barriers, motivations for implementing and sustainability TQEM in the LIF?.
3. What is the proposed framework for implementing TQEM in the LFI?.
4. Which practical suggestions and recommendation are proposed to aid the LFI's preparations for TQEM implementation?.

Figure 3.1, shows the research questions which are addressed in the conceptual framework.
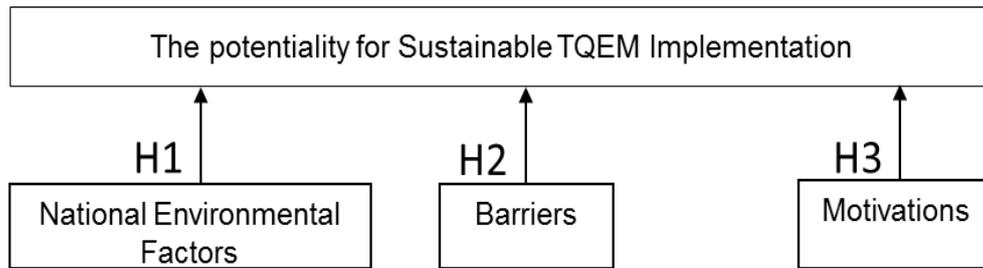
Figure 3. 1 Conceptual Framework for TQEM Implementation in LFI

Adapted from (Oakland and Marosszeky, 2006; Youseef 2006; Ajinah 2009; Hassin 2009; Morath and Doluschitz, 2009; Karapetrovic and Casadesu, 2009; Khadour, 2010; Hsieh, 2012).

As shown in Figure 3.1, The current conceptual framework illustrates Libyan environmental factors, barriers, and motivations for TQEM implementation in Libya, as a context. This research adopts the deductive approach, using qualitative and quantitative methods to investigate national factors, barriers, and motivations to TQEM implementation. From the literature discussion, therefore, the current research hypotheses to investigate are:

H1: The national environmental factors within the LFI that impact on the potential to implement TQEM.

- *H1a: Technical capability impact on the potential to implement TQEM.*
- *H1b: Organisational culture impact on the potential to implement TQEM.*
- *H1c: Human resource impact on the potential to implement TQEM.*
- *H1d: Competition impact on the potential to implement TQEM.*
- *H1e: Government policy impact on the potential to implement TQEM.*

H2: The barriers within the LFI that impact on the potential to implement TQEM.

- *H2a: A lack of top management commitment impact on the potential to implement TQEM.*
- *H2b: Misunderstanding of the implementation of TQEM impact on the potential to implement TQEM.*
- *H2c: Insufficient training for all levels of staff impact on the potential to implement TQEM.*

- *H2d: A lack in achieving a knowledge of customer needs and satisfaction impact on the potential to implement TQEM.*

- *H2e: A lack of support for the employee's participation impact on the potential to implement TQEM.*

H3: The motivations within the LFI that impact on the potential to implement TQEM.

- *H3a: Cost savings impact on the potential to implement TQEM.*

- *H3b: Increased production efficiency impact on the potential to implement TQEM.*

- *H3c: The reduction of waste impact on the potential to implement TQEM.*

- *H3d: The reduction of energy consumption impact on the potential to implement TQEM.*

- *H3e: The reduction of natural resource consumption impact on the potential to implement TQEM.*

It thus aims to test the research coceotual framework in relation to the potential of TQEM implementation. The qualitative and quantitative method is thus appropriate for examination within such a framework (Khadour, 2010 and Hassan, 2006). The justifications of the adopted methods and designs in the current research are addressed in Chapter 4. Further, the investigation of the framework, shown in Figure 3.1, is illustrated in Chapters 5 and 6.

3.7 Method for Effective Implementation of TQEM in this Study

There has been an increasing demand for the manufacturing industry to implement sustainable production policies. To meet such a demand, Environmental management plays an important role as part of the total quality management system of the company. To enhance the environmental management, the total quality management system has to be successfully implemented. In order to implement this managerial approach, businesses need to improve their understanding and practice at all levels of the organisation. The training of the workforce should be recognised by senior management in order to gain environmental and quality management enhancement, and priority must be given to satisfying customers as they are important stakeholders in all aspects of the operations.

How a firm establishes EMS and the approach it adopts may differ between different companies and fields. The relevant literature indicates that EMS approaches are advocated and some suggest that the development of EMS may go alongside the establishment of other management tools, for instance TQM. Such TQM programmes often use the Deming Model for quality management, which has four main phases: *Plan, Do, Check* and *Act (PDCA)* (Collins, 2000; Corbett and Cutler, 2000). Dennis (1997) identifies the cycle of PDCA as having the following steps:

- Decide on what needs to be accomplished over a given period of time, and identify what must be done to achieve this.
- Achieve what you plan to do. Start on a small scale with a pilot programme.
- Check the results of your actions to assess whether the objectives have been achieved.
- Act on the information. If you have succeeded, standardise the plan; if not, continue with the cycle in order to improve.

Sheldon and Yoxon (1999) have presented a diagrammatic representation of EMS. The typical structure of EMS specifications are divided into four parts: (1) *Setting up;* (2) *Planning;* (3) *Doing; and* (4) *Management review.* The details of these components are considered further:

(1) *Setting up* - Top level commitment, and an initial environmental review are essential to providing a foundation for EMS.

(2) *Planning* - The environmental impact of a business's activities should be clearly understood and firms should analyse the current environmental legislative and regulatory issues before setting out to devise an effective environmental policy. Having done this, objectives and targets should be set before an environmental management programme (is devised and set in place.

(3) *Doing-* This component requires both internal and external communication, including awareness of TQEM, motivation, the training of employees, good documentation procedures and operational controls. These three components are connected with the EMS auditing procedures that are needed to enable an organisation to keep track of its objectives.

(4) *Management review* - This stage requires a review of the EMS to be performed by top management. There are other EMS approaches in addition to those presented above *(Plan-Do-Check-Act; Setting up-Planning-Doing-Reviewing).* For instance, Hersey (1998) has indicated that EMS should include commitment and policy, planning, implementation, measurement and

evaluation, and review and improvement. This is very similar to the *Plan-Do-Check-Act* approach. It is also possible to view EMS as part of a wider and more encompassing management system for the whole of a company's production, incorporating organisational structure, responsibilities, practices, procedures, processes and resources for determining and implementing the firm's overall aims and principles of action regarding the environment. ISO 14001 puts into best practice the global EMS standard. EMS is a management system that includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining environmental policies (Siu-wa, 2009). The researcher has to choose the best method for effective implementation (PDAC).

3.8 Chapter Summary

This chapter builds on the previous two chapters and goes further to study the empirical literature of TQEM and use environmental and quality management practitioners' experience in developing the most important factors (that a company must do well in order to ensure the success of its TQEM journey). The literature reveals that every organisation has its own set of success factors and should use these as benchmark guidance for competitive performance.

From a comparison of empirical studies that have examined the relationship between the total quality environmental management (TQEM) and organisational performance and the empirical studies from Libya and other Arab countries as well as the TQEM Frameworks. Based on Quality Awards (Baldridge, Deming, EFQM model), five national factors, five barriers, and five motivations have been identified as being critical for successful TQEM in LFI. The results of this investigation suggest that addressing the framework will increase their chances of success within the Libyan context. In the following chapter, the methodological aspects of this research will be presented through discussing the methodological questions involved in TQEM research in general, and the issues pertaining to the study in particular.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 Introduction

The research methodology is formed from the methods through which the research is undertaken and this needs to be both explained and justified in order to understand the underlying reasons for which the methods were adopted.

The methodology includes a number of aspects, including the theoretical and philosophical assumptions on which the research is based. The stance that has been taken, or the underlying theories and philosophy, will have implications for which methods are being used (Saunders et al., 2007). The current chapter presents the methods and techniques which were used to guide the data collection process for this research. This chapter identifies the main research methods used in this study to investigate TQEM implementation in the Libyan food industry.

Essentially, two types of method were used in this research: both quantitative and qualitative, in order to collect the data, utilising semi-structured interviews and questionnaires. Semi-structured interviews aim to study the current situation, to identify barriers and the motivations for implementing TQEM in the LFI. Questionnaires aim to investigate the implementation of TQEM in the LFI with regard to environmental and quality issues, national environmental factors, barriers, and motivations. This chapter is therefore organised as follows: the research design is previewed, the adopted research strategy and research methods are explained, and justifications for the usage of qualitative and quantitative methods and data collection methods are also provided.

4.2. Research Design

Yin (2002) pointed that the research design is "*an action plan for getting from here to there*", Where "*here*" is the initial set of questions posed, and "*there*" is the set of answers or conclusions that the research arrives at after addressing these questions. The design is essentially structured in such a way as to answer the research question, but how well it is able to do this depends on how well the research problem is understood (Churchill and Iacobucci,

2005). Research design should naturally arise from the questions and lead to the production of data that will help to answer them. The design thus forms the basis for empirical research, and includes the collection strategy, through which the sample is to be derived, its size, and the means for collecting the data and then analysing it (Punch, 2000). In the current research, the design was constructed step by step, to link the whole of the research, see Figure 4.1, which depicts the research design with the choices that were driven by the research aim and objectives. More details about the chosen research design will be given in the following sections.
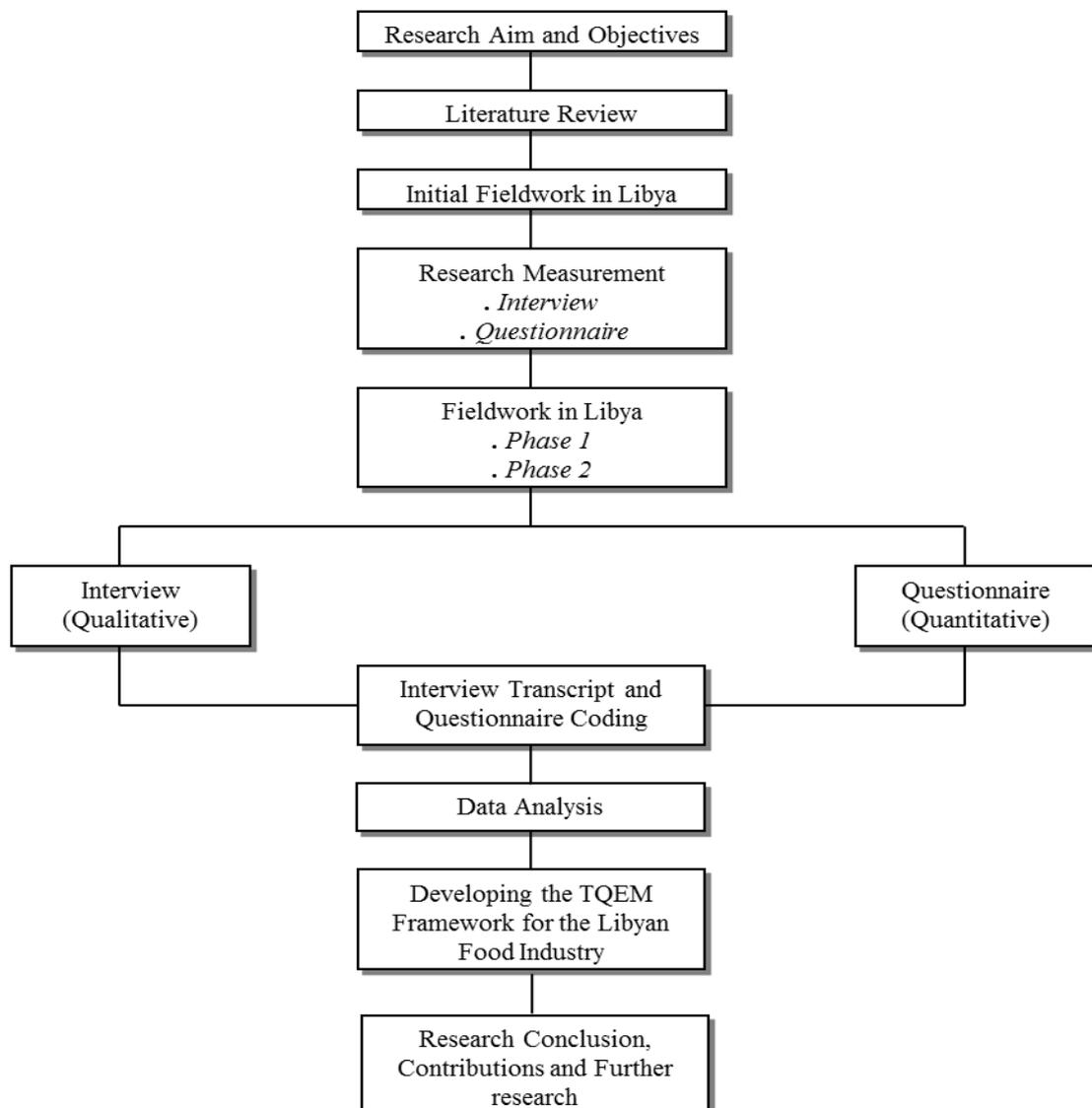
Figure 4. 1 The Research Design

4.3 Research Strategy

Saunders et al (2007) suggest that the research strategy is a "*general plan of how the researcher will go about answering the research question(s)*". The current study has adopted four research questions following the literature review, semi structured interviews, and a questionnaire survey. The reasons for adopting these strategies are presented in the following subsections.

4.3.1 Literature Review

The first research question- "What is the importance of integrating EMS and TQM into TQEM to improve the LFI's performance in moving towards sustainability?", the second question, "What are the national environmental factors, barriers, motivations for implementing and sustainability TQEM in the LIF?" are essentially descriptive. Punch (2000), sees a descriptive study as one which intends from the outset to collect data and information, to organise it and then to analyse it in order to summarise the information gathered about the research topic. It therefore aims to find patterns and explanations for the subject matter so that what at first appears complicated becomes understandable.

In order to answer these research questions the relevant published documents and reports were reviewed. The researcher therefore discusses the relevant literature on TQEM, EMS, and TQM to determine which previous works make a significant contribution to TQEM implementation.

4.3.2 Semi Structured Interviews

The first research objective is: "to explore the current situation in the LFI in comparison with other competitors in the Libyan market" This objective is exploratory in nature. It was therefore decided to adopt semi-structured interviews to try to achieve this objective and to explore the current situation relating to quality techniques, with a comparison with other competitors, the machinery, and to identify the expected barriers and motivations for implementing TQEM in the LFI. The sample of interviews chosen were with sixteen managers from three LFI companies (four top management, six middle managers of the quality and operations departments, and six lower managers of the quality and operations department). Semi structured interviews tend to produce more detailed information if compared with questionnaires because of their discursive nature, in which the interview subjects produce

additional information and further detail than was expected. This is something that questionnaire cannot do. In the area of TQEM implementation, some researchers have used semi structured interviews to develop their TQM and EMS implementation frameworks (e.g., Youssef, 2006; Ajinah, 2009; Hassin, 2009; Khadour, 2010; Tarı and Azorı´n, 2010; Hsieh, 2012; Irhoma, 2014). The current researcher was thus of the view that semi structured interviews should be used because they might produce more detailed information and would enhance the collection of secondary data on the LFI. The results obtained from the semi structured interviews are used to develop a framework of TQEM implementation that takes into account the current situation in the LFI.

4.3.3 Questionnaire

A questionnaire was used to collect the data, and this is the most common instrument used to collect primary TQEM-related data (Khadour, 2010). In the area of TQEM implementation, many researchers have collected data relating to TQEM using questionnaires (e.g., Hasan 2006; Youssef, 2006; Ajinah 2009; Hassin 2009; Khadour, 2010). A questionnaire is often recommended when the objective of the research is uncomplicated and clear (Bourque and Fielder, 1995), so it was believed that, this being the case for the current research, a questionnaire would be the most suitable approach. The sample to whom the questionnaires were given was conducted with 62 managers and a sample of the employees (518) from the three companies in the LFI. The selection of the questionnaire was necessary to collect information from a large number of employees and this reflects their responses and reaction towards TQEM implementation. Appropriate statistical methods were used to analyse the results of the questionnaire. The Statistical Package of Social Science (SPSS) was used, mainly to analyse the results.

4.4 Research Method

Empirical research has two main types:, qualitative and quantitative investigation. This research has adopted both qualitative and quantitative methods due to the type of information being gathered and in order to provide more reliable and valid information. Qualitative methods investigate in depth case studies without the collection of large numerical data sets which can be analysed using statistics, but instead they rely on oral responses from respondents in an

interview, and these respondents have detailed knowledge and understanding of the case subject and therefore provide subjective meaning. Quantitative research, on the other hand, involves study samples and populations. It relies on the collection of large numerical data sets and their statistical analysis. The two research styles are commonly considered to be two alternative approaches (Bryman, 2012).The two are often seen as being complementary, because quantitative methods often provide important insights into factors that underlie qualitative data and that assist in interpretation, thus giving a greater depth of insight. Quantitative methods rely on a specific enquiry into a problem in order to produce numerical data which can be analysed statistically.

4.4.1 Qualitative Research

Qualitative research has been defined as "*any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification*" (Corbin and Strauss, 2008). Qualitative research has a very different purpose to quantitative research. The results provide in-depth, detailed information that can give great insight into the problem being studied, and can lead to new hypotheses, theories and even directions of study (Tracy, 2010). However, it is advised that researchers should use caution in discussing any implications or making generalisations from the findings. Malterud (2001, 486) explained, "*The findings from a qualitative study are not thought of as facts that are applicable to the population at large, but rather as descriptions, notions, or theories applicable within a specified setting.*" The researcher should therefore take into account all aspects of the sampling and data collection and assess the rigour of that data collection in order to assess the extent to which generalisations or the transfer of findings can be made.

Within this approach, many traditions and practices have developed so that different practices have become accepted in order to deal with the data collected (Saunders et al., 2003). The relevant literature supports the collection of qualitative data by several different methods including, for example, in-depth and open-ended interviews, direct observation and written documents. Interviews provide data in the form of direct quotations from individuals regarding their experiences or opinions, along with their feelings and knowledge of the context. Direct observation provides detailed descriptions of staff behaviour and interactions. Document analysis provides extracts from documents, correspondence and records (Labuschagne, 2003).

Qualitative research provides a great variety of data from many sources, including face-to-face or phone interviews, focus groups, videos, observation, diaries, or historical documents (Corbin and Strauss, 2008). Such findings are usually generated through inductive processes – and range from the most detailed information to more general impressions (Bamberger et al., 2006). The most common technique used is that of thematic analysis, which involves:

- Firstly gathering an overview by looking at the data several times, for instance, by reading and re-reading manuscripts;
- Seeking out and identifying patterns and themes. These may be common statements or ideas that arise within the data sources;
- Reorganising the data according to the themes identified.

4.4.2 Quantitative Research

Quantitative methodology, on the other hand, attempts to quantify social phenomena and does so by collecting and then analysing numerical data. It aims to focus on any links between a smaller number of attributes across many cases (Tuli, 2010). Creswell and Clark (2007) suggests that quantitative methodology is the traditional, the positivist, the experimental, or the empiricist paradigm. This approach views reality as 'objective', because in this way it can be measured objectively. Commonly, this measurement is done by gathering data using a questionnaire, which is probably the most common method in social sciences, or a similar instrument.

In the TQM and EMS literature, there is much research that has used a quantitative method with which to investigate the contribution of TQEM, TQM, and EMS implementation (e.g., Karapetrovic and Willborn, 1998; Dale, 2003; Oakland, 2003; Wee and Quazi 2005; Hassan, 2006; Youssef, 2006; Curkovica and Sroufe, 2007; Ajinah, 2009; Bernardo et al., 2009; Hassin, 2009; Morath and Doluschitz, 2009; Khadour, 2010; Juan, and Jose, 2010; Nee, 2011 Hsieh, 2012). Generally, this research has tended to adopt quantitative methods, because researchers have wanted information that is based on extrapolating from a sample to a general population. Similarly, the quantitative method is used in the current research, where it was conducted with the managers and a sample of employees in the LFI, to produce representative findings that can be generalised to the Libyan industry. The quantitative method is therefore appropriate for investigation of TQEM implementation.

4.5 Research Context in this Study

The empirical research was conducted on one of the important sectors in Libyan industry (LFI)-which consists of 15 companies. The sector was selected because (1) the food industry in Libya represents about 25% of the total income of Libyan industry; (2) some sectors have received investigative treatment, such as the Oil, Electricity, and Cement industries, whilst food industry has not been researched significantly comparing with oil and heavy industrial sectors; (3) the importance of this sector as Libyan government support non-oil industry; (4) the originality and uniqueness of the research means that results will contribute to the development of both Libyan managers and organisations. Previous study investigations have neglected environmental management and the impact on the environment of such industry production (Saad, 2014). As such, in developing countries approaches are characterised by the use of methods that are no longer followed in TQEM practice, and that have become normalised in those countries.

It is important to note LFI are distributed across the four geographic regions of Libya (northern, eastern, western, and southern), subsequently posing implications in terms of time (PhD program time schedule) and the cost of fieldwork (scholarship funding). Therefore, food industry companies were selected in the eastern region of Libya. Furthermore, given the focus of the research, only the large companies in this region were studied, given that environment and quality management in larger companies, as a process and as departments, are more established than in smaller companies (Duffy, 2004). Table 4.1 shows the characteristics of the three selected LFI in eastern Libya, covering five main features: company name, type, standardisations, and manager and employee numbers.

Table 4. 1 The Characteristics of the LFI

Companies	Type	Standardisations	Top	Mid	Low	Employees	Total
Al Rehan	National	ISO 9000 & LNQS	3	4	10	300	317
Bou Attane	National	ISO 9000 & LNQS	4	6	10	650	670
National Mills and Fodders	National	LNQS	5	5	15	150	175
Total	**All national companies**	**Two companies have ISO 9000 & LNQS. One company has LNQS**	**12**	**15**	**35**	**1100**	**1162**

4.6 Data Collection Methods

There are two types of data collection available to the researcher, namely secondary and primary. Secondary data involves pre-existing data which has been collected by another, third, party, and this may be in the form of documentary material, such as books, journals and reports, or may indeed be in a non-written form, such as television programmes or CD-ROMs (Saunders et al., 2007). Primary data is that collected by the researcher themselves. In the business context, this frequently takes the form of questionnaires and interviews, but may also be personally recorded data in numerical form. Silverman (2001) also distinguishes the two distinct data survey types as being quantitative and qualitative. In the current research, secondary data was obtained from many sources, which can be classified as:

- Paper sources: books, journals, research reports, conference papers, PhD theses and government reports.
- Electronic sources: the following online data bases were used :
1- Science Direct
2- Emerald
3- Business Source Complete
4- International Bibliography of the Social Sciences (IBSS)

Primary data that is being collected for the specific research problem at hand uses methods that are specific to the research problem (Hox and Boeije, 2005). Such data can be collected in any number of ways but, in the context of business research, the commonly used methods are questionnaires and interviews. The current research used semi-structured interviews and a self-administered questionnaire. These methods were selected for a number of reasons:

- The questionnaire was used to gather information that was necessary to describe the current application of TQM and EMS within the LFI, while interviews using a limited number of respondents allowed an understanding to be gained of the practices currently being adopted.
- Using multi-methods of data collection makes it possible to carry out some triangulation (Leedy and Ormrod, 2001). This is "*the use of two or more independent*

sources of data or data collection methods within one study in order to help ensure that data are telling you what you think they are telling you". (Saunders et al. 2003),

- Creswell and Clark (2007), cite several advantages that arise from the use of triangulation: it provides an opportunity to bring together findings and to compare them against each other, so that any complementarity can be identified, and it broadens the study and adds depth.
- It is possible to carry out such triangulation by comparing the information gathered in semi-structured interviews with the data collected from questionnaires (Saunders et al., 2007).

The data collection methods decided upon can then be administered in order to gather the information and data which forms the basis of the research.

4.7 Semi-Structured Interviews

One of the most used forms of data collection in qualitative method evaluations is the interview (Bamberger et al. 2006). In this method, the interview is carried out to gain information on the issue of interest (Sekaran, 2003). An interview has been defined as a means of collecting data with the purpose of finding out what participants think, do or feel about the topic in question (Hussey and Hussey, 2006)

The literature on TQM and EMS shows that the qualitative data in other studies has been collected using several data collection tools, such as semi-structured, structured and unstructured interviews (Labuschagne, 2003). Semi-structured interviews are carried out when the researcher has a predetermined set of questions or themes that he wishes to explore, and then the interviewee discusses these in turn, expressing his experiences, feelings and knowledge of each area on the schedule. The interviews may vary from interview to interview as they are designed by the individual researchers to suit their own study. The results are largely descriptive and qualitative in open interviews, but if the questionnaires are based on standardised or identical sets of questions, then the results will lend themselves to quantitative analysis (Saunders et al. 2007). Unstructured interviews are adopted in exploratory studies in order to gain insight into a new area or topic on which the researcher wishes to gain insight.

The type of data collection methods selected therefore depends on the research's objectives (Leedy and Ormrod ,2001). For that reason, in the current research, semi-structured interviews were used. The semi-structured design is appropriate for the interviews for this research, because the interviewees (i.e., quality managers) were asked about what they actually recognise regarding:

(1) the current situation of their companies;

(2) the quality techniques used, although this was not to glean their opinions about it, as this may require the conducting of in-depth interviews;

(3) semi structured interviews are the most suitable for exploring and explaining themes that have arisen from the administering of a questionnaire. Saunders et al. (2007), have identified that "*semi structured interviews are used not only to reveal and understand the what and the how but, also, to place more emphasis on exploring the why*".

4.7.1 Method for Semi-Structured interviews

In this research, a qualitative approach (interviews) was adopted as being the appropriate method with which to collect the data, in order to study the current situation relating to quality techniques, machinery, and product systems in the LFI. The semi-structured interviews were also used to investigate the current barriers, and motivations for implementing TQEM in the LFI. Semi structured interviews (open-ended) were used to build a dialogue. Open-ended questions have the advantage of giving the subjects the opportunity to tell the interviewer what they believe is relevant, rather than having to be constrained by the researchers' preconceived ideas about what is important (Berry,2002). In research into TQEM implementation, some researchers have used these interviews to work on and devise their EMS and TQM implementation frameworks (Khadour 2010; Hsieh, 2012).

4.7.2 Interview Sample

The sample of interviews was chosen as being with sixteen managers from the three companies under research (four top managers, six middle managers of the operations and quality departments, and six lower managers in the operations and quality department). The researcher himself undertook the interviews with all of them. Table 4.2 shows the three LFI interviews' characteristics.

Table 4. 2 The Three LFI Interview Characteristics

Management Level / Companies	Top managers	Middle managers	Low managers	Total
Company (A) Al-Rayhan Drinks	2	2	2	**6**
Company (B) Bou Attane Drinks	1	2	2	**5**
Company (C) National Mills and Fodders	1	2	2	**5**
Total	**4**	**6**	**6**	**16**

4.7.3 Reflection After Conducting Interviews

In the collection phase of the interviews the respondents were helpful and cooperative and supported the project. This made the process of gathering the data quite straightforward, with few barriers. Those barriers that were encountered included, firstly: some companies were found to be closed on many occasions because the employees wanted to change some of their managers, since they believed this would alleviate the problems. Secondly, the researcher visited each company several times and, most often, he was kept waiting, even when an appointment had been made. Further, some managers found that they could not make themselves available so that the interviews could be undertaken because they were too busy, and a number of them also cancelled their appointments on more than one occasion. Companies were, however, only too happy to discuss this problem, in the hope that it would help them to find a solution. The researcher collected together all the information from the first stage of the interviews, with the intention of trying to find ways to improve the proposed TQEM framework and to attempt to introduce it to the LFI in the second stage by means of the questionnaire.

4.8 Questionnaire

Questionnaire surveys have been used by many researcher in the fields of both environmental and quality management. These have included, for example, (Wee and Quazi 2005; Najeh and Kara 2006; Youseef 2006; Ajinah 2009; Hassin 2009; Bernardo et al., 2009; Khadour, 2010; Nee, 2010). All these researchers developed their individual questionnaires in order to collect their data, which is based entirely on their own particular research's purposes. They are thus each unique and specific to their own context. Sekaran (2003) believes that there are advantages to using self-administered questionnaires. Firstly, they offer the opportunity to introduce the respondents to the research topic and to motivate them to answer honestly. They are offered

the opportunity to have any unclear sections, or any misunderstanding of the questions about the questionnaire. This is believed to be less expensive, since it results in an almost 100% response rate.

4.8.1 Questionnaire Sample

The research sample was conducted within 62 manager levels (top, middle, and low) and employees (518) of three companies in the LFI. Given the small number of managers in the three levels (12, 15, and 35), the questionnaire was delivered to them all in person (comprehensive survey). The table of Kregcie and Morgan (1970) was used in order to draw a sample with the employees. The use of a questionnaire was selected so as to facilitate the collection of information from a large number of employees concerning responses and reaction towards the implementation of TQEM. Table 4.3 shows the sample from the three selected companies in the Libyan food industry.

Table 4. 3 The Sample of Management Staff and Employees

Management level / Companies	Top Management (staff number)	Middle Management (staff number)	Lower Management (staff number)	Employees	Total
Al Rehan Drinks (A)	3	4	10	170	187
Bou Attane Drinks (B)	4	6	10	240	260
National Mills and Fodders (C)	5	5	15	108	133
Total	**12**	**15**	**35**	**518**	**580**

4.8.2 Questionnaire Design

The purpose of the questionnaire design stage is to translate the objectives of the research into specific questions, so that the responses provide the data from which to answer all the research questions that they are targeted to address. For this reason, and to achieve this aim, the planning and designing of the questionnaire is one of the most critical stages in the questionnaire development process, and from the literature review it seems that most problems with questionnaire data can be traced back to the design phase of the project. The researcher started design the questionnaire by preparing the measures and items of the research instruments adopted. Research variables, measures and sources for the questionnaire were reviewed. Phase two of the fieldwork was conducted through the questionnaire, which was delivered to managers and employees in the LFI by hand.

4.8.3 Measurement of the Questionnaire

The main measures adopted in this research are existing measures. Similarly, their items and scales were developed through selecting and adopting those that have been used in the literature (e.g., Saraph et al., 1989; Wee and Quazi, 2005; Hassin, 2009; Nee, 2010). The adopted research design of this research is consisted of deductive approach, quantitative method and variables oriented strategy, which focuses on any links between limited numbers of attributes across many cases. Such measurements are commonly conducted by gathering questionnaire data, a frequent or method in the social sciences. To explain further, the measures used fall into three types, in terms of the level of development:

(1) Existing measures, whose items and scales have been developed by previous studies;

(2) Composed measures, which exist in the literature, but whose items and scales have been adapted according to the current research;

(3) New measures whose items and scales have been developed adhoc for this research's purposes.

Accordingly, the measurements adopted for the questionnaire were reviewed and started from a few things about the respondents (Individual Characteristics). They are: gender, age, level of education, current position and personal experience. Most of these questions were formulated as Multi Choice Questions (MCQ).

In part 2 of the questionnaire the researcher was investigating environmental and quality management issues in the LFI. This part was measured by 17 questions in order to investigate environmental and quality management issues in the LFI. The literature identified a number of environmental factors relating to the degree of standardisation, which is mostly centred on the dimensions of environment, quality, and organisation, as well as on the factors that have an impact on TQEM implementation. A total of 15 questions were investigated to measure the national environmental factors for TQEM implementation in the LFI (part 3).

As mentioned in Chapter Three (five barriers) were identified. For each of them, a number of questions that related to the Libyan industrial culture (a total of 15) were carefully formulated so as to measure the barriers to the implementation of TQEM in the LFI (part 4).

From the literature review, it was possible to devise a list of motivations. These consisted of 15 questions which the researcher had the desire to analyse in relation to the five motivations (part5). Table 4.4 shows research variables, items, scale, and sources for the questionnaire fieldwork in Libya (phase 2).

Table 4. 4 The Questionnaire's Measurements

The research variable	Items	Scale	Source
TQEM	• Environmental management • Quality management	Likert 5-point	Derived and adapted from: Siu-wa, (2009) Youssef, (2006) Wee and Quazi, (2005) Graisa and Al-Habaibeh, (2011) Hassin, (2009) Hokoma, (2009)
National environmental factors	• Technical capability • Organisational culture • Human resource • Competition • Government policy	Likert 5-point	Derived and adapted from: Khadour, (2010) González, (2004) Ajinah, (2010) Naseem, (2008)
Barriers	• Misunderstanding of the implementation of TQEM. • A lack of top management commitment. • A lack of support for the employee's participation. • Insufficient training for all levels of staff. • A lack in achieving a knowledge of customer needs and satisfaction.	Likert 5-point	Derived and adapted from: Khadour, (2010) Hasan, (2006) Ajinah, (2010) Ab Rahman, et al (2011)
Motivations	• Cost saving • Increased production efficiency • The reduction of waste • The reduction of energy consumption • The reduction of natural resource consumption.	Likert 5-point	Derived and adapted from: Hasan, (2006) González, (2004) Khadour, (2010) Graisa and Al-Habaibeh, (2011)

4.8.4 Questionnaire Rating Scale

After a comparison of different rating scales, the researcher selected an approach that he believed would make the questionnaire easy for the Libyan respondents to answer. A 5 -point Likert scale was considered to be the most suitable in order to provide the information needed. This was used by Saraph et al. (1989) when undertaking their study for measuring the critical factors of total quality management. This approach is also consistent with that used by Wee and Quazi (2005) when they considered the critical factors for environmental management. This has also been used by Graisa (2011) when the current production challenges facing the Libyan cement industry were investigated. The respondents were therefore asked to score each of the questions using a five-point interval rating scale (1= never, 2= rarely, 3= I don't know, 4= sometimes, 5= Always), which was intended to show the extent of environmental and quality management, national environmental factors, barriers, and motivations in their

respective companies for each of the variables. The analysis involved the assessment of the average ratings given for the measurement of each variable to determine the level of practice in the companies.

4.8.5 Questionnaire Reliability and Validity

The reliability and validity of the questionnaire was assessed using a number of different strategies, these included: experts' evaluations, factor analysis, internal consistency analysis, pilot testing, and the literature review.

- **Questionnaire Reliability**

The reliability of the data derived refers to the extent to which any procedure produces similar results when repeated, under similar or constant conditions, at all attempts (Amaratunga et al., 2002). An analysis of internal consistency was carried out on 67 questions about respondents characteristics, environmental and quality issues, national environmental factors, barriers, and motivations.

The reliability of the questionnaire was confirmed using Cronbach Alpha measurements. In line with these measurements, achieving a score of 0.70 or more for a reliability coefficient is considered 'good' (Nunnally and Bemstein, 1994). As a result, the method developed to measure the items was considered to have high reliability and to be an acceptable instrument for this test. The reasons for this surrounded the fact that the correlation coefficients equalled or exceeded 0.70, and this was considered to be sufficient to indicate that the test- retest reliability is good (Pavot and Diener, 1993a). Table 4.5 shows the variables using Cronbach's Alpha results.

Table 4. 5 The Variables Using Cronbach's Alpha Results

Viriables	Questions	Number of Questions	Cronbach's Alpha
TQEM	Q6 to Q22	17	.80
National environmental factors	Q23 to Q37	15	.716
Barriers	Q38 to 51	15	.703
Motivations	Q52 to Q67	15	.713

It can be seen from Table 4.5, the reliability 'alpha' measured of this research was considered to have high reliability and to be an acceptable instrument for this test.

- **Questionnaire Validity**

Validity refers to the truthfulness or accuracy of the results, and the extent to which the questionnaire measures what it was set up to record. Flynn et al. (1990) indicate that there is no one way to determine the validity of a measuring instrument.

The validity of the questionnaire was tested by a review carried out by academics and research staff in university of Benghazi (Abu baker Buera, Izzudin Busnaina, and Omar Gnieber), and by 12 managers and 45 employees in the LFI. This rigorous testing was conducted before the circulation of the questionnaire in order to ensure accurate assessment. In the current study, SPSS (Statistical Package for the Social Sciences) software (Version 22) was used to analyse the data and identify which items were appropriate for each of the dimensions.

4.8.6 Questionnaire Pilot Test

A pilot study was carried out to test the questionnaire and to obtain feedback on its clarity, content and style. The questionnaire was then hand-delivered to 12 managers and 45 employees so as to receive their comments on the questionnaire, and to test its validity in terms of content. The Arabic version of the questionnaire was then given to a sample of individuals. The back translation method (English-Arabic-English) was used so as to ensure that the Arabic version of the questionnaire conveyed identical meaning to the respondents. Each respondent in the pilot test provided feedback to the researcher, after completing the questionnaire, regarding the clarity of the questionnaire.

The pilot test aimed:
- To know that the questionnaire instructions are easy to understand.
- To identify any misleading questions, where the wording was not understood.
- To determine that the rating scales were clear to all the respondents.
- To determine the time respondents would take to complete the questionnaire.
- To make an initial assessment of the reliability assessment of the measurement scales.

Following the pilot test and the feedback received, the findings were that the questionnaire needed to be shortened and some of the questions reworded. This was interpreted as being an indication of the insufficient understanding of the questionnaire in the pilot study and it was

anticipated that this would extend to the questionnaire. As a result, the questionnaire was redesigned and simplified. The questionnaire was hand-delivered to LFI managers and employees.

4.8.7 Response Rate

A total of 580 questionnaires were distributed by hand to three food companies, of which 555 were completed, while 5 questionnaires were ineligible. The response rate was 96% which is considered a good rate compared with other research in the same field.

To calculating the response rate the researcher used the formula which pointed by Saunders et al, (2007).

$$Total\ response\ rate = \frac{Total\ number\ of\ responses}{Total\ number\ in\ sample\text{-}\ Ineligible}$$

$$= \frac{555}{580\text{-}5} = 96\%$$

This shows that the responds rate was adequate and high. Jarvis et al., (2003) recommended with high rates from 83.30 % up to 100 %. To increase the response rate the researcher taken into account the following of procedures:

1. Explaining the method of sampling that have been used;
2. Assuring respondents that all information will be used for this research;
3. Explaining the importance of this study to LFI;
4. The researcher delivered and collected the questionnaires by hand.

4.8.8 Questionnaire Analysis

At this stage, the data analysis conducted lead to the presentation and discussion of the results of the current research. This task requires the processes of ordering, manipulating, and interpreting data in order to obtain answers to the research questions. As the purpose of the data analysis is to produce information that will help to address the problem at hand, it embodies a fundamental stage in the research, which links the data collected and the findings.

The researcher has coded, sorted and classified the data of the questionnaire, which makes the data ready to enter into SPSS software. In the data coding process, some considerations should be given to reversed words and the permutations in some questions. In view of the great sample size and the number of questions in the questionnaire. This dealt primarily with the statistical analysis of the responses to the data, and a variety of methods were applied in this phase. Basic statistical analyses were conducted to observe frequencies, percentages, means, and standard deviations as a method of data examination.

4.9 Hypothesis Testing

The hypotheses are related to the impact on the potential to implement TQEM (research question 3), which is a dependent variable on the environmental factors, barriers, and motivations as independent variables that have been mentioned in Chapter Three (refer to Section 3.6). Pearson's correlation coefficients were used to test each hypothesis and to assess the correlation between the independent variables (national environmental factors, barriers, and motivations) and dependent variables (TQEM) and to show the correlation between the independent variables themselves. The multiple regressions is introduced by using the model summary Analysis of variance (ANOVA) and a coefficients model for each main hypothesis.

4.10. Fieldwork

A two-phase fieldwork has been the choice for the LFI. The first phase included field visits to the companies under research and to collect the secondary data with which to explore the current situation, barriers, and motivations for implementing TQEM in the LFI. The documents and reports of these companies were studied and were supported with interviews with 16 managers. Phase 2 was conducted through a questionnaire to the managers at the three managerial levels and other employees in these companies. Regarding the network in Libya that was used to get the data, the research has drawn a personal network with some senior executives in Libya and senior people in the Ministry of Libyan Industry (MLI).

4.11 Chapter Summary

This chapter has reviewed the methodology to be adopted. The qualitative and quantitative tools and philosophy underlying the data collect. The methods adopted of semi structured interviews and questionnaires were explained and analysed and their place in the research explained and justified. The measures undertaken to ensure reliability and validity of the data collection to ensure the rigor of the data, and the methods of piloting to ensure a robust questionnaire that would be achievable by all respondents.

The succeeding course of the research is to administer the qualitative analysis methods and the semi structured interview with the managers in the LFI. Therefore, the next chapter will discuss the qualitative data analysis that has been conducted with sixteen managers (four top management, six middle managers of the quality and operations departments, and six low managers of the quality and operations department) in LFI.

CHAPTER FIVE: DATA ANALYSIS FROM THE INTERVIEWS

5.1 Introduction

Qualitative data were collected through using semi structured interviews, with managers in the Libyan food industry (LFI). The semi-structured interviews were used as the first phase of the research in order to study the current situation, barriers, and motivations to implementing TQEM in the LFI. In this chapter, Section 5.2 provides analysis of the qualitative data. Section 5.3 will discuss the current situation in the Libyan food industry. Sections 5.4 and 5.5 investigate the barriers to, and motivations for, implementing TQEM in the LFI. Section 5.6 will summarise this chapter.

5.2 Analysis of the Qualitative Data

The researcher designed the interviews according to the literature on environmental and quality management and then of a review of many books, reports, articles and PhD theses (e.g., Dale, 2003; Oakland, 2003; Wee and Quazi, 2005; Hassn, 2006 Youssef, 2006; Ajinah, 2009; Hassin, 2009; Morath and Doluschitz, 2009; Khadour, 2010; Tari and Azori'n, 2010; Graisa and Al-Habaibeh, 2011; Hsieh, 2012). The researcher then designed the interview in three parts (current situation, barriers, and motivations for implementing TQEM in the LFI. To ensure that the researcher contacted Libyan staff with experience (Abu Baker Buera, Izzudin Busnaina, and Omar Gnieber), and following their comments on this interview, the researcher re reviewed it and translated the resulting interviews from the Arabic language, as the respondents were speaking in Arabic. A pilot study was conducted with a few respondents so as to check the convenience and timing for the undertaking of the interviews. This was also aimed to ensure that the interviews' questions were fully understandable to the target interviewees.

The researcher interviewed managers individually. Each interview lasted for approximately one hour. The interviews included both open–ended and closed questions. All interviews were conducted in Arabic. It was intended to carry out 16 semi-structured interviews; all 16 were achieved, and the information gathered was later analysed.

The analysis of the qualitative data was taken in stages, firstly, by recording in writing each interviewee's responses during the interview. Secondly, the responses were categorised, based on the answers to the interview's parts across the interview transcript forms. The responses of all of the interviewees to Part 1, for example, were written on a separate sheet. Thirdly, the codes were divided and classified into simpler codes to situate them for this study. Fourthly, the researcher categorised the answers to each question and the related data was placed under each category. Finally, the answers were sorted in terms of the topics or categories, and quotations were used to explain them.

The thematic analysis is used to analyse the interview, since it is considered an appropriate technique for this research (Riessman, 2004) and has been used in qualitative research (e.g., Youssef, 2006 and Twaissi, 2008). As there is not a significantly large body of research on TQEM in Libya, it is difficult to start to build a framework directly for these issues without obtaining an overview of the situation. It was therefore necessary to conduct qualitative research so as to explore the current situation, the barriers, and motivations for, the implementation of TQEM in the LFI.

5.3 Current Situation in the LFI

In this part of the first phase, the researcher conducted semi-structured interviews with the general, operations, and quality managers in the LFI in order to generate general information about the current situation in the LFI. The main purposes of the questions in this section was to identify the current quality and technique implemented and to make a comparison with other competitors, and with the machinery in these companies. The next subsections show the analysis of interviews with managers in LFI.

5.3.1 Product System in LFI

The aim of this section is to explore the current situation and the up-to-date key aspects of the TQEM in LFI. This has been adopted in order to understand, and identify the impact on the environment in LFI. Also, to explore some of the process issues in the three companies. Figure 5.1 shows main stages of the manufacturing process in LFI.
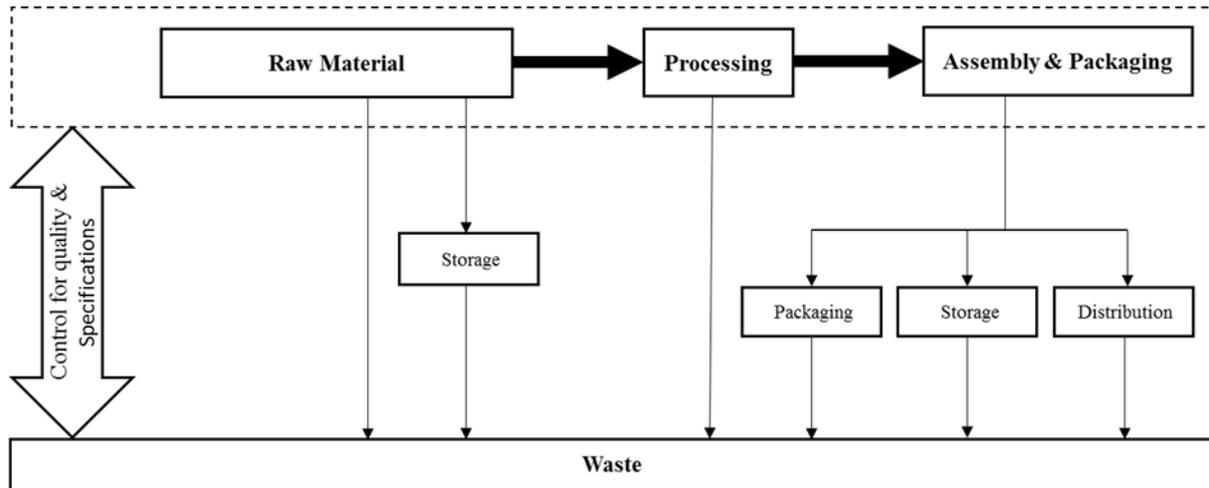
Figure 5. 1 Product System in the LFI

As it can be seen from the above Figure, there are five main stages of the manufacturing process in LFI:

1. Before introduction to the manufacturing production line, raw materials are inspected to ensure they meet required specifications (e.g. hygiene standards), as well as at purchase.

2. When products are finished and ready to be delivered out, a sample is randomly selected twice a day and examined against the quality standards set by the Libyan quality award and ISO standard.

3. At the delivery stage, it is the quality department that controls and assures the packaging of the product before it leaves the factory. This is to confirm dispatch is to required standard and to ensure safe carriage.

4. Products dispatched from the factory can go to the retail store of the company, a distribution agency. The warehouse is therefore used for the buffer stock. The distribution agencies are responsible for distributing LFI's products nationally and internationally. At this stage, the quality department checks out the products randomly before shipping them out to the dealers.

5. The final stage is waste management. Waste containing glass, metal, paper, or plastic contributes significantly to the solid waste stream and these products can be recycled. These can arise as packaging non-packaging solid wastes.

5.3.2 Supporting Quality and Environmental Management in the LFI

In these themes the researcher asked Libyan managers to talk about supporting quality and environmental management and to be responsible for checking the level of quality in their companies. According to the managers interviewed, these companies need to improve the quality of the products and services provided, and to give more attention to EMS. The quotation below is from the manager in Company C.

- *"The company does not support new quality and environmental programmes as it does not provide quality environmental management training to the employees"..... (C1, C2, C3).*

This shows that they are still in the early stages in regard to quality and do not yet use a new method (e.g., TQM, EMS, Six Sigma, Reengineering, etc.) to improve quality and environmental management in their companies. However, they are interested to adapt and implement a new managerial philosophy, like TQM and EMS.

According to the interviews in two companies (A, B), those responsible for checking the level of quality are in the quality department. Whereas, in Company C, those responsible for checking the level of quality are in a quality office. This may be one of the main reasons that this company is suffering from low quality in their products. The LFI under research also does not have an EMS department to control environmental impact.

5.3.3 Quality and Environmental Management Techniques

In order to identify which techniques are used by these companies in the LFI, the researcher asked Libyan managers about the techniques adopted by their companies, whether they were following the Statistical Process Control (SPC), TQM, EMS, Six Sigma, ISO-series (specify), re-engineering, Libyan National Quality Standards (LNQS), or any other techniques.

Companies A and B used the ISO 9002- 2000 system and the Libyan National Quality Standards as the quality management systems in their companies. However, Company C were not using a formal quality management system, but they were using another system of quality techniques, they used quality control and assurance and followed the Libyan National Quality Standards. TQM, ISO 14000, Six Sigma, and reengineering was not used at these companies.

5.3.4 Comparison With Other Competitors in the LFI

Because the LFI are facing increased competition and rapid advances in technology, the researcher asked Libyan managers to explore to what extent its products require the Libyan market, and who the LFI face when in competition with foreign products in the Libyan market, due to high quality and competitive prices. Many companies do surveys that depend on their customers. Without satisfied customers, the company cannot exist (Busnaina, 2011). Customer satisfaction is therefore an important requirement of both the Libyan National Quality Standards and ISO 9002: 2000.

As a result of the high competition in the Libyan market, the LFI should pay attention to their external and internal customers, and this is reflected in the overall planning of quality efforts (Najeh and Zaitri, 2006; Youseef, 2006; Hassin, 2009). This was confirmed according to the managers' quotations below, which are taken from the interviews with them:

- *"In our company, customer information is available. In our view, that customer satisfaction is the company's highest priority. Achieving lower costs for making products gives our company a great competitive advantage over our competition". Company"… (A1,..A6).*

- *"The Customer Survey feedback has a low consideration in our company and customer satisfaction surveys are conducted once a year"… (B1,…B5).*

- *"We have established simple and effective complaints procedures so that problems can be resolved quickly and efficiently. The primary reasons for assessing customer satisfaction are to maximize customer retention, and to gain and build customer loyalty"…(C1,..C5).*

According to these respondents only one company (Company A) in the LFI has demonstrated its commitment to the highest levels of customer satisfaction, and this was clear from the following quotations from the quality manager in Company A:

"Our company produces products with better quality, a cheaper price, faster delivery and better service to customers, compared to competitors"…(A1, A2, A4, A5).

Table 5.1 shows a brief summary of the quality techniques and comparison with other competitors in the LFI.

Table 5. 1 Quality Techniques and Comparison With Other Competitors in the LFI

Questions in Interview	Qestions	Cod of Interviewee	Results
Q1	Supporting Quality and Environmental Management program.	A1, A2,...A6 B1, B2,…B5 C1, C2, C3	Most of the interviewees confirmed that their companies give little support to a quality programme. The quality initiatives in these companies were not fully supported.
Q2	Responsibility for checking the level of quality and environment.	A1, A2,...A6 B1, B2,…B5 C1, C2,…C5	Checking quality in most companies in the LFI is at a departmental level in the organisational structure.
Q3	Quality techniques that have been used by the LFI to drive improvement.	A1, A3, A4, A6 B1, B2, B5 C1, C2, C4, C5	Most of the interviewees confirmed that the companies use the quality, ISO 9002- 2000 system and the LNQS.
Q4	Consumer research on Libyan customers	A1, A2,...A6 B1, B2,…B5 C1, C2,…C5	Most of the companies in the LFI had not paid enough attention to their external and internal customers.
Q5	Compare offerings with other organisations	A1, A2, A4, A5 B1,B2…B5 C1,C3, C5	The three investigated companies (A, B, and C) evaluate current competition at the Libyan market level.

5.3.5 Machinery

The other important themes to study in relation to the current situation in LFI is about the machinery and then to identify the ability level of the machinery and equipment in each company. The next four items investigated focus on: the ability of the machinery, the need to update it, the frequency with which machines break down, and the qualified engineering team to ensure the continuous operation of machines.

The problem that the machines in the LFI are not capable of doing the jobs required was investigated by the researcher to identify the reasons for this weakness, and the comments given by the participants were as follows:

- *"We have very limited resources of expertise to improve and maintain the productivity quality of our machinery"…(A1, A2, A4, A6).*

- *"The main problem is funding. The machinery in our company is quite old and we have an efficient maintenance system to keep it running"…(B1, B2, B4, B5.*

- *"The machines need updating and this will cost us an amount of money, and we are not ready for this now"…(C1, C2, C5).*

According to the interview analysis, those companies are suffering from low quality production due to unsuitable machinery. Regarding the updating or replacing them with new machines, the overall answers to the question showed that the managers in the LFI believed that although their existing machines were capable of producing a satisfactory products, they still needed updating and renewing with a better system in order to achieve higher levels of productivity and efficiency. The analysis indicated that the three companies mainly had old machinery, which was likely to have higher rates of machine breakdown.

The rate of breakdown was lower in Company A, but Companies B and C had a higher number of faults in their machinery. The managers confirm that the causes of such breakdowns are the companies' inability to maintain the constant operation of machinery and the lack of the maintenance team's readiness to repair any fault which may occur. Mal- management, a shortage of funding, or other factors may be involved.

Companies B and C did not even have an engineer to take care of any emergency faults. An operations manager in Company B said:

> " *Our company, is suffering from machinery breakdowns and we do not have a maintenance team"…(B4, B5).*

As the cleaning of machinery is one of the most important items in the environment, managers in the LFI encourage cleaning in the company. They thus believe that cleaning is essential in the company, despite the high level of dust in them. According to the managers in Company C:

> "*Stopping cleaning the machinery caused a failure to control the dust in our companies and we do not have any programme for the inspection of equipment."…(C1,…C5).*

The machinery and equipment in the three companies are out-of-date, and this may affect and damage the environment both inside and outside their companies. This was caused by the high level of dusts and pollution. In fact, the government invests a great deal of money to improve every aspect of the company, but because of corruption in the management system and the way in which the government funding is deployed, this is obstructed. Such corruption leads the government to minimise of the amount of funding dedicated to improving and updating the machines. Table 5.2 shows a brief summary of interviews relating to the machinery in the LFI.

Table 5. 2 Machinery in the LFI

Questions in interview	Qestions	Cod of Interviewee	Results
Q6	Machinery provided is capable of quality production.	A1, A2, A4, A6 B1, B2, B4, B5 C1, C2,…C5	The three companies' machines are not capable of doing the jobs required.
Q7	Machinery provided needs updating or replacing with new machines.	A1, A2,...A6 B1, B2,…B5 C1, C2,…C5	Quality managers emphasised the need for updating and renewing their machines.
Q8	Faults in the machines.	A1, A3, A4, A6 B1, B2, B5 C1, C2, C4, C5	The three companies had frequent faults and breakdowns, also, the speed of maintenance is low.
Q9	Qualified engineers available for maintenance at all times.	A1, A2,...A6 B1, B2,…B5 C1, C2,…C5	Most company did not have their own maintenance team with at least one engineer who was knowledgeable about the machinery.
Q10	Is equipment and machinery cleaned regularly	A1, A2, A4, A5 B4, B5 C1,…C5	Almost all companies had no regular checks and cleaning for all machinery.
Q11	Do you think that the machinery and equipment in your company are friendly to the environment?	A1, A2,...A6 B1, B2,…B5 C1, C2,…C5	Managers in the LFI confirmed that the machinery and equipment in their company is not friendly to the environment.

5.4 Barriers of Implementing TQEM in the LFI

In this part, the LFI's managers were asked to identify and rank the five barriers they faced most, based on their knowledge of implementing TQEM initiatives in their companies (these five barriers were identified by the literature on TQEM and the initial fieldwork in Libya).

One of the barriers to implementing TQEM is the misunderstanding of the implementation of TQEM (Khadour, 2010). In order to investigate the understanding of the TQEM concept in the LFI, each company's interviewees were asked what the TQEM was, to their knowledge.

The managers in Company A believed that the TQEM showed continuous improvement. Company B considered quality to be in conformance with requirements. Similarly, company C defined quality management as fitness for use. This indicated that almost all of the managers do not fully understand TQEM. However, some managers have little understanding of TQEM. This indicated that the misunderstanding in relation to the implementing of TQEM & Sustainability is one of the most important barriers to implementing TQEM in the LFI.

The second barrier to TQM implementation is a lack of top management commitment. The majority of managers in the LFI stated during the interviews that the top management does not encourage TQEM implementation. Managers in the LFI being researched, stated that:

- *"TQEM implementation cannot be successful without the participation of the employees and the support of their top management"...(A1, A2,... A6).*

- *"Top management does not participate in the quality and environmental management activities"...(B1, B2,... B5).*

- *"Although we are moving towards improving quality and protecting the environment for our products and services, we could do better if top management were more open and supportive"...(C1, C2,... C5).*

It can be seen from the above respondents that the top management has a lack in regard to their TQEM implementation. This indicated that most of the LFI were still running with a traditional, management style, as reflected in the comments of Libyan managers. The top management of the LFI does not provide sufficient support for environmental and quality programmes, which negatively affects the companies' productivity and, consequently, their competitive position.

Another barrier that was investigated is a lack of support of the employee's participation and suggestions. Most managers in the LFI mention that employee suggestions should be encouraged. Most managers in the LFI stated that:

> *"Employee participation and suggestions regarding quality and the environment should be encouraged and improved by top management"...(A1, A2, A4, A6), (B1, B4,...B5), and (C1, C2...C5).*

This indicated that these companies are not supporting their employees to achieve TQEM and productivity improvement. Top management also does not encourage their employees to participate and make suggestions in regard to TQM and EMS. The researcher believes that without employees' participation and suggestions the LFI cannot advance in the implementation of any sort of TQEM initiative.

The fourth barrier investigated is insufficient training for all levels of staff. Company A and B indicated that they have conducted training programs for their employees on TQM and EMS,

but have done little to implement them in our company. However, the training programmed for environmental management is not satisfactory. They still lack training and education as important elements to support and build good teamwork and participation. Most managers in the LFI stated that:

"The barrier of a lack of training programs regarding quality and environmental management is probably due to a lack of financial resources"…(A2, A4, A6), (B1, B3,…B5), and (C3, C4, C5).

The fifth barrier that was investigated by the researcher is a lack in achieving a knowledge of customer needs and satisfaction. Most managers in the LFI stated that:

"50% of our customers are not satisfied, 10% are moved to buy foreign imported products. However, just 40% of our customers are satisfied with our products and services"…(A1, A2, A4, A6), (B1, B4,…B5), and (C1, C2,…C5).

This indicated that companies are in an early stage of marketing implementation. They only focus on selling and promotion, but neglecting consumer research and the designing of their products – including the level of quality – according to customers' needs. Most companies do not have a marketing department and they just delegate their marketing activity to the other departments, like commercial or selling.

Table 5.3 shows a brief summary of interviews regarding the barriers to implementing TQEM in the LFI.

Table 5. 3 Interview Results Relating to Barriers to Implementing TQEM in the LFI

Questions in interview	Qestions	Cod of Interviewee	Results
Q12 & Q13	Misunderstanding about implementing TQEM	A1, A2, A4, A6 B1, B2, B5 C1, C2,…C5	Managers in the LFI do not fully understand what TQEM means.
Q14 & Q15	Lack of top management commitment	A1, A2,...A6 B1, B2,…B5 C1, C2,…C5	There was little awareness of TQEM at top management level. This means that these companies are suffering from a lack of commitment caused by top management.
Q16 & Q17	Lack of support of the employee's participation	A1, A2, A4,..A6 B1, B4, B5 C1, C2,…C5	Employees in the LFI do not sufficiently participate during the commencement of quality programs, which means that issues affecting employees are not being given appropriate attention.
Q18 & Q19	Insufficient training at all levels of staff.	A2, A4, A6 B1, B3, B5 C3, C4, C5	Most managers have not received formal environmental and quality management training; it was only oriented to the group of employees who were following the ISO 9000 implementation.
Q20 & Q21	A Lack in achieving a knowledge of customer needs and satisfaction.	A1, A2, A4, A6 B1, B4,…B5 C1, C2…C5	The majority of managers show that our customers are not fully satisfied with our products and services. So, it is difficult to motivate them with our current or efficient or effective incentives.

At the end of this part of the interview, the researcher asked LFI managers to rank the five barriers from the most to the least effective barrier according to which degree the barriers to implementing a TQEM in their company. (number 1; the most important barrier to number 5; the least important barrier). Table 5.4 shows the ranking of barriers to implementing TQEM in the LFI.

Table 5. 4 The Ranking Barriers to Implementing TQM in the LFI

Barriers	Ranking
Misunderstanding of the implementation of TQEM.	2nd
A Lack of Top management commitment.	1st
A Lack of support of the employee's participation.	5rd
Insufficient training at all levels of staff.	3th
A Lack in achieving a knowledge of customer needs and satisfaction.	4th

It can be seen that the highest barrier to TQEM implementation faced in the LFI is the lack of top management commitment. This is followed by a lack of understanding of the TQM concept, insufficient training for all levels, a lack in achieving customer needs and satisfaction, and a lack of support and encouragement for the employee's participation and suggestions.

5.5 Motivations for Implementing TQEM in the LFI

The aim of this part was to investigate the motivations to implement TQEM that drives the achievement of TQEM implementation in the LFI. The interviews investigate the motivations for implementing TQEM, including cost savings, a reduction in waste and pollution for the environment, increased production efficiency, reducing the natural resources, and a reduction in energy consumption. In order to investigate the motivations of these companies, the interviewees were asked to investigate and rank the five motivations.

Cost saving is a key motivation for implementing TQEM. Libyan companies are at an early stage of environmental performance, so the managers perceive TQEM only from the financial point of view. Regarding this, almost all managers stated that:

"The reason for many in the LFI implementing some aspects of TQEM could be the requirements for appropriate environmental performance. However, the main stated motivation for our company to implement TQEM is cost saving"…(A1, A2,…A6).

Another manager said:

"Any TQEM framework for the LFI should concentrate on cost saving and the issues that add value and are fit for purpose for the LFI"…(B1, B3, B4, B5) and (C2, C3, C5.)

This indicated that Libyan managers did not see TQEM as being an opportunity for their businesses to increase sales or to reduce operational costs. In addition to this, they perceived that whatever cost savings might appear in the short-term, they would become long-term costs.

The second motivation for implementing TQEM is the reduction of waste and pollution to the environment. Many things can impact on the environment, for example: waste, dust, odour or noise outside the site, or spillage of polluting liquids onto the ground, into a drain or a watercourse (Graisa and Al-Habaibeh, 2011). In order to investigate this motivation by the LFI, each company's interviewees were asked from the company's point of view, what are those aspects of production that could have a bad impact on the environment (waste, pollution to the environment, etc.)?. The LFI have little idea about the waste, prevention of pollution and emissions so, they do not support it and have no plan to manage in any environmentally friendly

way now. However, they want to support it in the future if that will lead to reduce air pollution, reducing and recycling waste, because most managers believe that there is no programme for recycling office waste, or they are not aware of one. Almost managers stated that:

- *"Our company needs to support waste, prevent pollution, emissions, and to manage any such waste and emissions in environmentally friendly ways"…(A2, A3,…A6).*

- *"Our company's management give little importance to reducing and recycling wastes wherever practicable"…(B3, B4, B5).*

- *"Although, our company is free to do any kind of managing of recycled materials, we do not put them into the trash directly or recycle them"…(C1, C2,…C5).*

The above respondent reports that there is no concern in regard to the negative aspects of production on the environment (i.e., pollution to the environment). Managers stated that:

"The Libyan government should play a fundamental role in the business environment, and also, it can play a significant role in encouraging strategic quality and environmental management planning"…(A1, A2,…A6), (B1,B2,…B5), and (C1, C2,…C5).

This indicated that Libyan managers believe that Libyan government leaders should recognise the benefits of environmental management for economic development. However, waste was the aspect that has the worst impact on the environment from most companies' points of view.

The third motivation that was investigated in the LFI is the reducing of natural resources consumption. In this context, the researcher asked managers: *whereabouts do you get the raw materials? How do you test raw materials in your companies?*

The LFI managers highlights that the LFI being researched received their raw materials mainly from international suppliers and partly from national suppliers (i.e., fuel). Since the supplying of fuel was controlled by the government, and also, that these had guaranteed to receive it under all circumstances and at the lowest price ever. The LFI were required to import most of its raw materials from abroad in order to maintain the level of product quality. The packaging boxes and bags were also supplied internationally. All the LFI being researched did not use the just in time (J1T) system, since supplying the supply of raw materials was easy to access and was based locally.

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This indicated that they could not provide the required raw materials by reducing the cost and the risk of storage, and these companies cannot avoid using old raw materials and having a high level of waste.

The fourth motivation that was investigated in the LFI is increased production efficiency. In order to investigate this motivation, managers were asked from the company's point of view, what are the plan for increased production efficiency in your company?. The LFI have little idea about it so, they do not have plan to manage in any programme to increased production efficiency. Almost managers said:

- *"Our company should know that it's important to support the employee to increase production efficiency"... (A1, A2,...A6).*

- *"We believe that our company need more training to improve current production efficiency to meet the Libyan customer"...(B1, B2,...B5).*

- *"We believe that it's impossible to increase production efficiency due to no plans require an urgent maintenance and updating"...(C2, C3,...C5).*

The fifth motivation investigated is the reduction of energy consumption. In this context, the researcher asked managers: *What are those aspects (waste, pollution to the environment, etc.) that lead to the consumption of energy? how could this be done to reduce energy consumption?*.

The interviewee showed that reducing the energy consumption is not going to be a priority of the companies in the foreseeable future, as there are several causes for this, such as the cheap prices of energy, the high cost of green technology, and the lack of government control. This indicated that reducing the energy consumption is not a significant issue in the LFI. Almost all Libyan managers stated that:

- *"Our company encourages reducing the consumption of energy wherever possible, and aims to recycle the maximum amount"...(A2, A3, A4, A5, A6).*

- *"we do not have a system for reducing energy consumption and for more efficient energy management"...(B3, B4, B5).*

- *"We encourage our employees to increase their performance and we have a potential list of activities that a manager can undertake to improve employee performance in regard to the responsibilities for reducing energy"...(C1, C2,...C5).*

In this context, waste may be the most important aspect leading to the consumption of energy in the LFI that occurs as a result of lack of clean and up to date machinery. Table 5.5 shows the interview results relating to the motivations for implementing TQEM in the LFI.

Table 5. 5 Interview Results Relating to Motivations for Implementing TQEM in the LFI.

Questions in interview	Qestions	Cod of Interviewee	Results
Q23	Cost saving	A1, A2,…A6 B1, B3, B4, B5 C2, C3, C5	Although managers in the LFI do not know TQEM is the best way to solve their problems, they see TQEM as an opportunity for their businesses to increase sales or to reduce operational costs.
Q24	The reduction of waste and pollution to the environment	A2, A3,...A6 B3, B4,…B5 C1, C2,…C5	Managers in the LFI want to support it in the future if that will led to reducing air pollution, reducing and recycling wastes.
Q25, Q26	Reducing natural resource consumption	A1, A2,...A6 B1, B2,…B5 C1, C2,…C5	Libyan managers cannot provide the required raw materials by reducing the costs and the risk of storage. The LFI also cannot avoid using old raw materials and having a high level of waste.
Q27	Increased production efficiency.	A1, A2,…A6 B1, B2, …B5 C2, C3,…C5	The LFI do not have plans and programme to increase production efficiency, and also, they need more training to improve current production efficiency to meet the Libyan customer needs.
Q28	The reducing of energy consumption	A2, A3,…A6 B3, B4,…B5 C1, C2…C5	The interviewees showed that reducing energy consumption, is not a priority for the companies in the foreseeable future.

At the end of this part of the interview, the researcher asked the LFI managers to rank the five TQEM motivations that have been mentioned, from the most to the least in their company, (number 1; the most important motivation, number 5; the least important motivation). Table 5.6 shows the ranking of motivations for implementing TQEM in the LFI.

Table 5. 6 The Ranking Motivations of Implementing TQEM in the LFI

Motivations	Ranking
Cost saving.	1st
The reduction of waste and pollution to the environment.	3rd
Increased production efficiency	2nd
The reducing of energy consumption.	4th
The reduction of natural resource consumption.	5th

The respondents showed that cost saving, reduction of waste and pollution to the environment, reducing energy consumption, and reducing natural resource consumption are not only the inportant motivations for implementing TQEM in the LFI. The respondents highlight increased production efficiency as one of the important motivations for implementing TQEM. As shown in Table 5.6, LFI managers ranked the TQEM motivations that have been mentioned, from the most to the least important to their company. The three highest motivations were ranked by the respondents as: cost saving, increased production efficiency, and the reduction of waste and pollution to the environment. On the other hand, reducing the energy consumption, and reducing natural resource consumption were the two least important motivations respectively.

5.6 Chapter summary

This chapter considers the present current situation in the Libyan food industry, paying particular attention to its production and its impact on the environment. The chapter considers the benefits that might accrue from the importance of the food industry to Libya's economy, the opening up of the market to international partners, the consequential need for improvements in quality and environmental control, and the need to introduce management techniques such as TQEM.

This phase has presented the interview that have been conducted with 16 managers in LFI. Qualitative analysis was carried out using both content analysis and quotation comparison to compare Libyan companies. The interviews showed the LFI are using the ISO 9000:2000, Libyan Quality standard, quality control, and quality assurance as a quality technical. LFI are suffering from compete the foreign products that includes a high quality and low price. Furthermore, it seems difficult for LFI to control quality production and machinery operation. The interviews reveals that managers in LFI have a little support for environmental and quality programmes, which negatively affect the companies' productivity and, consequently, competitive position. In this chapter five barriers and five motivations were identified and ranked based on the managers in LFI knowledge in their companies (that have been identified by the literature of EMS, TQM, and the initial fieldwork in Libya). Next chapter will introduce the data analysis that have been conducted with Libyan managers and employee in LFI.

CHAPTER SIX: DATA ANALYSES FROM THE QUESTIONNAIRE

6.1 Introduction

This current chapter analyses the data collected from managers and employees in the LFI. As mentioned previously, the current research consisted of two phases. To explore the current situation in the LFI (Phase1), where qualitative analysis was mainly used, and to investigate TQEM implementation in the LFI, where a questionnaire was used (Phase 2). The results from the questionnaire that was used to investigate TQEM implementation in the LFI and which was analysed and used to achieve the second, third, fourth, fifth, and sixith research objectives, which were outlined in Section 1.3 of Chapter One. A series of analyses was carried out using SPSS sofware.

In this chapter, Section 6.2 discusses the data analysis steps which were used in the questionnaire data analysis. Section 6.3 describes the following demographic variables of the participants: (a) Gender, (b) Age, (c) Education Level (d) Current position (e) Years of personal experience. The next sections describe the data analysis of environmental and quality management issues, national environmental factors, barriers, and motivations in the LFI. Section 6.8 shows the hypotheses testing. Section 6.9 summarises the whole chapter.

6.2 Data Analysis

As mentioned previously, the research data were collected from managers and employees in the LFI. The data collected was measured through questions, the answers to which were graded on a five -point Likert scale (1= never, 2= rarely, 3= do not know, 4= sometimes, 5= always), where participants were asked to provide a number on the scale as an answer to statements that were given. The average on the Likert scale is 3 ((1+2+3+4+5)/5). A mean above 3 shows a positive result, while a mean below 3 shows an overall negative result. Descriptive statistics (e.g.. frequencies, means and percentages) are used to demonstrate the individual characteristics, environmental management issues, quality management issyes, national environmental factors, barriers, and motivations of TQEM implementation.

There are many benefits of descriptive statistics, one of these is that they make the collected data easier to present to the reader, with the ability to present it through tables, graphs and various other descriptive methods, such as central tendency measures (i.e., mean, mode, median) and measures of variability (Variance and Standard Deviation), as explained by Babbie (1995). ANOVA was chosen to test the hypotheses between the dependent and independent variables. As the data analysis process was presented, the next sections preview the data analysis using the statistical tests above, and show the results which were produced from the fieldwork in the LFI.

6.3 Respondent's Characteristics

The purpose of this section is to describe the participants who completed the questionnaire concerning respondents' gender, age, educational level, current position, and years of personal experience for this study. Table 6.1 shows these characteristics which resulted from the questionnaires completed by the respondents in the LFI.

Table 6. 1 The Characteristics of Respondents in the LFI

characteristics	Frequency	Percent
Gender		
Male	368	66.9
Female	182	33.1
Total	550	100.0
Age		
18-27	12	2.2
28-37	149	27.1
38-47	196	35.6
48-57	85	15.5
58-67	92	16.7
68 and above	16	2.9
Total	550	100.0
Education Level		
Prim School	72	13.1
High School or equivalent	205	37.2
Graduated University	255	46.4
Post Graduate	18	3.3
Total	550	100.0
Current position		
Employee	488	88.7
Lower Manager	35	6.4
Middle Manager	15	2.7
Top Manager	12	2.2
Total	550	100.0
Years of personal experience		
3 to 6	160	29.1
7 to 10	279	50.7
> 10	111	20.2
Total	550	100.0

6.3.1 Gender and Age of the Participants

From Table 6.1 it can be seen that, male 66.9% of 550 respondents, while female 33.1%. The respondents age are: 35.6% were 38 to 47 years, 27.1% were 28 to 37 years, 16.7% were 58 to 67 years, 15.5% were 48 to 57 years, 2.9% were 68 years and above, and 2.2% were aged between 18 and 27 years old.

6.3.2 Educational Level

As shown in Table 6.1, 46.4% of 550 respondents have graduate university, 37.2% have high school degrees or an equivalent, 13.1% hold primary school, and 3.3% have postgraduate. This indicates that managers and employees are generally good educated.

6.3.3 The Current Position and Personal Experience of the Participants

Table 6.1 indicated that 88.7% of 550 respondents are employees, 6.4% were lower managers, 2.7% were middle managers, and 2.2% were general managers. The years of personal experience in the LFI category at 3 main levels, where 50.7% of 550 respondents had 7 to 10 years' work experience in the LFI while 29.1% had 3 to 6 years, and 20.2% had more than 10 years.

6.4 Total Quality Environmental Management (TQEM) in LFI

In part 2 of the questionnaire the researcher investigated TQM and EMS (TQEM) issues in the LFI. In this part of the questionnaire, the researcher investigated EMS issues in the LFI, which consists of 9 questions that were aimed to investigate in terms of pollution, emissions, raw materials, environmental performance, environmental aspects, and the companies' relationship with its stakeholders. Also, in this part of the questionnaire, the researcher investigated TQM issues in the LFI, which consists of 8 questions relating to the cost of the quality process, statistical process control, quality techniques, rewards for employees, information systems, and frameworks needed.

6.4.1 Environmental Management Issues in the LFI

Table 6.2 and Figure 6.1 present the results related to environmental management and the responses from LFI. The researcher measured this by nine questions, related to whether they support the prevention of pollution and emissions, hazardous materials disposed of in an environmentally suitable manner, work towards reducing pollution emitted by the company, focusing on the environmental aspect, attended courses to address the problem of dust and pollution, pollution to the environment, procedures to check and revise the environmental performance of the company, a relationship of cooperation with stakeholders for environmental protection, and the identifying of opportunities for improving environmental performance.

Table 6. 2 The Results of Data Analysis for Environmental Management Issues in the LFI

Questions	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
Supports prevention pollution and emissions.	Al-Rayhan	38	45	34	38	23	2.79	1.343
	Abu-Ante	46	65	77	28	28	2.70	1.229
	National Mills	40	50	10	18	10	2.28	1.261
	Total	**124**	**160**	**121**	**84**	**61**	**2.59**	**1.277**
Hazardous materials disposed.	Al-Rayhan	37	29	47	38	27	2.94	1.349
	Abu-Ante	66	43	87	8	40	2.64	1.352
	National Mills	69	37	14	6	2	1.71	.949
	Total	**172**	**109**	**148**	**52**	**69**	**2.45**	**1.216**
Work towards reducing pollution.	Al-Rayhan	36	76	40	20	6	2.35	1.032
	Abu-Ante	20	104	62	33	25	2.75	1.114
	National Mills	38	54	15	17	4	2.18	1.097
	Total	**94**	**234**	**117**	**70**	**35**	**2.42**	**1.081**
Focusing on the environmental aspects.	Al-Rayhan	24	45	45	56	8	2.88	1.131
	Abu-Ante	112	76	46	8	2	1.82	.907
	National Mills	62	17	29	16	4	2.09	1.223
	Total	**198**	**138**	**120**	**80**	**14**	**2.26**	**1.087**
Courses to address the problem of dust and pollution	Al-Rayhan	53	60	17	20	28	2.49	1.423
	Abu-Ante	81	32	75	44	12	2.48	1.255
	National Mills	65	49	1	5	8	1.77	1.090
	Total	**199**	**141**	**93**	**69**	**48**	**2.24**	**1.256**
Pollution to the environment.	Al-Rayhan	16	13	41	54	54	3.66	1.235
	Abu-Ante	44	37	52	66	45	3.13	1.368
	National Mills	15	9	21	48	35	3.62	1.281
	Total	**75**	**59**	**114**	**168**	**134**	**3.47**	**1.294**
Check and revise the environmental performance.	Al-Rayhan	18	40	69	44	7	2.90	1.015
	Abu-Ante	87	74	73	8	2	2.03	.929
	National Mills	41	21	50	11	5	2.36	1.135
	Total	**146**	**135**	**192**	**63**	**14**	**2.43**	**1.026**
A relationship of cooperation with stakeholders.	Al-Rayhan	61	40	39	33	5	2.33	1.206
	Abu-Ante	112	76	46	8	2	1.82	.907
	National Mills	62	17	29	16	4	2.09	1.223
	Total	**235**	**133**	**114**	**57**	**11**	**2.08**	**1.112**
Identifying opportunities for improving environmental performance.	Al-Rayhan	1	20	48	82	27	3.64	.892
	Abu-Ante	31	39	60	60	54	3.27	1.316
	National Mills	22	16	25	42	23	3.22	1.351
	Total	**54**	**75**	**133**	**184**	**104**	**3.37**	**1.186**
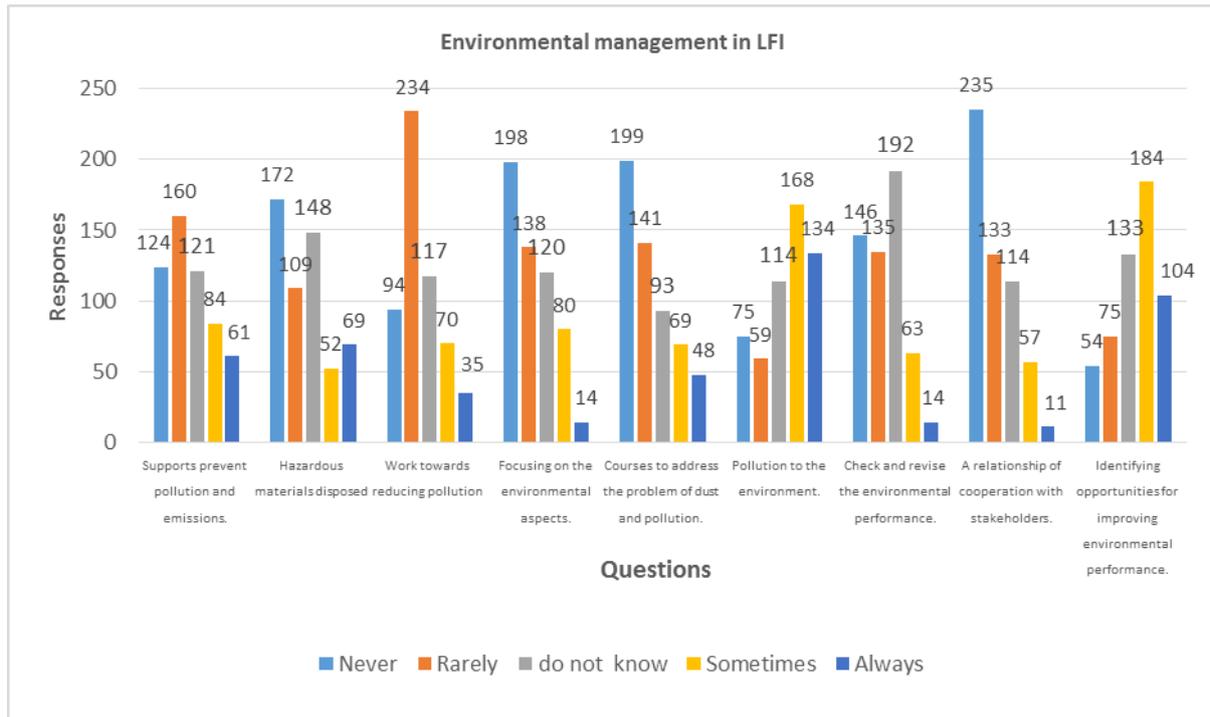
Figure 6. 1 The Results of Data Analysis for Environmental Management Issues in the LFI

Table 6.2 and Figure 6.1 show the results gained from measuring environmental management, which can be summarised as: all respondents were asked about support to prevent the environment from pollution and emissions, wherever possible, and, in their companies, support to manage any such emissions in environmentally friendly ways. 284 responses were 'never' or 'rarely', 121 were 'do not know', and 145 were 'sometimes' or 'always'.

Descriptive analysis of hazardous materials disposed of in an environmentally suitable manner shows that 281 responses said 'never' or 'rarely', 148 were do not know, and 121 were 'sometimes' or 'always'. These results show that the LFI is neither used or disposed to, acting in an environmentally friendly manner so as to protect the environment.

Descriptive analysis of the questionnaire shows the results relating to work towards reducing the pollution emitted by the companies. 328 responses were 'never' or 'rarely', 117 were "do not know", and 105 were 'sometimes' or 'always'. With regard to focusing on the environmental aspects, 336 responses were 'never' or 'rarely', 120 were 'do not know', and 94 were 'sometimes' or 'always'. This indicated that the LFI have not taken responsibility for protecting the environment. The significance of these findings is that their operations may

cause risk to human health, safety and the environment. The LFI have not given enough support to the green development of products in order to assist in the preservation of the environment. Table 6.2 and Figure 6.1 reveal that 340 answered 'never' or 'rarely' in relation to whether they had attended courses to address the problem of dust and pollution. while 93 said 'do not know', 117 'sometimes' or 'always'. Managers in the LFI know that pollution to the environment may have a bad impact on it, 302 responses were noted as being 'sometimes' or 'always', 114 were 'do not know', and 134 were 'never' or 'rarely'.

This shows that, the main problem is that planning strategies for training in environmental protection are not available in the LFI. The LFI does not encourage its employees to protect the environment. Managers in the LFI are not concerned with aspects of production that may have a bad impact on the environment.

Table 6.2 and Figure 6.1 shows that, 281 answered 'never' or 'rarely' to the question on the LFI's procedures to check and revise environmental performance, while 192 said 'do not know', and 77 'sometimes' or 'always'. In regard to their relationship with stakeholders, 368 responses said 'never' or 'rarely', 114 were 'do not know', and 68 were 'sometimes' or 'always'. This indicates that the LFI does not have good relationships with stakeholders (government, clients, suppliers, etc.) in dealings relating to environmental protection.

In regard to the notion that an: 'environmental audit is primarily a means of identifying opportunities for improving environmental performance', 129 answered 'never' or 'rarely', 133 'do not know', and 288 'sometimes' or 'always'. Although Libyan managers and employees know that an environmental audit is primarily a means to identify opportunities to improve environmental performance, the LFI does not encourage staff to do their work correctly in order to improve environmental performance.

It can be observed in both Table 6.2 and Figure 6.1 that the results regarding: 'managers in the LFI know that pollution to the environment may have a bad impact on the environment' and "an environmental audit is primarily a means of identifying opportunities for improving environmental performance' show positive feedback, with the environment in the LFI showing a mean average of 3.47 and 3.37. While company support prevents pollution and emissions, hazardous materials being disposed of in an environmentally suitable manner, work towards reducing pollution, focus on the environmental aspects, attending courses, procedures to check

and revise the environmental performance, and the relationship with stakeholders, all have a mean average of below 3. This has indicated that all these elements show the LFI has an overall negative engagement with the environment.

6.4.2 Total Quality Management Issues in the LFI

Table 6.3 and Figure 6.2 show the results of the analysis of the questions selected to measure total quality management in the LFI. These related to the cost of quality processes, understanding the product costs during products development, applying statistical process control, using ISO 9000 as a quality technique to drive quality improvement, rewards to employees for quality achievement, use of a good information systems to improve its performance, qualifications and experience required for improving employees' work, and the need for a framework for implementing environmental and quality management.

Table 6. 3 The Results of Data analysis for Total Quality Management Issues in the LFI

Questions	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
Cost of quality process.	Al-Rayhan	29	36	28	52	33	3.13	1.371
	Abu-Ante	76	30	102	28	8	2.43	1.140
	National Mills	49	26	40	9	4	2.16	1.114
	Total	**154**	**92**	**170**	**89**	**45**	**2.60**	**1.27**
Understanding the product costs.	Al-Rayhan	30	34	30	49	35	3.14	1.385
	Abu-Ante	91	28	107	12	6	2.24	1.085
	National Mills	57	45	13	6	7	1.91	1.10
	Total	**178**	**107**	**150**	**67**	**48**	**2.45**	**1.296**
Applies statistical process control.	Al-Rayhan	25	55	22	39	37	3.04	1.389
	Abu-Ante	32	44	51	93	24	3.14	1.211
	National Mills	19	24	25	43	17	3.12	1.284
	Total	**76**	**123**	**98**	**175**	**78**	**3.10**	**1.286**
ISO 9000 as a quality techniques.	Al-Rayhan	41	26	14	40	57	3.26	1.588
	Abu-Ante	73	12	16	50	93	3.32	1.699
	National Mills	13	23	15	46	31	3.46	1.310
	Total	**127**	**61**	**45**	**136**	**181**	**3.33**	**1.579**
Reward for employees' quality achievement.	Al-Rayhan	17	27	45	73	16	3.25	1.118
	Abu-Ante	122	64	48	6	4	1.80	.951
	National Mills	58	31	23	12	4	2.01	1.140
	Total	**197**	**122**	**116**	**91**	**24**	**2.31**	**1.236**
Uses a good information systems to improve performance.	Al-Rayhan	50	53	47	21	7	2.34	1.124
	Abu-Ante	89	85	58	7	5	1.99	.951
	National Mills	33	21	54	17	3	2.50	1.087
	Total	**172**	**159**	**159**	**45**	**15**	**2.27**	**1.054**
Qualifications and experience required for the improvement employees' work.	Al-Rayhan	10	62	78	26	2	2.71	.826
	Abu-Ante	64	60	90	10	20	2.43	1.162
	National Mills	36	19	50	18	5	2.51	1.157
	Total	**110**	**141**	**218**	**54**	**27**	**2.55**	**1.048**
Framework needed to implement quality and environment.	Al-Rayhan	25	34	22	34	63	3.43	1.480
	Abu-Ante	22	31	82	49	60	3.39	1.237
	National Mills	4	10	19	46	49	3.98	1.065
	Total	**51**	**75**	**123**	**129**	**172**	**3.6**	**1.260**
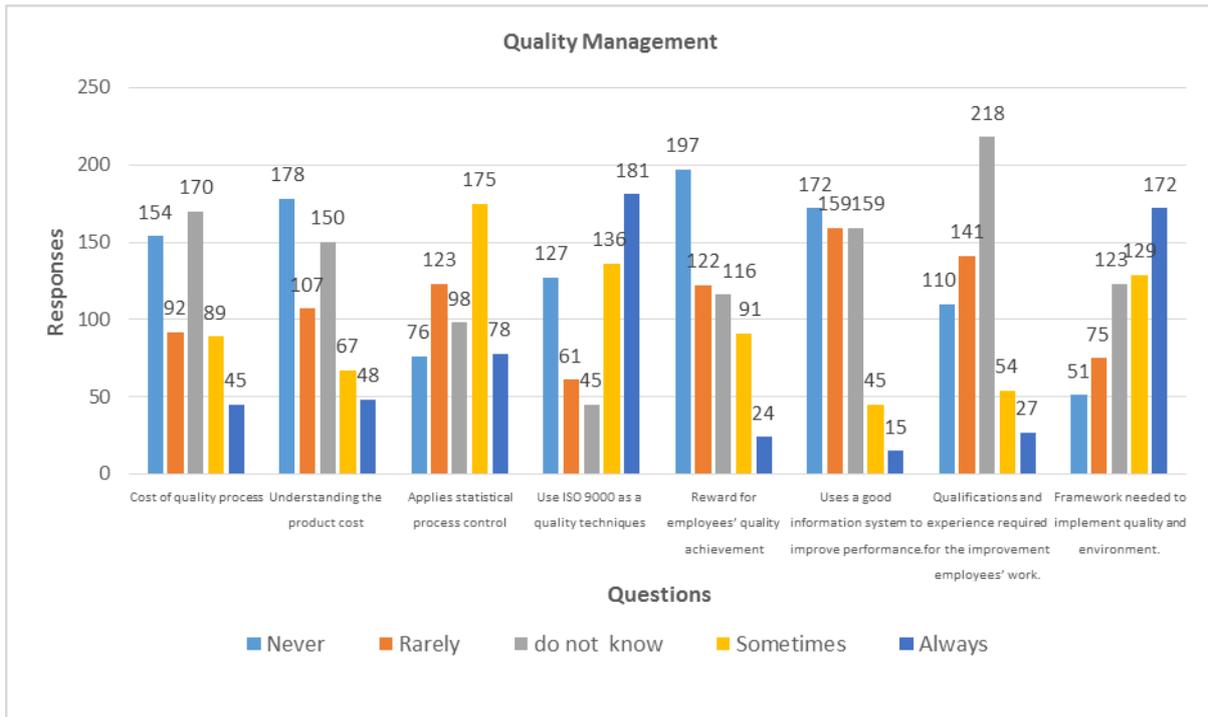
**Figure 6. 2 The Results of Data Analysis for Total Quality Management Issues
in the LFI**

Table 6.3 and Figure 6.2 indicate that 246 of responses noted work towards reducing the cost of quality processes as 'never' or 'rarely', and also, 170 of the respondents did not know if their company works towards reducing the cost of quality processes. However, 134 of the responses were 'sometimes' or 'always'. This result is slightly similar to the question about understanding the product costs during product development. It can be seen that 285 of respondents answered 'never' or 'rarely', 150 'don't know', and 115 'sometimes' or 'always'.

Descriptive analysis of the application of statistical process control shows that 199 responses were 'never' or 'rarely', 98 replied 'do not know', and 253 'sometimes' or 'always'. This result indicates that the LFI believed that reducing costs resulted in a reduction in quality. Some of the LFI companies use statistical process control and other systems, such as Libyan standards, to help them to control the quality of their products.

To know which quality management methods were implemented in the LFI, this was investigated by asking the question: Does your company use ISO 9000 as a quality technique to drive quality improvement? Of the 550 respondents, 188 responded 'never' or 'rarely',

whereas 45 did not know. 317 answered that they had 'sometimes' or 'always' formally implemented ISO 9000: 2000 as a quality management system in their companies.

Descriptive analysis of the item on rewarding employees' quality achievement in improvement initiatives in order to assist quality achievement implementation shows that 319 answered this question with 'never' or 'rarely', 116 with I do not know, and 115 with 'sometimes' or 'always'.

In responding to the question: 'use a good information system in their company to improve its performance', 331 responses replied 'never' or 'rarely', and 159 respondents 'did not know' if their company used a good information system. Descriptive analysis shows that 251 responses said 'never' or 'rarely', 218 'did not know', and 81 replied 'sometimes' or 'always' in relation to the qualifications and experience required to improve employees' work. This indicates that the LFI show low adoption of information systems to enhance the quality of production and the implication is that the LFI face having to compete with foreign products in the Libyan market due to their high quality and competitive prices. The LFI has not paid attention to their external and internal customers.

To understand the need for a framework for the implementation of environmental and quality management, the questionnaire asked: 'Can environmental and quality management problems be solved by a clear framework for the LFI?' In responding to this question, 126 said 'never' or 'rarely', whereas 123 'did not know', and 301 answered 'sometimes' or 'always'. Which shows an overwhelming positive feeling towards such a clear framework, even though such a system is rarely implemented.

From Table 6.3 and Figure 6.2, we can see that the questions that were negatively worded showed means of less than 3.00. In general, the participants indicated marked negative attitudes toward reducing the costs of quality processes, understanding the product costs during product development, rewards for employees' quality achievement, uses a good information system in improving its performance, and qualifications and experience required for improving employees' work in the LFI, whereas the positively worded ones have mean values greater than 3.00 in relation to: applies statistical process control, uses ISO 9000 as a quality technique to drive quality improvement, and needs a framework for implementing environmental and quality management.

6.5 National Environmental Factors for Implementing TQEM in the LFI

The next five sub sections show the results collected from the questionnaires, through the part relating to national environmental factors for implementing TQEM in the LFI. All the respondents had been asked to state to what extent they had a negative or positive attitude to the given statements regarding the technical capability, organisational culture, human resource, competition, and government policy, in their companies.

6.5.1 Factor 1: Technical Capability

Table 6.4 and Figure 6.3 presents the results that are related to technical capability aspects in the LFI and the response in each company. The researcher measured this by three questions related to qualified engineers who were available for maintenance at all times, that technical capability support provided is able to ensure high quality production, and whether technical in their company are operating in a way that is friendly to the environment.

Table 6. 4 The Results of Data Analysis for Factor 1: Technical Capability in the LFI

Questions	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
Engineers available for maintenance at all times.	Al-Rayhan	47	53	26	30	22	2.59	1.363
	Abu-Ante	82	24	62	49	27	2.65	1.405
	National Mills	65	46	5	4	8	1.78	1.094
	Total	**194**	**123**	**93**	**83**	**57**	**2.34**	**1.28**
Technical provided is ability of quality production.	Al-Rayhan	41	31	44	44	18	2.81	1.312
	Abu-Ante	97	102	22	13	10	1.92	1.033
	National Mills	32	41	30	14	11	2.46	1.223
	Total	**170**	**174**	**96**	**71**	**39**	**2.39**	**1.189**
Technical in your company are friendly with environment.	Al-Rayhan	45	28	63	26	16	2.66	1.253
	Abu-Ante	100	106	7	7	24	1.97	1.202
	National Mills	52	38	17	12	9	2.13	1.242
	Total	**197**	**172**	**87**	**45**	**49**	**2.25**	**1.232**
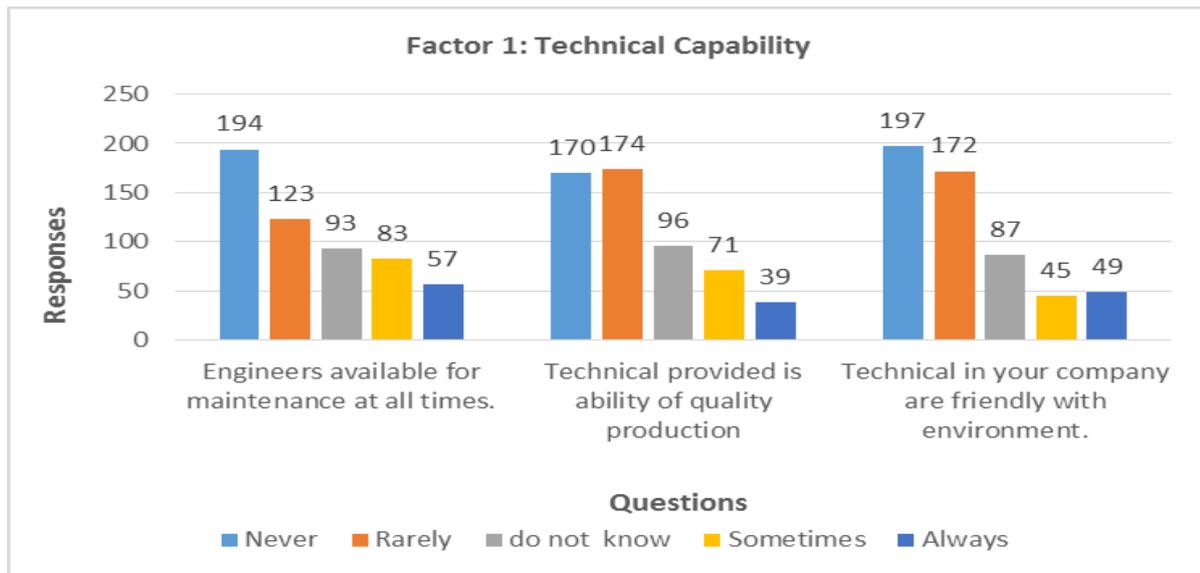
Figure 6. 3 The Results of Data Analysis for Factor 1: Technical Capability in the LFI

From Table 6.4 and Figure 6.3, we can observe that the respondents consider that there are not qualified engineers available for maintenance at all times if any fault occurs in one of the machines. Here, 317 answer this question as ' never' or 'rarely', 93 with 'do not know', and 140 with 'sometimes' and 'always'. This result conforms to the 344 responses which were answered with 'never' or ' rarely' about the questions relating to technical capability provided and its capability in quality production.

To understand whether the lack of technical capability support in the LFI is affecting and damaging the environment inside and outside their companies, the researcher asked the respondents about whether the technical capability support in their company operated in an environmentally friendly way. 369 answered 'never' or 'rarely', 87 'do not know', and 94 'sometimes' and 'always'.

According to the data analysis above, the responses relating to technical capability factor in the LFI were negative, with a mean of 2.34 for engineers available for maintenance at all times, 2.39 for technical provided is capable of quality production, and 2.25 for technical in LFI are friendly to the environment. This shows a lack of technical support where it is needed in the LFI.

6.5.2 Factor 2: Organisational Culture

Another important area to investigate are the national environmental factors for implementing TQEM in the LFI's organisational culture. Table 6.5 and Figure 6.4 presents the results relating to a clear vision the future, the creation of quality and environmental awareness among employees, and a culture of continuous improvement in the products.

Table 6. 5 The Results of Data Analysis for Factor 2: Organisational Culture in the LFI

Questions	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
Clear vision the future.	Al-Rayhan	40	32	39	45	22	2.87	1.349
	Abu-Ante	106	33	74	18	13	2.18	1.220
	National Mills	57	26	24	11	10	2.15	1.293
	Total	**203**	**91**	**137**	**74**	**45**	**2.4**	**1.287**
Creation quality and environment awareness.	Al-Rayhan	38	45	34	38	23	2.79	1.343
	Abu-Ante	46	56	64	42	36	2.86	1.317
	National Mills	40	50	10	18	10	2.28	1.261
	Total	**124**	**151**	**108**	**98**	**69**	**2.64**	**1.307**
A culture of the continuous improvement of the products.	Al-Rayhan	26	22	43	49	38	3.29	1.328
	Abu-Ante	66	43	87	8	40	2.64	1.352
	National Mills	69	40	12	5	2	1.68	.913
	Total	**161**	**105**	**142**	**62**	**80**	**2.53**	**1.197**
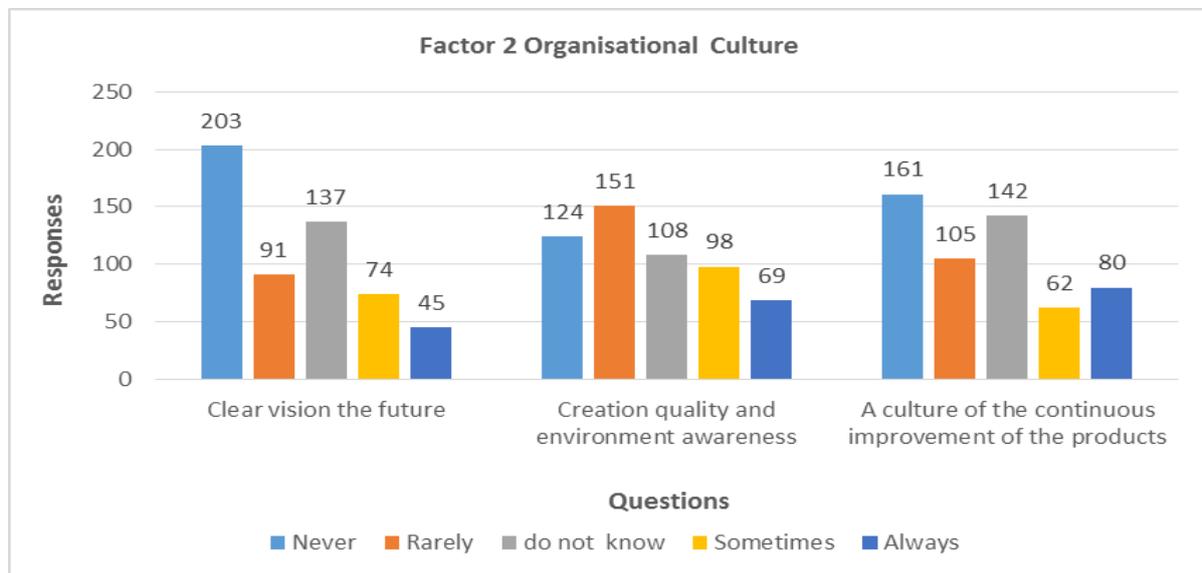
Figure 6. 4 The Results of Data Analysis for Factor 2: Organisational Culture in the LFI

Table 6.5 and Figure 6.4 show the results relating to the existence of a clear vision for the future, the majority of (294) respondents answered this with 'never' or 'rarely', 137 with 'do

not know', and 119 with 'sometimes' and 'always'. Quality and environmental awareness building amongst employees is not ongoing in the LFI, showing 50% of the responses were 'never' and 'rarely', 108 were 'I do not know', and 167 were 'sometimes' and 'always'. With regard to focusing on the culture of continuous improvement of products, 266 answered 'never' or 'rarely', 142 with 'do not know', and 142'sometimes' or 'always'.

It can be seen that questions relating to organisational culture show a negative response to this factor in the LFI, with the lowest mean. Clear vision had a mean 2.4; creation of quality and environmental awareness 2.64, and a culture for the continuous improvement of products was 2.53.

6.5.3 Factor 3: Human Resources

Table 6.6 and Figure 6.5 shows the results of data analysis for Factor 3: human resources in the LFI. The next three questions investigated focus on: a system reward for employees' quality and environmental achievement, teams to generate ideas and explore issues for environmental protection and the quality of production, and teams available for employees' training needs and development.

Table 6. 6 The Results of Data Analysis for Factor 3: Human Resources in the LFI

Questions	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
Reward to employees' quality and environment achievement.	Al-Rayhan	52	74	24	14	14	2.24	1.184
	Abu-Ante	84	85	9	32	34	2.37	1.424
	National Mills	48	46	17	12	5	2.06	1.114
	Total	**184**	**205**	**50**	**58**	**53**	**2.22**	**1.240**
Generates ideas and explores issues for the best environmental and quality.	Al-Rayhan	24	45	45	56	8	2.88	1.131
	Abu-Ante	112	76	46	8	2	1.82	.907
	National Mills	62	16	29	15	6	2.12	1.265
	Total	**98**	**137**	**120**	**79**	**16**	**2.27**	**1.101**
Available resources for employees training needs and development	Al-Rayhan	53	60	17	20	28	2.49	1.423
	Abu-Ante	81	32	75	44	12	2.48	1.255
	National Mills	63	49	1	7	8	1.81	1.121
	Total	**197**	**141**	**93**	**71**	**48**	**2.26**	**1.266**
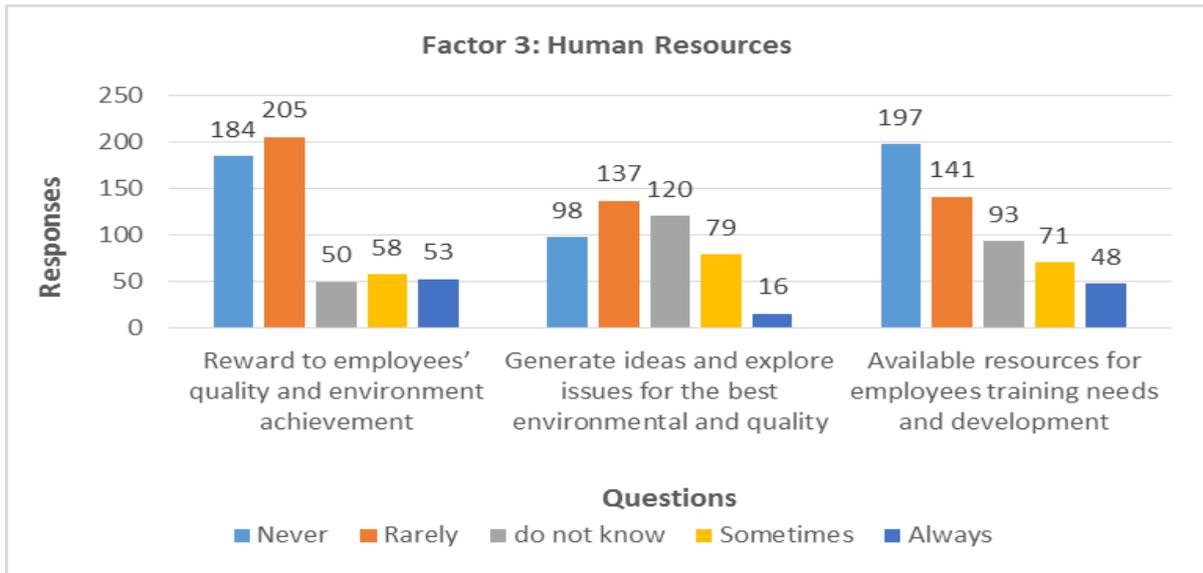
Figure 6. 5 The Results of Data Analysis for Factor 3: Human Resources in the LFI

Table 6.6 and Figure 6.5 show that more than 70% of the 550 respondents answered 'never' or 'rarely' in regard to rewards for employees' quality and environmental achievement, 50 answered 'I do not know', and 111 answered 'sometimes' or 'always'. Regarding whether teams are used to generate ideas and explore issues for the best practicable environmental and quality options, 235 of the 550 respondents answered 'never' or 'rarely', 120 with 'I do not know', and 95 answered 'sometimes' or 'always'. To understand the availability of teams in the LFI, the researcher asked managers and employees in LFI teams whether they are available to cover employees' training needs and development. More than 60% of the 550 respondents answered 'never' or 'rarely, 93 answered 'I do not know', and 119 answered 'sometimes' or 'always'.

Accordingly, questions that were investigated were answered negatively with factor 3: human resources in the LFI, with a mean of 2.22 for rewards for employees' quality and environmental achievement, 2.27 for the teams used to generate ideas and explore issues for the best practicable environmental and quality options, and 2.26 for the availability of teams in the LFI to cover employees' training needs and development. They show a low level of support within the LFI for enhancing the knowledge and skill base for employees in respect of enhancing their knowledge and performance with regard to the environment.

6.5.4 Factor 4: Competition

In this part, the researcher asked managers and employees in the LFI to what extent its products require a Libyan market, to compare offerings with foreign products, and how the LFI face competition with foreign products in the Libyan market due to imports' high quality and competitive prices. Table 6.7 and Figure 6.6 shows the results of data analysis for factor 4: competition in LFI.

Table 6. 7 The Results of Data Analysis for Factor 4: Competition in the LFI

Questions	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
Competitive benchmarking	Al-Rayhan	45	20	55	47	11	2.77	1.261
	Abu-Ante	112	111	14	5	2	1.66	.749
	National Mills	36	39	30	15	8	2.38	1.191
	Total	**193**	**170**	**99**	**67**	**21**	**2.27**	**1.067**
Compare offerings with foreign products	Al-Rayhan	48	25	67	24	14	2.61	1.236
	Abu-Ante	100	118	2	2	22	1.89	1.120
	National Mills	55	35	15	12	11	2.13	1.300
	Total	**203**	**178**	**84**	**38**	**47**	**2.21**	**1.218**
Identify the best practice to compete other foreign companies.	Al-Rayhan	61	35	45	36	1	2.33	1.163
	Abu-Ante	110	103	4	5	22	1.88	1.162
	National Mills	43	55	19	5	6	2.03	1.034
	Total	**214**	**193**	**68**	**46**	**29**	**2.08**	**1.119**
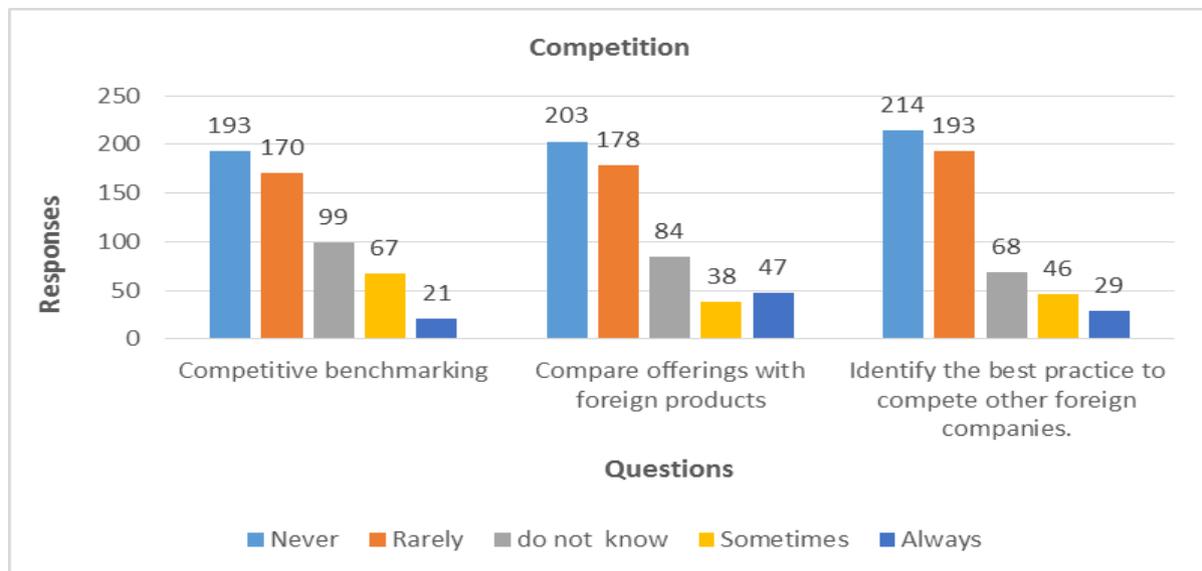
Figure 6. 6 The Results of Data Analysis for Factor 4: Competition in the LFI

Table 6.7 and Figure 6.6 show that the LFI being researched is not using a benchmarking against primary competitors. This shows that 363 answered 'never' or ' rarely', while 99 'do not know'. However, 88 answered 'sometimes' or 'always'. From Table 6.8 about 70%

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confirm that the LFI do not compare their offers with foreign products. On the other hand, 74% of 550 responses show that the LFI do not have any programme to identify the best practice for improvements and opportunities to compete against foreign companies.

The 550 responses were negative about the competition factor in the LFI. The mean average of benchmarking was 2.27, comparing their offers with foreign products with a mean 2.21, and 2.08 for a programme to identify the best practice for improvements and opportunities to compete with foreign companies. This shows that engagement with competition is low, so LFI pay little attention to the competition and do not consider best practice or the competition's offerings with a view to being more competitive themselves and to increasing sales profits.

6.5.5 Factor 5: Government Policy

In this part, the researcher asked managers and employees in the LFI to investigate how the government is supporting social and economic priorities, including improved food quality, safety, health, and the environment, attendance on the programme for TQM and EMS sponsored by government, government encouragement of the clients of the industry, and the encouraging of more environmental practices.

Table 6. 8 The Results of Data Analysis for Factor 5: Government Policy in   the LFI

Questions	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
Promoting social and economic priorities, improved food quality, safety, health, and environment.	Al-Rayhan	29	36	28	52	33	3.13	1.371
	Abu-Ante	76	30	102	28	8	2.43	1.140
	National Mills	49	26	40	9	4	2.16	1.114
	Total	**154**	**92**	**170**	**89**	**45**	**2.57**	**1.208**
Attended programme about TQM and EMS that sponsored by your government.	Al-Rayhan	30	34	30	49	35	3.14	1.385
	Abu-Ante	91	28	107	12	6	2.24	1.085
	National Mills	56	47	13	2	10	1.93	1.145
	Total	**177**	**109**	**150**	**63**	**51**	**2.43**	**1.205**
Encouraging client of the industry, more environmental practices.	Al-Rayhan	29	27	40	49	33	3.17	1.342
	Abu-Ante	54	94	64	24	8	2.34	1.031
	National Mills	39	38	19	26	6	2.39	1.93
	Total	**122**	**159**	**123**	**99**	**47**	**2.63**	**1.434**
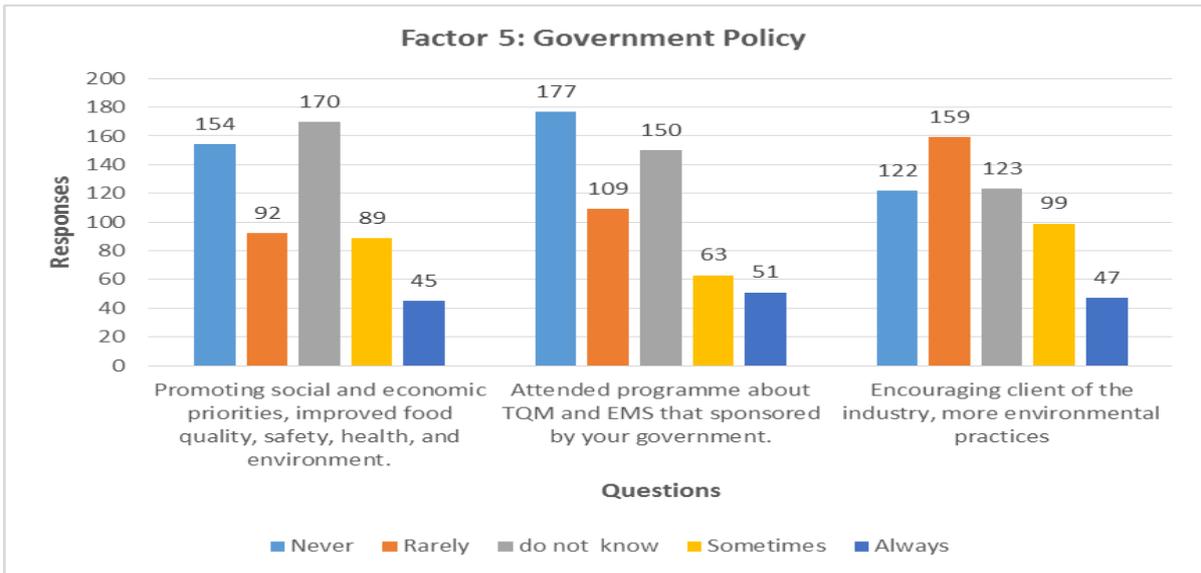
Figure 6. 7 The Results of Data Analysis for Factor 5: Government Policy

Table 6.8 and Figure 6.7 show that the Libyan government is not supporting quality, safety, health, and the environment. This is confirmed by the 246 who answered 'never' or ' rarely', 170 with 'do not know'. However, 134 answered 'sometimes' or 'always'. When asked about whether or not they had attended programmes on TQM and EMS that were sponsored by the government, the Table and Figure above show 286 answers as 'never' or ' rarely', 150 were 'do not know', 114, answered 'sometimes' or 'always'. With regard to the government encouraging the clients of the industry and more environmental practices, 281 answered 'never' or ' rarely', 123 'do not know', 146 answered 'sometimes' or 'always'.

Descriptive analysis of the factor of government policy show they were negative about this factor. The mean average of whether the government supports social and economic priorities, including improved food quality, safety, health, and the environment, was 2.57, attending the programme on TQM and EMS that was sponsored by the government had a mean of 2.43, the government encouraging clients of the industry and more environmental practices had a mean of 2.63. The responses therefore showed an overall negative response to governmental promotional encouragement and to the program to improve food quality and environmental practice.

At the end of this part of the questionnaire the researcher asked respondents if there were any national environmental factors for implementing TQEM in the LFI. Around 80% said social responsibility was one of the important external factors for implementing TQEM in the LFI.

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They confirm that the LFI should consider Libyan culture when they need to implement TQEM.

6.6 Barriers to Implementing TQEM in the LFI

In this part, the researcher carried out an investigation into the barriers to implementing TQEM in the LFI with managers and employees in the industry. In order to investigate the barriers faced by the companies in implementing TQEM, several statements were put to managers and employees about possible barriers, based on their knowledge of implementing quality and environmental initiatives in their companies. 15 questions were asked and analysed, and summary statistics for each question are provided in the next subsections.

6.6.1 Barrier 1: Lack of Top Management Commitment

Top management commitment is the first barrier chosen to measure how well top Libyan management committed themselves to supporting the implementation of TQEM initiatives, such as top management's interest in the quality improvement process, the use of performance indicators to ensure quality improvement and environmental protection, and efforts to control and improve methods of operation with respect to quality and the environment.

Table 6. 9 The Results of Data Analysis for Barrier 1: Lack of Top Management Commitment

Items	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
Interest in quality improvement and environmental protection.	Al-Rayhan	16	59	43	38	22	2.95	1.185
	Abu-Ante	48	107	16	56	17	2.54	1.235
	National Mills	46	27	35	18	2	2.24	1.135
	Total	**110**	**193**	**94**	**112**	**41**	**2.57**	**1.185**
Use of performance indicators to ensure quality improvement and environmental protection	Al-Rayhan	20	31	29	73	25	3.29	1.232
	Abu-Ante	108	58	48	12	18	2.07	1.225
	National Mills	57	31	28	9	3	1.98	1.079
	Total	**185**	**120**	**105**	**94**	**46**	**2.44**	**1.178**
Efforts to control and improve of plans related quality and environment	Al-Rayhan	17	31	21	65	44	3.49	1.294
	Abu-Ante	104	29	95	10	6	2.12	1.092
	National Mills	68	12	41	2	5	1.94	1.128
	Total	**189**	**72**	**157**	**77**	**55**	**2.51**	**1.171**

Figure 6. 8 The Results of Data Analysis for Barrier 1: Lack of Top Management Commitment

The findings in Table 6.9 and Figure 6.8 show that 303 answered 'never' or ' rarely', 94 'do not know', 153 answered 'sometimes' or 'always' about top management's interest in the quality improvement process. The findings from Table 7-11 and Figure 7-10 revealed that the companies being researched do not use performance indicators to ensure quality improvement. This reveals that 305 responses were 'never' or ' rarely', 105 were 'do not know', 140 were 'sometimes' or 'always'. Top management make limited efforts to control and improve plans that are related to quality and the environment, 261 answered 'never' or ' rarely', 157 were 'do not know', 132 answered 'sometimes' or 'always'. This demonstrates that top management in the LFI have few plans to improve quality and environmental protection.

Descriptive analysis of the lack of top management commitment shows that the overall mean of these barriers is negative. The mean of the top management interest in the quality improvement process was 2.57, use of performance indicators to ensure quality improvement was 2.44, and efforts to control and improve plans related to quality and the environment was 2.51. It became clear from the data analysis that the LFI is suffering from the lack of top management commitment. Without management commitment, any efforts to improve the relevant quality and the environment in the LFI will be a waste of time and resources, causing high costs, pollution, and may lead to the damaging of the environment.

6.6.2 Barrier 2: Misunderstanding of The Implementation of TQEM

Misunderstanding of TQEM is the second barrier chosen to measure how good an understanding of TQEM there is in the LFI, for instance, of the efforts of a company to encourage managers and employees to learn about quality and the environment, about quality improvement and the concept that an environmental management culture, once implemented, spreads across the company, and attended workshops or programmes on TQM and EMS that are organised by the LFI.

Table 6. 10 The Results of Data Analysis for Barrier 2: Misunderstanding of TQEM

Items	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
Efforts to encourage managers and employees to learn about quality and the environment.	Al-Rayhan	21	50	10	50	47	3.29	1.420
	Abu-Ante	92	33	71	27	21	2.39	1.318
	National Mills	37	25	36	24	6	2.51	1.223
	Total	81	108	117	170	74	2.73	1.320
Quality improvement and environmental management culture spreads across the companies..	Al-Rayhan	29	53	30	46	20	2.86	1.283
	Abu-Ante	97	40	53	42	12	2.31	1.287
	National Mills	49	25	33	16	5	2.24	1.202
	Total	175	118	116	104	37	2.47	1.257
Attended workshops or programmes on TQM and EMS that are organised by the LFI.	Al-Rayhan	42	25	54	35	22	2.83	1.325
	Abu-Ante	103	89	28	16	8	1.92	1.045
	National Mills	46	44	25	7	6	2.09	1.094
	Total	**191**	**158**	**107**	**58**	**36**	**2.28**	**1.154**

Figure 6. 9 The Results of Data Analysis for Barrier: Misunderstanding of TQEM

Table 6.10 and Figure 6.9 show that the LFI being researched does not encourage managers and employees to learn about quality and the environment. This confirmation came from 189 respondents who answered 'never' or 'rarely', and 117 who answered 'do not know'. There are also almost no activities on the deployment of environmental and quality management in the LFI. This is confirmed by the 293 responses answered as 'never' or ' rarely', 116 which were do not know, and 141 that were 'sometimes' or 'always'. The LFI have not organised workshops or programmes on the TQM and EMS. This indicated that there were 349 responses that answered 'never' or ' rarely', 107 'do not know', and 94 answered 'sometimes' and 'always'.

The analyses of the second barrier were negative, with means of less than 3.00. The mean of the efforts of the company to encourage managers and employees to learn about quality and the environment was 2.73, quality improvement and environmental management culture spreads across the company had a mean of 2.47, The LFI not having organised any workshops or programmes on TQM and EMS had a mean of 2.28.

6.6.3 Barrier 3: Insufficient training for all levels of staff

In questions relating to the third barrier, the respondents were asked to give answers that were related to employee training for dealing with an emergency situation (health and safety training), about skills that are required to fulfil their quality and environmental responsibilities and to achieve their environmental goals, and the extent to which they used modern training methods to educate employees to increase their quality and environmental awareness.

Table 6. 11 The Results of Data Analysis for Barrier 3: Insufficient Training for all Levels of Staff

Items	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
Training to deal with an emergency situation (health and safety training).	Al-Rayhan	46	38	22	39	33	2.86	1.483
	Abu-Ante	74	36	97	29	8	2.43	1.136
	National Mills	60	34	25	5	4	1.90	1.049
	Total	**180**	**108**	**144**	**73**	**45**	**2.39**	**1.222**
Training to enhance employees' responsibilities for quality & the environment	Al-Rayhan	32	30	39	48	29	3.07	1.347
	Abu-Ante	139	18	39	32	16	2.05	1.360
	National Mills	75	22	4	18	9	1.94	1.350
	Total	**246**	**70**	**82**	**98**	**54**	**2.35**	**1.352**
Uses modern training methods to educate employees to increase their quality and environmental awareness.	Al-Rayhan	35	32	59	33	19	2.83	1.248
	Abu-Ante	49	96	66	3	30	2.46	1.191
	National Mills	46	18	37	16	11	2.44	1.321
	Total	**130**	**146**	**162**	**52**	**60**	**2.57**	**1.253**
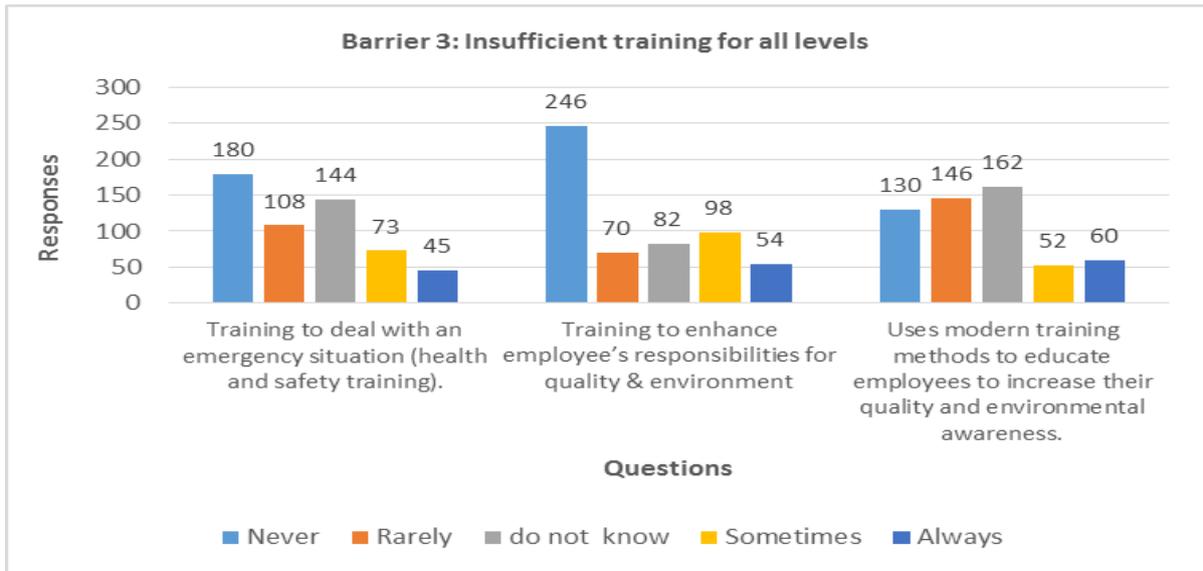
Figure 6. 10 The Results of Data Analysis for Barrier 3: Insufficient Training for all Levels of Staff

From Table 6.11 and Figure 6.10 it can be seen that respondents show that the LFI has very limited training for dealing with an emergency situation (health and safety training). 288 answered this question with ' never' or 'rarely', and 144 with 'do not know', and 118 with 'sometimes' and 'always'. The LFI does not give sufficient training for employees in order that they can enhance their quality of operation and have an understanding of their environmental responsibilities. This result is confirmed by 316 responses of 'never' or ' rarely', and 82 that were answered with 'do not know'. The results of this analysis showed that the LFI is still using traditional training methods. This is confirmed by the responses to the question related to modern training methods in order to educate employees to increase their quality and environmental awareness. 276 answered 'never' or 'rarely', 162 'do not know', and 112 'sometimes' and 'always'.

According to the data analysis above, all of these items were negative in Barrier 3 (insufficient training for all levels). The mean was 2.39 for training to deal with an emergency situation, 2.35 for training to enhance employees' responsibilities for quality & environment, and 2.44 for using modern training methods to educate employees to increase their quality and environmental awareness.

6.6.4 Barrier 4: Lack in Achieving a Knowledge of Customer Needs and Satisfaction

The fourth barrier investigated is lack in achieving customer needs and satisfaction. The researcher asked the participants whether their company would conduct a survey, or other feedback, with which to measure customers' satisfaction, information from customer services to improve its processes and services, and programmes to identify customers' needs over a long period.

Table 6. 12 The Results of Data Analysis for Barrier 4: Lack in Achieving a knowledge of Customer Needs and Satisfaction

Items	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
Conduct a survey or other feedback techniques in order to measure customers' satisfaction.	Al-Rayhan	35	51	36	22	34	2.83	1.393
	Abu-Ante	31	46	82	58	27	3.02	1.176
	National Mills	13	26	41	30	18	3.11	1.185
	Total	**79**	**123**	**159**	**110**	**79**	**2.98**	**1.251**
Information from customer services to improve its processes and services.	Al-Rayhan	42	25	54	35	22	2.83	1.325
	Abu-Ante	103	89	28	16	8	1.92	1.045
	National Mills	46	44	25	7	6	2.09	1.094
	Total	**191**	**158**	**107**	**58**	**36**	**2.28**	**1.154**
Programme to identify customers' needs over a long period.	Al-Rayhan	8	34	32	69	35	3.50	1.141
	Abu-Ante	137	40	54	5	8	1.80	1.060
	National Mills	65	32	23	4	4	1.83	1.036
	Total	**210**	**106**	**109**	**78**	**47**	**2.37**	**1.079**
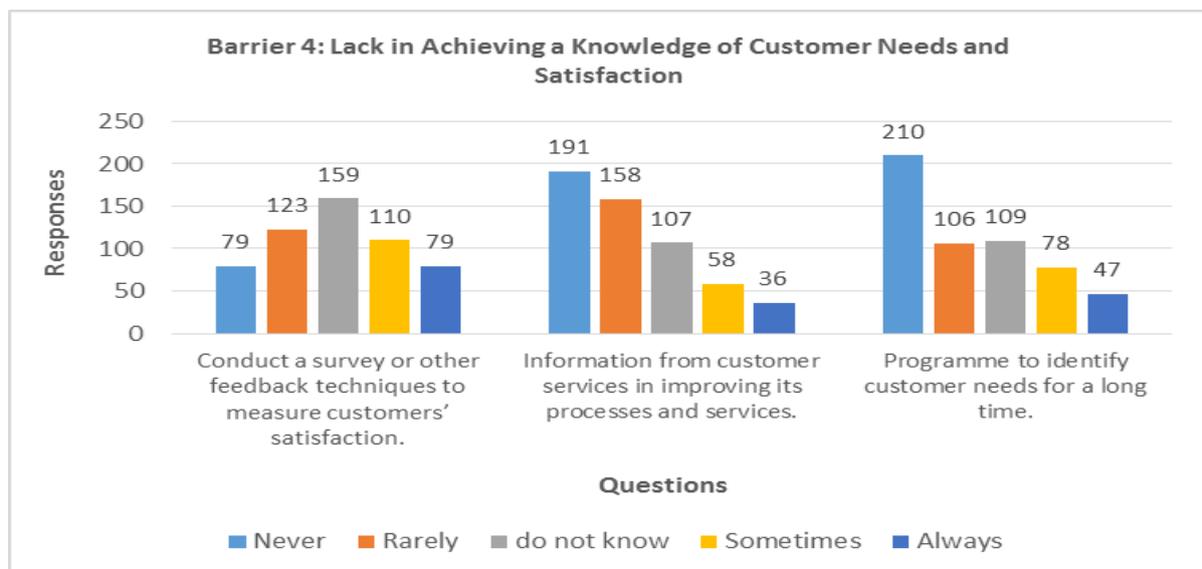
Figure 6. 11 The Results of Data Analysis for Barrier 4: Lack in Achieving a knowledge of Customer Needs and Satisfaction

Table 6.12 and Figure 6.11 show the results for the items selected to measure the lack in achieving customers' needs and satisfaction. The respondents show that the LFI has not conducted a survey or any other feedback techniques to measure their customers' satisfaction. 202 answered this question with 'never' or 'rarely', and 159 with 'do not know'.

The respondents also confirmed that the LFI being researched does not use information that might be collected from customer services to improve its processes and services. This was confirmed by the 349 responses that answered 'never' or ' rarely' , 107 responded 'do not know', and 94 with 'sometimes' or 'always'. Accordingly, the LFI dos not have a programme to use to identify customer needs. This was confirmed by the 316 respondents who answered 'never' or 'rarely', and the 109 who answered 'do not know'. The results from Table 6.12 show that the LFI does not give much attention to its customers' needs.

From the Table and Figure above It can be understood that the analyses of the fourth barrier were negative at 2.98 for conducting a survey or other feedback techniques with which to measure customers' satisfaction, 2.28 for information from customer services to improve its processes and services, and 2.37 in regard to a programme to identify customer needs over a long period.

6.6.5 Barrier 5: Lack of Support for the Employee's Participation and Suggestion

The fifth barrier to be investigated is the lack of support for employee participation. The researcher asked the respondents about the company's encouragement of its employees to participate in setting the organisation's objectives, encouraging the employees to undertake their individual responsibilities for environmental management and to initiate continuous improvement, and encouraging the employees to participate in cleaning the company collectively with the aim of being free of dust.

Table 6. 13 The Results of Data Analysis for Barrier 5: Lack of Support for the Employees' Participation

Items	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
Encourage employees participate in setting the organisation objectives.	Al-Rayhan	70	32	48	20	8	2.24	1.212
	Abu-Ante	99	23	94	17	11	2.25	1.190
	National Mills	58	21	28	9	12	2.19	1.333
	Total	227	76	170	46	31	2.22	1.245
Encourage employees for environmental and continuous improvement.	Al-Rayhan	23	39	54	46	16	2.96	1.166
	Abu-Ante	44	69	40	47	44	2.91	1.385
	National Mills	41	23	34	28	2	2.43	1.195
	Total	108	131	128	121	62	2.766	1.248
Encourage employees to participate in cleaning the company with the aim of being free of dust.	Al-Rayhan	29	40	58	36	15	2.82	1.180
	Abu-Ante	65	106	22	39	12	2.29	1.166
	National Mills	28	32	34	28	2	2.59	1.180
	Total	122	178	114	103	29	2.566	1.175
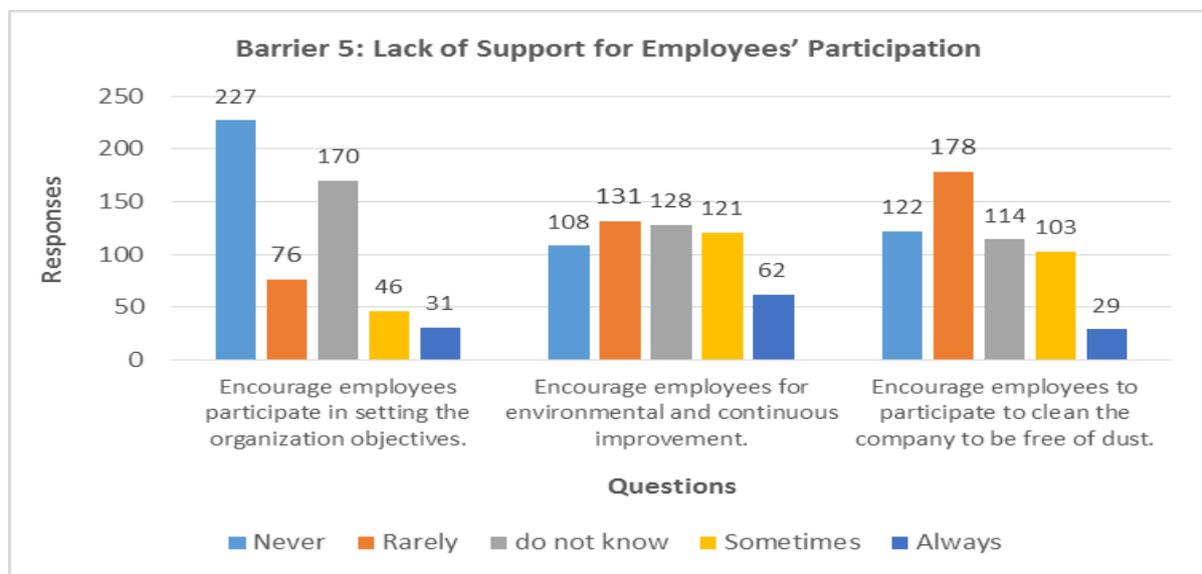
Figure 6. 12 The Results of Data Analysis for Barrier 5: Lack of Support for the Employees' Participation

Table 6.13 and Figure 6.12 shows that the LFI being researched does not encourage the employees to participate in setting the organisational objectives. This is confirmed by the results:303 answered 'never' or ' rarely', 170 answered 'do not know', and 62 answered 'sometimes' or 'always'. To encourage the employees to undertake their individual responsibilities for environmental management and to initiate continuous improvement, the Table and Figure above show that 239 answered 'never' or ' rarely', 128 'do not know', 183, answered 'sometimes' or 'always'. With regard to encouraging the employees to participate in

cleaning the company with the aim of being free of dust, 300 answered 'never' or ' rarely', 114 with 'do not know', and 132 answer with 'sometimes' or 'always'.

A descriptive analysis of barrier 5 were negative about this barrier. The mean for encouraging employees to participate in setting the organisational objectives was 2.22, Encouraging employees to undertake environmental and continuous improvement had a mean of 2.76, Encouraging employees to participate in cleaning the company with the aim of being free of dust had a mean of 2.56.

The last question asked in this part of the questionnaire was: 'Are there any barriers to implementing TQEM in the LFI'. About 55% said that the lack of the an information system was one of the important barriers to implementing TQEM in the LFI. The respondents confirmed that using a high level information system in the LFI would improve its performance, could be used to make decisions in a company, and information in the company would then be reliable, comprehensive, and clear. On the other hand, 60% of the responses said that a lack of governmental environment control is another barrier to implementing TQEM in the LFI.

6.7 Motivations for The Implementation of TQEM in the LFI

In this part, the researcher investigates the motivations for the implementation of TQEM in the LFI. In order to investigate these motivations, several statements were prepared to be asked of respondents on their motivations for implementing quality and environmental improvements in their companies. 15 questions were investigated and analysed and summary statistics for each question are provided in the next five subsections.

6.7.1 Motivation 1: Cost Saving

The first motivation that was investigated is cost saving. The researcher asked the respondents about their uses of a programme for continuous environmental and cost improvement, a system for reduced operating costs, waste reduction, and energy conservation, and a system to reduce selling costs.

Table 6. 14 The Results of Data Analysis for Motivation 1: Cost Saving

Items	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
A programme for continuous environmental and cost improvement	Al-Rayhan	17	48	73	19	21	2.88	1.106
	Abu-Ante	34	74	97	15	24	2.68	1.103
	National Mills	32	56	25	5	10	2.26	1.117
	Total	**73**	**178**	**195**	**39**	**55**	**2.60**	**1.108**
A system for reduced operating costs, waste reduction, energy conservation.	Al-Rayhan	40	32	39	45	22	2.87	1.349
	Abu-Ante	106	33	74	18	13	2.18	1.220
	National Mills	57	26	24	11	10	2.15	1.293
	Total	**203**	**91**	**137**	**74**	**45**	**2.4**	**1.287**
A system to reduce selling costs.	Al-Rayhan	24	26	46	65	17	3.14	1.192
	Abu-Ante	159	6	70	7	2	1.72	1.025
	National Mills	54	29	35	6	4	2.04	1.082
	Total	**237**	**61**	**151**	**78**	**23**	**2.3**	**1.099**
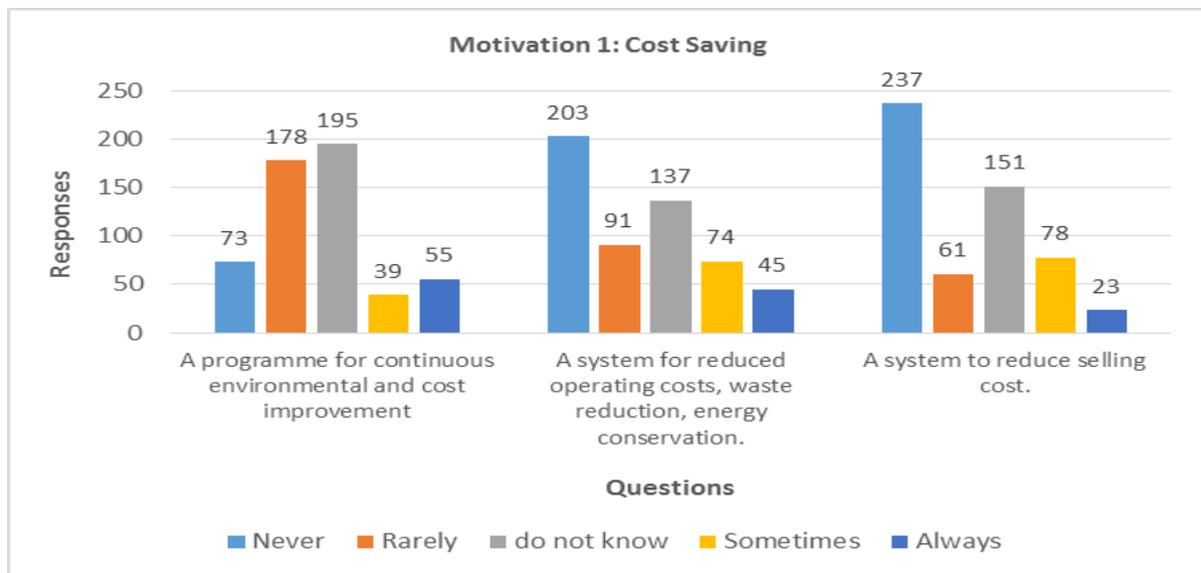
Figure 6. 13 The Results of Data Analysis for Motivation 1: Cost Saving

Table 6.14 and Figure 6.13 shows that the LFI being researched does not have a programme for continuous environmental and cost improvement. 251 answered 'never' or ' rarely', 195 with 'do not know', 94 answered 'sometimes' or 'always'. 294 also answered 'never' or ' rarely', 137 were 'do not know', 119, answered 'sometimes' or 'always' to the question about a system for reduced operating costs, waste reduction, and energy conservation. With regard to a system to reduce selling costs, 298 answered 'never' or ' rarely', 151 'do not know', 101 'sometimes' or 'always'.

Descriptive analyses of the motivations for cost saving were negative. The mean of the programme for continuous environmental and cost improvement was 2.60; a system for

reduced operating costs, waste reduction, and energy conservation had a mean of 2.4; a system to reduce selling costs had a mean of 2.3.

6.7.2 Motivation 2: Increased Production Efficiency

Table 6.15 and Figure 6.14 show the results of data analysis for motivation 2: increased efficiency in the LFI. The items investigated focus on: a clean working environment to increase production efficiency, determine the training needs to increase production efficiency, and encourage employees to control and improve plans related to production efficiency.

Table 6. 15 The Results of Data Analysis for Motivation 2: Increased Production Efficiency

Questions	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
provide a safe and clean working environment for increasing production efficiency.	Al-Rayhan	32	54	47	26	19	2.70	1.230
	Abu-Ante	55	85	44	33	27	2.56	1.280
	National Mills	5	44	30	34	15	3.08	1.113
	Total	**92**	**183**	**121**	**93**	**61**	**2.78**	**1.207**
Managers determine training needs to increase production efficiency.	Al-Rayhan	32	39	30	62	15	2.94	1.276
	Abu-Ante	136	46	58	3	1	1.72	.897
	National Mills	59	11	29	22	7	2.27	1.344
	Total	**227**	**96**	**117**	**87**	**23**	**2.31**	**1.172**
Encourage employees to control and improve plans related to production efficiency.	Al-Rayhan	17	31	21	65	44	3.49	1.294
	Abu-Ante	104	29	95	10	6	2.12	1.092
	National Mills	68	12	41	2	5	1.94	1.128
	Total	**189**	**72**	**157**	**77**	**55**	**2.51**	**1.171**

Figure 6. 14 The Results of Data Analysis for Motivation 2: Increased Production Efficiency

From Table 6.15 and Figure 6.14 it can be seen that respondents confirm that the LFI has not provided a safe, clean working environment so as to increase production efficiency. Here, 275 answered this question with ' never' or 'rarely', 121 with 'do not know', and 154 with 'sometimes' and 'always'. For the question: 'managers determine training needs to increase production efficiency', 323 respondents answered 'never' or ' rarely', 117 'do not know', and 110 'sometimes' and 'always'. Respondents also determined that managers in the LFI give little encouragement to their employees to control and improve plans related to production efficiency, 261 respondents answered 'never' or ' rarely', 157 'do not know', and 132 'sometimes' and 'always'.

According to the data analysis above, we can see that the analyses of the second motivation were negative, with means of less than 3.00. The mean of the clean working environment to increase production efficiency was 2.78, the mean for determining training needs to increase production efficiency was 2.31, and the mean for encouraging employees to control and improve plans that are related to production efficiency was 2.51.

6.7.3 Motivation 3: The Reduction of Waste and Pollution to the Environment

The other important motivation for implementing TQEM in the LFI is the reduction of waste. Table 6.16 and Figure 6.15 presents the items that are related to a programme for setting an internal materials recycling system, a program for recycling normal office waste (e.g., paper), and a policy for recycling materials such as cardboard and empty food bags.

Table 6. 16 The Results of Data Analysis for Motivation 3: The Reduction of Waste

Items	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
A programme for setting internal materials recycling system.	Al-Rayhan	45	20	55	47	11	2.77	1.261
	Abu-Ante	112	111	14	5	2	1.66	.749
	National Mills	36	39	30	15	8	2.38	1.191
	Total	**193**	**170**	**99**	**67**	**21**	**2.27**	**1.067**
A program for recycling normal office waste (e.g. ,paper)	Al-Rayhan	48	25	67	24	14	2.61	1.236
	Abu-Ante	100	118	2	2	22	1.89	1.120
	National Mills	55	35	15	12	11	2.13	1.300
	Total	**203**	**178**	**84**	**38**	**47**	**2.21**	**1.218**
A policy for recycling materials such as cardboard and empty food bags.	Al-Rayhan	61	35	45	36	1	2.33	1.163
	Abu-Ante	110	103	4	5	22	1.88	1.162
	National Mills	43	56	19	5	5	2.01	1.000
	Total	**214**	**194**	**68**	**46**	**28**	**2.073**	**1.108**
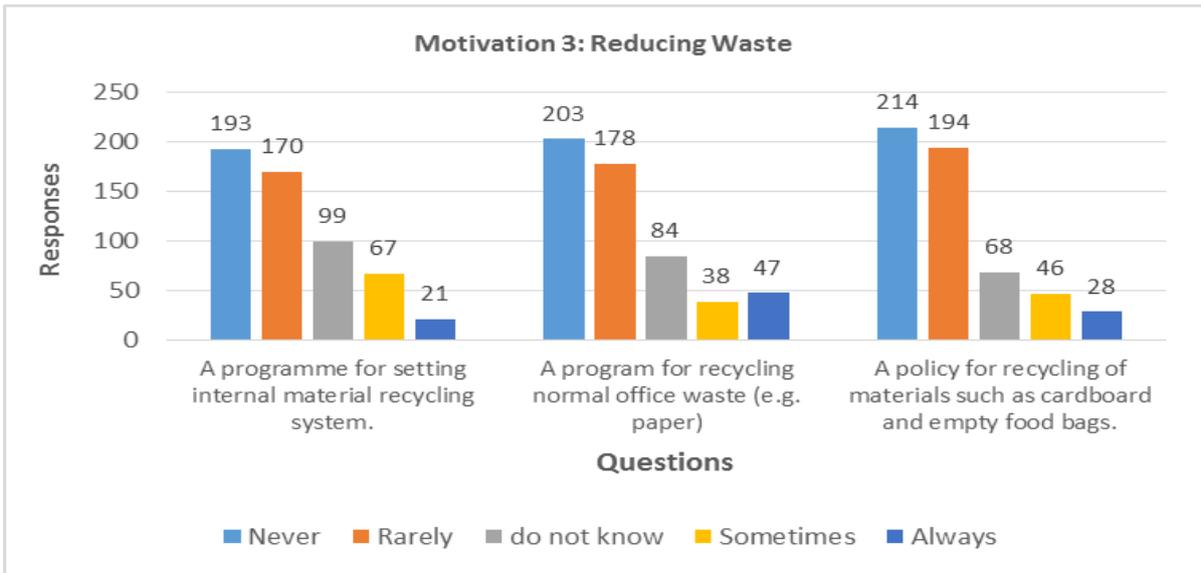
Figure 6. 15 The Results of Data Analysis for Motivation 3: The Reduction of Waste

From Table 6.16 and Figure 6.15 it can be observed that respondents consider that they do not have a programme for an internal materials recycling system. 363 respondents answered this question with ' never' or 'rarely', 99 were 'do not know', and 88 were 'sometimes' and 'always'. This indicated that the LFI does not have a programme for recycling. There were 381 responses of 'never' or ' rarely' to the questions that were related to a program for recycling normal office waste. 408 responses also confirmed that the LFI does not have a policy for the recycling of materials such as cardboard and empty food bags.

Descriptive analysis of motivation 3: the reduction of waste, were negative. The mean of the programme for setting up an internal materials recycling system was 2.27, a program for recycling normal office waste had a mean of 2.21, and a policy for the recycling of materials, such as cardboard and empty food bags, had a mean of 2.07.

6.7.4 Motivation 4: The Reducing of Energy Consumption

The fourth motivation investigated is the reduction of energy consumption. The researcher asked the participants three things about the programme to reduce the energy consumption, a system to promote energy conservation and more efficient energy management, cleaned equipment and machinery to reduce the energy consumption.

Table 6. 17 The Results of Data Analysis for Motivation 4: The Reducing of Energy Consumption

Items	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
A programme to reduce energy consumption	Al-Rayhan	5	23	56	56	38	3.56	1.052
	Abu-Ante	114	108	12	5	5	1.68	.828
	National Mills	36	65	6	9	12	2.19	1.195
	Total	**155**	**196**	**74**	**70**	**55**	**2.47**	**1.025**
A system to promote energy conservation and more efficient energy management.	Al-Rayhan	25	31	43	60	19	3.10	1.224
	Abu-Ante	140	61	30	8	5	1.68	.955
	National Mills	32	39	25	24	8	2.51	1.230
	Total	**197**	**131**	**98**	**92**	**32**	**2.43**	**1.136**
Cleaned equipment and machinery to reduce energy consumption.	Al-Rayhan	43	32	35	44	24	2.85	1.386
	Abu-Ante	75	32	82	36	19	2.56	1.277
	National Mills	25	61	23	16	3	2.30	1.000
	Total	**143**	**125**	**140**	**96**	**46**	**2.57**	**1.221**
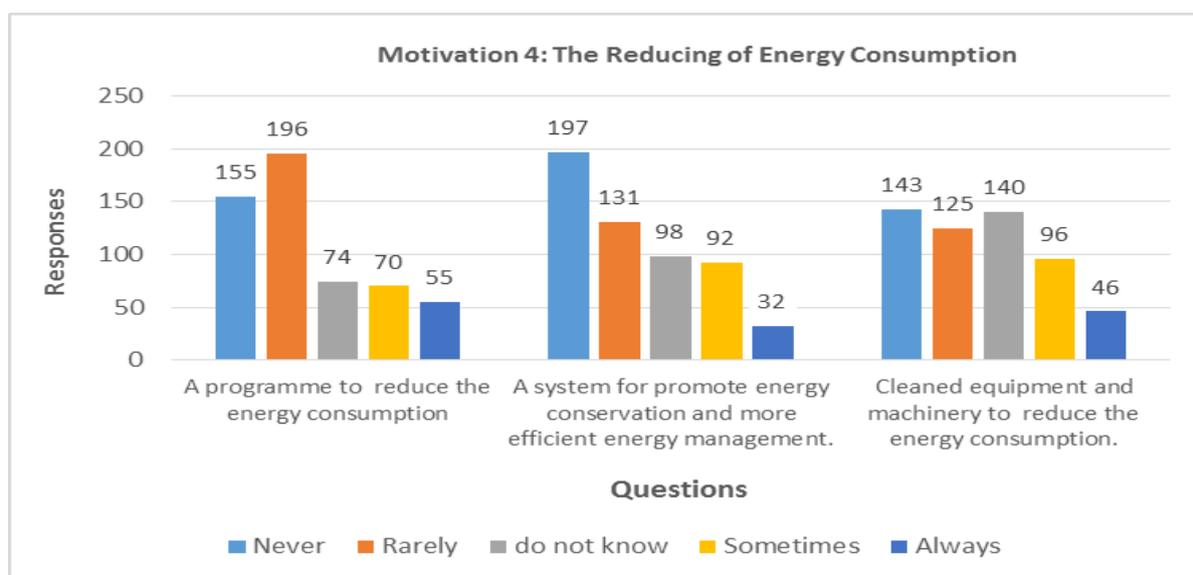
Figure 6. 16 The Results of Data Analysis for Motivation 4: The Reducing of Energy Consumption

Table 6.17 and Figure 6.16 show that the LFI being researched do not have a programme to reduce energy consumption, 351 confirms this by answering 'never' or ' rarely', 74 with 'do not know', 125 answered 'sometimes' or 'always'. The LFI also does not have a system for promoting energy conservation and more efficient energy management, 328 answer 'never' or ' rarely', 98 with do not know, 124, answered 'sometimes' or 'always'.

Although, the cleaning of machinery is one of the most important items for the environment, the LFI does not believe in cleaning in the company.

This was confirmed by the 268 who answered 'never' or ' rarely', 140 'do not know', 142 answered 'sometimes' or 'always'.

It can be observed in both Table 6.17 and Figure 7.16 that the items relating to a programme to reduce energy consumption shows as a negative, with a mean of 2.47. While a system to promote energy conservation and more efficient energy management has a mean of 2.43, and cleaned equipment and machinery with the aim of reducing the energy consumption has a mean of 2.57. This indicated that all of the elements show an overall negative in relation to reducing energy consumption in the LFI.

6.7.5 Motivation 5: The Reducing of Natural Resource Consumption

The fifth motivation investigated was reducing natural resource consumption. The researcher asked the respondents about the programme to reduce the natural resource consumption, a system for modifying production processes to reduce the natural resource consumption, and a programme for water-saving.

Table 6. 18 The Results of Data Analysis for Motivation 5: The Reducing of Natural Resource Consumption

Questions	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
A programme to reduce the natural resource consumption.	Al-Rayhan	30	53	46	28	21	2.76	1.246
	Abu-Ante	71	79	47	32	15	2.35	1.203
	National Mills	22	25	39	29	13	2.89	1.231
	Total	**123**	**157**	**132**	**89**	**49**	**2.66**	**1.226**
System for modifying production processes to reduce natural resource consumption	Al-Rayhan	25	54	48	34	17	2.80	1.185
	Abu-Ante	39	146	27	6	26	2.32	1.109
	National Mills	17	16	61	20	14	2.98	1.122
	Total	**81**	**216**	**136**	**60**	**57**	**2.70**	**1.138**
A programme for water-saving	Al-Rayhan	29	27	40	49	33	3.17	1.342
	Abu-Ante	54	94	64	24	8	2.34	1.031
	National Mills	39	38	19	26	6	2.39	1.244
	Total	**122**	**159**	**123**	**99**	**47**	**2.63**	**1.205**
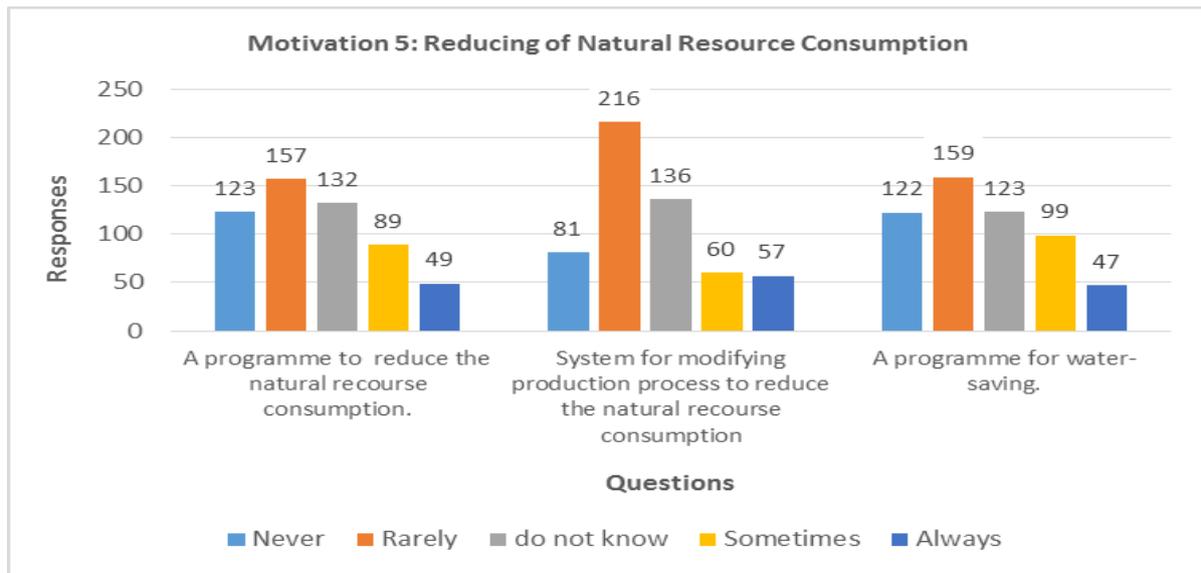
Figure 6. 17 The Results of Data Analysis for Motivation 5: The Reducing of Natural Resource Consumption

Table 6.18 and Figure 6.17 show that the LFI being researched does not have a programme to reduce the natural resource consumption, 280 confirm this by answering 'never' or ' rarely', 132 'do not know', 138 answered 'sometimes' or 'always'. The LFI also does not have a system to modify production processes to reduce the natural resource consumption, 296 answered 'never' or ' rarely', 136 'do not know', 117 answered 'sometimes' or 'always'. Regarding water-saving in the LFI, the respondents confirmed that 281 thought 'never' or ' rarely', 123 'do not know', 146 answered 'sometimes' or 'always'.

It can be seen that in both Table 6.18 and Figure 6.17 the item on a programme to reduce the natural resource consumption shows as a negative, with a mean of 2.66. A system for modifying production processes to reduce the natural resource consumption had a mean of 2.70, and a programme for water-saving a mean of 2.63. This indicates that all of the elements show overall negative results for reducing natural resource consumption in the LFI.

At the end of this part of the questionnaire, the researcher asked respondents whether there were any motivations for implementing TQEM in the LFI. About 70% of the responses said that implementing TQEM with the aim of an improved environmental performance is one of the important motivations for implementing TQEM in the LFI.

6.8 Hypotheses testing

This section aims to test the three main hypotheses that were formulated by researcher related to the impact on the potential to implement TQEM that was mentioned in Chapter Three (refer to Section 3.6) which are the dependent variable on the national environmental factors, the barriers to, and the motivations for, as independent variables. Pearson's correlation coefficients were used to test each hypothesis and to assess the correlation between the independent and dependent variables, and to show the correlation between the independent variables themselves (Sekran, 2003; Saunders et al., 2007). A multiple regression result is introduced for each hypothesis, which was achieved by using an ANOVA model and a coefficients model.

6.8.1 Testing the First Main Hypothesis

H1: National **e**nvironmental factors within the LFI impacts on its potential to implement TQEM towards sustainability.

- *H1a: Technical capability impact on the potential to implement TQEM.*
- *H1b: Organisational culture impact on the potential to implement TQEM.*
- *H1c: Human resource impact on the potential to implement TQEM.*
- *H1d: Competition impact on the potential to implement TQEM.*
- *H1e: Government policy impact on the potential to implement TQEM.*

In order to fit a model which explains TQEM in terms of the independent variables (technical capability , organisational culture, human resource, competition, and government policy) it is necessary look at the degree of correlation between TQEM and the independent variables.

Table 6. 19 Correlation Results for the First Hypothesis

		TQEM	Technical	culture	Human	Competition	Government	Environmental factors
TQEM	Pearson Correlation	1	.212**	.465**	.467**	.349**	.242**	.542**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	550	550	550	550	550	550	550
Technical capability	Pearson Correlation	.212**	1	.153**	.407**	.349**	.107*	.648**
	Sig. (2-tailed)	.000		.000	.000	.000	.012	.000
	N	550	550	550	550	550	550	550
Organisational culture	Pearson Correlation	.465**	.153**	1	.221**	.364**	.191**	.610**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	550	550	550	550	550	550	550
Human resource	Pearson Correlation	.467**	.407**	.221**	1	.441**	.157**	.692**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	550	550	550	550	550	550	550
Competition	Pearson Correlation	.349**	.349**	.364**	.441**	1	.162**	.737**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000
	N	550	550	550	550	550	550	550
Government policy	Pearson Correlation	.242**	.107*	.191**	.157**	.162**	1	.490**
	Sig. (2-tailed)	.000	.012	.000	.000	.000		.000
	N	550	550	550	550	550	550	550
Environmental Factors	Pearson Correlation	.542**	.648**	.610**	.692**	.737**	.490**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	550	550	550	550	550	550	550

**. Correlation is significant at the 0.01 level (2-tailed).
 *. Correlation is significant at the 0.05 level (2-tailed).

Table 6.19 shows a correlation which presents the value of the Pearson correlation coefficient between every pair of variables. After that, the 2-tailed significance of each correlation is displayed and the number of cases contributing to each correlation (N=550) is shown. TQEM, as a dependent variable, is positively correlated at a 1 % level of significance. Table 6.19 also indicates a positive correlation between the independent variables themselves.

Table 6.20 explains the way the correlation is assessed, based on the range of coefficients, according to Hair et al. (2003).

Table 6. 20 Correlation Coefficient Size*

Coefficient range	Strength of association
-/+.91- -/+1.00	Very strong
-/+.71- -/+.90	High
-/+.41- -/+7.0	Moderate
-/+.21- -/+4.0	Small but definite relationship
-/+.01- -/+2.0	Slight

*Assumes correlation coefficient is statically significant

Source: Hair et al., (2003, p.282)

According to this analysis, the organisational culture (46.5%) and human resources (46.7%), were moderately correlated with the level of TQEM. The factor of competition (34.9%), government policy (24.2%), and technical capability (21.2%) were correlated as having a small but definite relationship with TQEM.

It is expected that the coefficients in the regression model may not measuring the individual impact of the independent variables; they can, however, be used for the prediction of TQEM.

Hair et al. (1998, p.191) have pointed out that *"there are three recommended methods for assessing multicolinearity: the presence of high correlation; the tolerance values; the variance in inflation factor values. However, the variance inflation factor (VIF) showed no values that exceed the generally accepted maximum level of 10 (an indication of high levels of multicolinearity) and the tolerance values showed no values less than the maximum level of 0.2"*.

According to Field (2005) *"multi-colinearity causes a problem for multiple regressions since it can affect the parameters of a regression model"*. Examining the colinearity diagnostics variance inflation factor and tolerance) for this model, (the values of tolerance and variance inflation factor (VIF) are from Table 6.21).

Accordingly, The researcher checked the multicolinearity problem in the regression model using VIF, it found all of the VIF values were less than 10. this means there is no multicolinearity. The VIF values range from 1.058 to 1.426, all well below 10. Tolerance values range from .946 to 0.701. None should be below 0.1, since tolerance = 1/VIF values below 0.2 are a cause for concern (Menard, 1995).

The five national environmental factors in LFI are examined to see if it contributes to the predictive impact of the model. The Table 6.21 and Table 6.22 demonstrate that the three independent variables (organisational culture, government policy, and human resource) have p-values below .005. This indicates that they make a significant contribution to the explanatory power of the model. The $R^2 = 0.371$, so the model explains 37.19% of the variation in TQEM. Since, technical capability has a p-value of .662 and competition has p-values of .200.

Table 6. 21 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.609[a]	.371	.365	.33039

a. Predictors: (Constant), GP, T, OC, HR, C.

Table 6. 22 Coefficient Results for Dependent Variable: TQEM

Coefficients[a]

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Colinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	1.646	.077		21.366	.000		
Technical capability	-.008-	.018	-.017-	-.437-	.662	.798	1.254
Organisational culture	.172	.018	.349	9.433	.000	.847	1.181
Human resource	.190	.021	.357	8.926	.000	.725	1.379
Competition	.025	.020	.052	1.283	.200	.701	1.426
Government policy	.060	.019	.113	3.220	.001	.946	1.058

a. Dependent Variable: TQEM

The ANOVA model shows that the F-statistic = 64.106 with a p-value = 0.000. This indicates that the multiple regression model fitted, and this includes the organisational culture, government policy, and human resources as independent variables, and is significant at 1% level in explaining the variability in TQEM.

Table 6. 23 ANOVA Output for the First Hypotheses

ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	34.988	5	6.998	64.106	.000[a]
	Residual	59.381	544	.109		
	Total	94.368	549			

a. Predictors: (Constant), GP, T, OC, HR, C.

b. Dependent Variable: TQEM

Referring back to the correlation matrix, which shows the correlation coefficients for each of the independent variables with TQEM, and backward elimination regression, which shows the R and R squared values for the TQEM and the five national environmental factors' independent variables, it is shown that all five of the independent variables are positively correlated with TQEM at 1% level of significance.

6.8.2 Testing the Second Main Hypothesis

 H2: The barriers within the LFI impacts on the potential to implement TQEM towards sustainability.

> •*H2a: A lack of top management commitment impact on the potential to implement TQEM.*

> •*H2b: Misunderstanding of the implementation of TQEM impact on the potential to implement TQEM.*

> • *H2c: Insufficient training for all levels of staff impact on the potential to implement TQEM.*

> • *H2d: A lack in achieving a knowledge of customer needs and satisfaction impact on the potential to implement TQEM.*

> •*H2e: A lack of support for the employee's participation impact on the potential to implement TQEM.*

Pearson's correlation and ANOVA were carried out to investigate whether there are any impacts on the potential to implement TQEM in the LFI. Table 6.24 shows the Pearson correlation coefficient between the independent and dependant variables.

Table 6. 24 Correlation Results for the Second Hypothesis

		TQEM	LTMC	MU	IT	LACN	LSEP	Barriers
TQEM	Pearson Correlation	1	.366**	.420**	.344**	.152**	.157**	.446**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	550	550	550	550	550	550	550
LTMC	Pearson Correlation	.366**	1	.198**	.297**	.105*	.047	.494**
	Sig. (2-tailed)	.000		.000	.000	.014	.275	.000
	N	550	550	550	550	550	550	550
MU	Pearson Correlation	.420**	.198**	1	.341**	.073	.015	.469**
	Sig. (2-tailed)	.000	.000		.000	.089	.726	.000
	N	550	550	550	550	550	550	550
IT	Pearson Correlation	.344**	.297**	.341**	1	.088*	-.037-	.492**
	Sig. (2-tailed)	.000	.000	.000		.039	.387	.000
	N	550	550	550	550	550	550	550
LACN	Pearson Correlation	.152**	.105*	.073	.088*	1	.782**	.774**
	Sig. (2-tailed)	.000	.014	.089	.039		.000	.000
	N	550	550	550	550	550	550	550
LSEP	Pearson Correlation	.157**	.047	.015	-.037-	.782**	1	.709**
	Sig. (2-tailed)	.000	.275	.726	.387	.000		.000
	N	550	550	550	550	550	550	550
Barriers	Pearson Correlation	.446**	.494**	.469**	.492**	.774**	.709**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	550	550	550	550	550	550	550

**. Correlation is significant at the 0.01 level (2-tailed).

LTMC (lack of top management commitment); (MU) misunderstanding of TQEM; IT (insufficient training for all levels; (LACN) lack in achieving customers' needs and satisfaction; LSEP (lack of support for employees' participation).

The table above shows barriers as an independent variable, it is positively correlated at 1 % level of significance. There is also a positive correlation between the independent variables themselves.

According to correlation coefficient size (Table 6.20), it seems that misunderstanding of TQEM (42%) was moderately correlated with the level of TQEM. However, the lack of top management commitment (36%) and insufficient training at all levels (34%) were correlated as having a small but definite relationship with TQEM. The barrier 'lack in achieving customer needs and satisfaction' (15.2%) and lack of support for employees' participation (15.7%) were correlated at a small relationship with TQEM.

The researcher checked the multicolinearity problem in a regression model using VIF, it found that all of the VIF values were less than 10. This means there is no multicolinearity. The VIF values range from 1.116 to 2.683, all well below 10. Tolerance values range from .373 to 0.896.

None should be below 0.1, since tolerance = 1/VIF, values below 0.2 are a cause for concern (Menard, 1995).

The five barriers in LFI are examined to see if it contributes to the predictive impact of the model. Table 6.25 and Table 26 show that the four independent variables (the lack of top management commitment, misunderstanding of TQEM, insufficient training at all levels, and a lack of support for employees' participation) have p-values below .005. This indicates that they have a significant contribution to the explanatory power of the model. The $R^2 = 0.552$, so the model explains 55.2% of the variation in TQEM. Since, a lack in achieving customer needs and satisfaction has p-value .22.

Table 6. 25 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.552a	.305	.299	.34724

a. Predictors: (Constant), LSEP, MU, LTMC, IT, LACN.

Table 6. 26 Coefficient Results for Dependent Variable:TQEM

Coefficients [a]

Model		Unstandardised Coefficients		Standardised Coefficients			Colinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1.722	.071		24.382	.000		
	LTMC	.117	.018	.250	6.606	.000	.896	1.116
	MU	.155	.019	.313	8.169	.000	.872	1.147
	IT	.084	.019	.177	4.459	.000	.808	1.237
	LACN	-.026-	.021	-.072-	-1.229-	.220	.373	2.683
	LSEP	.070	.020	.204	3.499	.001	.377	2.655

a. Dependent Variable: TQEM

The ANOVA table shows that the F-statistic = 47.732 with a p-value = 0.000. This indicates that the multiple regression model fitted, which includes the four independent variables: lack of top management commitment, misunderstanding of TQEM, insufficient training at all levels,

and a lack of support for employees' participation as independent variables, is significant at 1% level in explaining the variability in TQEM.

Table 6. 27 ANOVA Output for The Second Hypotheses

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.776	5	5.755	47.732	.000^a
	Residual	65.592	544	.121		
	Total	94.368	549			

a. Predictors: (Constant), LSEP, MU, LTMC, IT, LACN

b. Dependent Variable: TQEM

Referring back to the correlation matrix, which shows the correlation coefficients of each of the independent variables with TQEM, and backward elimination regression, which shows the R and R squared values for the TQEM and the five barriers' independent variables, it is shown that all five of the independent variables are positively correlated with TQEM at 1% level of significance.

6.8.3 Testing the Third Main Hypothesis

H3: The motivations within the LFI impacts on the potential to implement TQEM towards sustainability.

- *H3a: Cost savings impact on the potential to implement TQEM.*
- *H3b: Increased production efficiency impact on the potential to implement TQEM.*
- *H3c: The reduction of waste impact on the potential to implement TQEM.*
- *H3d: The reduction of energy consumption impact on the potential to implement TQEM.*
- *H3e: The reduction of natural resource consumption impact on the potential to implement TQEM.*

Table 6.28 shows a correlation of the Pearson correlation coefficient between independent and dependant variables. After that, the 2-tailed significance of each correlation is displayed. Considering TQEM as a dependent variable, it is positively correlated at 1% level of significance with all of the variables.

Table 6. 28 Correlation Results for the Third Hypothesis

		TQEM	CS	IPE	RWP	REC	RNRC	Motivations
TQEM	Pearson Correlation	1	.460**	.283**	.354**	.155**	.293**	.502**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	550	550	550	550	550	550	550
CS	Pearson Correlation	.460**	1	.285**	.420**	.152**	.200**	.672**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
	N	550	550	550	550	550	550	550
IPE	Pearson Correlation	.283**	.285**	1	.322**	.089*	.120**	.581**
	Sig. (2-tailed)	.000	.000		.000	.037	.005	.000
	N	550	550	550	550	550	550	550
RWP	Pearson Correlation	.354**	.420**	.322**	1	.094*	.296**	.699**
	Sig. (2-tailed)	.000	.000	.000		.028	.000	.000
	N	550	550	550	550	550	550	550
REC	Pearson Correlation	.155**	.152**	.089*	.094*	1	.128**	.535**
	Sig. (2-tailed)	.000	.000	.037	.028		.003	.000
	N	550	550	550	550	550	550	550
RNRC	Pearson Correlation	.293**	.200**	.120**	.296**	.128**	1	.542**
	Sig. (2-tailed)	.000	.000	.005	.000	.003	550	.000
	N	550	550	550	550	550		550
Motivations	Pearson Correlation	.502**	.672**	.581**	.699**	.535**	.542**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	550
	N	550	550	550	550	550	550	

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

CS (cost savings); IPE (increased production efficiency); RWPE (reduction of waste and pollution); REC (reducing energy consumption); RNRC (reducing natural resource consumption).

According to correlation coefficient size (Table 6.20), it seems that cost saving (46%) was correlated with TQEM at a moderate level. The reduction of waste and pollution of the environment (35.4%), increased production efficiency (28.3%), and reducing natural resource consumption (29.3%) were correlated in a small but definite relationship with TQEM. Reducing energy and natural resource consumption (15.5%) was correlated at a small relationship with TQEM.

The researcher checked the multicolinearity problem in a regression model using VIF, it found that all of VIF values were less than 10. that means there is no multicolinearity. The VIF values range from 1.036 to 1.355, all well below 10. Tolerance values range from .738 to .965. None should be below 0.1, since tolerance = 1/VIF values below 0.2 are a cause for concern (Menard, 1995).

The five motivations in LFI are examined to see if it contributes to the predictive impact of the model.

Table 6.29 and Table 6.30 demonstrated that the three independent variables (cost savings, increased production efficiency, reducing natural resource consumption) have p-values below .005, the independent variables of the reduction of waste and pollution to the environment has p-value .005. This indicated that they have a significant contribution to the explanatory power of the model. The $R^2 = 0.288$, so the model explains 28.8% of the variation in TQEM. Since reducing energy consumption has p-value .102.

Table 6. 29 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.537[a]	.288	.282	.35135

a. Predictors: (Constant), M5, M2, M4, M1, M3

Table 6. 30 Coefficient Results for Dependent Variable TQEM

Coefficient Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients			Colinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1.707	.081		20.957	.000		
	CS	.169	.021	.331	8.107	.000	.784	1.276
	IPE	.067	.021	.125	3.215	.001	.868	1.152
	RWP	.058	.020	.119	2.818	.005	.738	1.355
	REC	.026	.016	.060	1.640	.102	.965	1.036
	RNRC	.097	.022	.169	4.420	.000	.897	1.115

a. Dependent Variable: TQEM

The ANOVA table shows an F-statistic= 44.085 (p-value = 0.000), indicating that the multiple regression model with independent variables: cost saving, increased production efficiency, reduction of waste and pollution to the environment, reducing natural resource consumption, is significant at 1% level in predicting the variability of TQEM.

Table 6. 31 ANOVA Output for The Third Hypotheses

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.211	5	5.442	44.085	.000[a]
	Residual	67.157	544	.123		
	Total	94.368	549			

a. Predictors: (Constant), RNRC, IPE, REC, CS, RWPE.

b. Dependent Variable: TQEM

Referring back to the correlation matrix, which shows the correlation coefficients of each of the independent variables with TQEM, and backward elimination regression, which shows the R and R squared values for the TQEM and the five motivations as independent variables, it is shown that all five of the independent variables are positively correlated with TQEM at a 1% level of significance. This analysis therefore supports H3, which means that H3 is accepted.

6.9 Chapter Summary

This phase has presented the data analysis that have been conducted with 62 managers and 518 in LFI. Quantitative analysis was carried out using descriptive analysis (observation of frequencies, percentages, means, and standard deviations) as a method for data examination. The data analysis from the questionnaire identified the TQEM issues, five national environmental factors, five barriers, and five motivations. Three hypotheses related to the impact on TQEM implementation on the environmental factors, barriers, and motivations have been tested. Pearson's correlation coefficients were used to assess the correlation between them and to show the correlation between the independent variables themselves. That has been achieved by using model ANOVA and a coefficients model. In addition, there is postive impact of three national environmental factors (organisational culture, government policy, and human resource), four barriers (the lack of top management commitment, misunderstanding of TQEM, insufficient training at all levels, and a lack of support for employees' participation), and motivations (cost savings, increased production efficiency, the reduction of waste and pollution to the environment, and reducing natural resource consumption) as an independent variable on TQEM implementation as the dependent variable. The analysis and results is to provide a starting point to design a framework for the LFI for implementing TQEM. A discussion of the results, findings, and proposed TQEM framework for LFI will be presented in the next chapter.

CHAPTER SEVEN: DISCUSSION AND FINDINGS

7.1 Introduction

The literature review has identified the natures of TQEM, TQM, and EMS, the motivations underlying the implementation of TQM and EMS, as well as the barriers encountered during the introduction of such measures. Semi-structured interviews were selected for two reasons; firstly, to gather information concerning the implementation of TQEM in LFI, and, secondly, to inform and enable the design of the questionnaire that was circulated in order to obtain data from the LFI regarding environmental and quality issues, national environmental factors, barriers, and motivations. The results of the questionnaire were subsequently used to explain the findings that were derived from the semi-structured interviews, the main aim of this research seeks to contribute to the development of a framework preparing the LFI for the implementation of TQEM.

In this chapter, Section 7.2.1 presents the discussions and findings relating to the current situation in the LFI (*Objective 1*) based on the data derived from the qualitative investigations. Section 7.2.2 discusses the findings relating to environmental and quality management issues in the LFI (*Objective 2*). Section 7.2.3 discusses the national environmental factors in the LFI (*Objective 3*). Sections 7.2.4 and 7.2.5 identify the barriers and motivations involved in the implementation of TQEM (*Objectives 4 and 5*). Section 7.2.6 discusses the impact of environmental factors, barriers, and motivations on the implementation of TQEM that are aimed at sustainability in the LFI (*Objective 6*). Section 7.3 introduces a proposed framework for the implementation of TQEM in the LFI (*Objective 7*). Section 7.4 presents a summary of this chapter.

7.2 A discussion of the findings

The analysis of the interviews and results was intended to provide a starting point for the design of a framework for the implementation of TQEM methods in the LFI, so as to improve its future performance and competitiveness. Questionnaires were conducted with managers and employees in the LFI, and the findings derived from them are presented and discussed in this chapter.

7.2.1 First Objective: To Explore the Current Situation in the LFI in Comparison with Other Competitors in the Libyan Market.

This Section presented the results from the interviews that related to the current situation in the LFI. Qualitative analysis was carried out, using both content analysis and quotation comparison, in order to compare Libyan companies. The results of the qualitative analysis were combined at the interpretive level of research.

The interviews revealed that each company is still currently in the early stages of implementing TQEM, and that the LFI is implementing some popular quality techniques, such as the ISO 9002:2000, the Libyan Quality Standard, quality control, and quality assurance. However, they were not using other environmental management technique systems (e.g. ISO. 14000). The interviews showed that only one of them has achieved a mid-level quality programme. Despite the fact that most companies are still achieving average levels, this is probably due to a lack of understanding and knowledge of TQEM in the LFI.

According to the interviews conducted with two of the surveyed companies (A/B), the quality department is responsible for checking quality levels whereas, in company C, the quality office is responsible for checking these levels. This may be one of the main reasons that explains the low quality production of this company. In addition, the LFI companies addressed by this research do not have any EMS departments or offices through which to control environmental impact.

The LFI tries to develop their offerings so as to compete with high and low price foreign products. However, the LFI still needs to manage new plans in order to challenge competitors in the Libyan market. Furthermore, it seems that it is difficult for the LFI to control quality production and machinery operation, and it is also unable to achieve high levels of staff satisfaction. This is currently one of greatest challenges to quality implementation. Analysis of the interviews reveals that top management in the LFI does not provide sufficient support for new, quality or environmental management programmes, thus negatively affecting the productivity and the competitive positions of the companies.

The findings from the interviews revealed fairly low levels of TQEM implementation in the LFI. This is not surprising given that companies were using quality management systems (i.e.,

ISO 9002: 2000). The whole programme was simply a response to pressure from overseas clients.

The analysis reveals that Company A has a fairly solid competitive position, in spite of several Libyan and foreign competitors in the market. Considering that this company was the juice and milk manufacturer for the Libyan market, this enabled it to be a shaper of Libyan consumers' juice and milk preferences. However, as the situation has changed (e.g., competitors and imports) this company would face remarkable challenges to the maintenance of its competitive position.

The machinery and equipment of the three companies is outdated. This may affect and damage the environment both inside and outside the companies, particularly those factors that are associated with high levels of dust and pollution. The government invests a great deal of money in improving every aspect of the company, however, this funding is disrupted due to corruption in the management system and the way in which the government funding is deployed. Such corruption leads the government to minimise the amount of funding that is dedicated to improving and updating the machines.

7.2.2 Second Objective: To Identify the Environmental and Quality Management Issues for the Integration of TQEM in the LFI

- *Environmental Issues*

This finding confirm that environmental management is relatively new in the LFI, and so has not yet developed methods to drive environmental improvement both within companies and externally. Generally, Libyan managers and employees know that implementing any approach which protects the environment will achieve some increase in sales market shares, cost reductions in material, energy and services, a better distribution network, better corporate management, better risk management, and a green corporate image. So, the LFI should have an awareness of environmental management issues. However, it is unclear how this would translate into environmental management practices or formalised systems.

One of the findings from the questionnaire is that the LFI has not yet started to be more socially responsive in dealing with pollution and waste disposal, or in beginning to develop environmentally friendly packaging or in attempting to introduce the numerous other

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improvements needed to bring the LFI into line with current thinking on environmental protection. Managers in the LFI also have no concern for aspects of production that may have negative impacts on the environment, although they know pollution to the environment may affect the environment negatively.

The results confirm that the LFI does not have any environmental policy planning in their companies, and there is still very little support for EMS. The LFI also attaches little importance to reducing and recycling waste. The LFI companies being researched are also reaching low levels in relation to achieving EMS, including, for example, the reduction of environmental damage, in which these companies are particularly unsuccessful.

It can be seen from the data analysis that green products are not known in the LFI as ecological products or as environmentally friendly products. A green product is one that has more environmentally sound content or packaging to reduce its environmental impact (Chen and Teck, 2010). To ensure a balance between development and environmental sustainability is in itself a challenge. The LFI must ensure environmental sustainability and resource management in production.

From the questionnaires' answers, there is no concern about the pollution to the environment. So, waste has an impact on the environment in the LFI. The field visits to Libya found that there is a lack of training that would be beneficial to addressing the problem of dust and pollution. According to this, the main problem is that planning strategies for training in environmental protection in the LFI are unavailable. The LFI does not encourage its employees to protect the environment.

The environmental management issues in the LFI that are identified through the questionnaire can be summarised as follows:

- The LFI is not used and disposed of in an environmentally friendly manner in order to protect the environment;
- The LFI does not implement a system which would ensure control in obtaining raw materials and there is no clear method for testing the materials;

- Libyan managers do not attend enough training courses in relation to environmental management and there is no clear idea about this system;

- There is no programme to measure pollution and inspection procedures;

- In the LFI, the employees are not encouraged to accept responsibility for environmental protection and for the recognition and appreciation of environmental effort and the success of individuals and teams;

- The LFI does not have not a good record of responsibility towards environmental issue that cause risk to health, safety or the environment;

- The main problem is that there are no planning strategies in the LFI for companies' procedures to check and revise environmental performance training for environmental protection in LFI;

- The LFI does not have a good relationship with stakeholders (government, clients, suppliers, etc.) for environmental protection;

- Although Libyan managers and employees know that environmental audit is primarily a means of identifying opportunities for improving environmental performance, the LFI does not encourage employees to do their work correctly in order to improve environmental performance.

The value of environmentally sound practices is beginning to be recognised and a resultant change in attitude amongst managers is being seen as the benefits are being publicised (Klassen, 1993). The general behaviour is changing to become a more proactive approach to environmental practices from the old reactive one, since companies are beginning to recognise that the relationship between environmental quality and the opportunities for economic growth, and with improved environmental performance, can impact positively on profits. (Khadour, 2010; Hsieh, 2012). Clearly, environmental management and quality management come together to form what is now known as total quality environmental management (TQEM). This was a significant development from the previous approach that used a control-type role to make quality and environment the responsibility of a single person or a technical unit in production, rather than of individual employees, (Saad et al., 2014).

- *Quality Issues*

The findings revealed that managers and employees in the LFI have a fairly low level of understanding of the product cost during product development, which negatively affects the companies' productivity and, consequently, their competitive position. Clearly, under the effects of such problems, it might be difficult for their products to meet international standards. The impact on product quality and productivity was limited and it had little impact on reducing or controlling defective product units. Reducing costs resulted in a reduction in quality, and companies generally accepted that this trade-off between quality and cost was inevitable. Deming and others showed that improved quality can be achieved without extra cost and, indeed, can be seen as a way to reduce costs (Lawrence and Cutler, 2000). The LFI, as with most other emerging economy organisations, is generally run by managers with a lack of experience, whose main interest is to guard their own existence at any cost.

The main finding of the questionnaire was the lack of sufficient support from top management in the LFI in order to track rework, waste, rejects, so that continuous improvement is prioritised. This indicated that some of the greatest challenges faced by the LFI are associated with changing consumer tastes, scepticism at the clams of green advertising, a poor consumer perception of green products and the perceived high costs of developing green products. An understanding of this issue is thus essential, as is an understanding of both sustainability and of environmentally friendly products.

The responses confirmed that the LFI applies statistical processes, ISO 9002- 2000 system, and the Libyan quality award, to control quality in some units. This indicated that quality levels in the LFI are at modest and poor levels. This result indicates that some of the LFI uses statistical process control and other systems, such as the Libyan Quality Standard, to help them to control quality in some units. Although the LFI were using quality management systems (i.e., ISO 9002: 2000), the whole programme was just a response to pressures coming from their clients abroad who buy their products (Saad et al., 2014).

The quality management issues findings that were identified through the questionnaire could be summarised as follows:

- The LFI is not supporting a new quality programme, so the LFI face competing with foreign products in the Libyan market due to their high quality and competitive prices;

- The LFI has not paid attention to their external and internal customers;

- The majority of managers in the LFI fail to encourage quality management implementation;

- There was little awareness of quality management in the LFI;

- Most managers have not received formal quality management training;

- Quality measurement systems and benchmarking are not clear in the LFI, and also, they is no encouragement to attend training relating to this;

- The LFI does not have a good information system for improving its performance, they do not use information to make decisions in their companies, and information is not reliable, comprehensive, or clear;

- The employees in the LFI do not have the appropriate qualifications and experience that are required to improve their work, and their companies do not provide them with sufficient resources to implement the education plan;

- Top management in the LFI encourages change within a new framework of the implementation of environmental and quality management;

- The developing of a TQEM framework can be beneficial to the LFI, and the environmental and quality management problems can be solved by a clear framework in the LFI.

7.2.3 Third Objective: To Identify the National Environmental Factors relevant to the Implementing of TQEM to Sustainability in the LFI

The findings from the current investigation have identified five national environmental factors including: technical capability, organisational cultural, human resource, competition, and government policy.

- *Technical Capability*

The main findings from the questionnaire show that technical capability in the LFI that is provided needs updating or replacing with new machines. The overall answers to this question showed that the managers in the LFI believed that although their machines existed to produce products, they still needed updating and renewing using a better system to achieve higher levels of productivity and efficiency. The analysis indicated that the three companies mainly operated

with old machinery that was likely to have higher rates of machine breakdown. In fact, the Libyan government invests a great deal of money to improve every aspect of the companies, but because of corruption in the management system and the way in which the government funding is deployed, this is obstructed. Such corruption leads the government to minimise the amount of funding that is dedicated to improving and updating the machines.

The rate of breakdown was lower in Company A, but Companies B and C had higher numbers of faults in their machinery. Managers confirm that the causes of such breakdowns are the companies' inability to maintain the constant operation of machinery and the lack of maintenance teams' readiness to repair any fault that may occur. Mismanagement, shortage of funding, or other factors may be involved.

Companies B and C did not even have an engineer to take care of any emergency fault. The quality manager in Company B said: "Our company is suffering from machinery breakdowns and we do not have a maintenance team".

To implement modern techniques in developing countries, such as Libya, will be difficult, because the production system can be described as being at the 'base of the pyramid'. The attempt to implement new techniques and strategies for existing systems could lead to an unstable system that is difficult to implement (Youssef, 2006; Guresa, 2011; Irhoma et al., 2014). This finding could be summarised as follows:

- A lack of training may be the main reason for the negative attitudes in the technical capability of the LFI.
- The LFI has very limited resources in expertise with which to improve and maintain the productivity quality of their technical capability.
- The technical capabilities used in the LFI are not friendly to the environment.
- The technical capabilities of the LFI are insufficient to do the jobs required, and this may cause low quality production and a lack of environmental protection.
- Equipment in the three companies is outdated, and this may affect and damage the environment both inside and outside their companies and this is caused by the high level of dusts and pollution.
- The machinery in the LFI is quite old and must have an efficient maintenance system in order to keep it running.

- *Organisational Culture*

The results confirm that the organisational culture was seen by managers and employees as being one which had the greatest impact on TQEM implementation. The LFI attempts to develop techniques in order to overcome this issue, or at least to minimise its negative impacts on quality and environmental implementation. This issue could also be applicable to other industries in Libya. Organisational culture and strategic planning are two important key elements that should be addressed when implementing TQEM in the LFI.

In fact, organisational culture plays a great role in connection with Libyan managers' management and staff behaviour (Youssef, 2006). The LFI believes that organisational culture should be considered in training programmes in order to successfully implementation of TQEM. The findings on this factor can be summarised as follows:

- Organisational culture has not been given any attention in the LIF and it does not play a part in influencing an organisation's level of environmental and quality management practices;
- The LFI does not support the changes in style or structure that are required to adapt to changes in the business environment;
- Managers and employees have no clear vision of organisational culture in the future;
- Libyan management does not encourage employees to do their work correctly to work towards a continuous improvement in the products.

- *Human Resources*

Employees are one of the most important assets of an organisation, since they contribute to its growth and success. It is believed that the main aspect required to improve productivity is to focus on the human resources of an organisation. This may be inside the company or outside of the business. From this finding, it seems that human resources are one of the most important national environmental factors affecting TQEM implementation in the LFI. This study has revealed that the key findings regarding human resources in the LFI are:

- Human resources in the LFI show little improvement in relation to health, safety, and the environment;

- The human resources in the LFI do not understand what is expected from them and they are not given the freedom to become proactive within the companies;
- The LFI needs to increase the enhancement of the successful implementation of ISO 9000 and ISO 14000;
- The LFI does not focus on what human resources need or on top management, whose commitment and support is lacking, so there has been little encouragement for TQEM implementation;
- The LFI are seeking to develop managers and employees who are capable of designing and enacting changes which will enhance environmental protection and improve the quality of operation and who will impact significantly on the quality of products and services.

- *Competition*

The analysis reveals that Company A has a quite solid competitive position, in spite of several Libyan and foreign competitors in the market. Although the LFI makes an effort to compare their offerings with those of other companies (i.e., imported products) when aiming to achieve higher quality, they are still unable to compete with foreign entrants into the Libyan market. The findings on this factor can be summarised as follows:

- The LFI are facing increased competition and rapid advances in technology;
- Most managers in the LFI do not understand the complex nature of international trade and world markets have become globalised;
- The LFI does not identify best practice for improvements and opportunities to compete with other foreign companies;
- Clearly, under the effects of such problems, it might be difficult for the LFI's products to meet international standards.

- *Government Policy*

It is clear that there is no concern about the aspects of production that may have negative impacts on the environment (e.g., through pollution). So, the LFI being researched has negative impacts on health and the environment. Pollution may be the most important external impact of the company that can be linked directly to a lack of cleaning and updating of their machinery.

As the Libyan government does not implement environmental protection regulations that could be put in place by the government and local authorities in order to force factories with a similar profile to take positive measures regarding pollution, health and safety. The findings for this factor are:

- The Libyan government does not support a programme for TQM and EMS that is sponsored by government;
- The lack of encouragement for the food industry to take up more environmental practices by the Libyan government;
- The Libyan government is not supporting social and economic priorities, including improved food quality, safety, health, and the environment;
- The Libyan government is not supporting Libyan factories to deliver the latest technology, which supports the local company's contributions to environmental protection.

- *Social Responsibility*

In this study, social responsibility is not measured as a national environmental factor for the implementation of TQEM in the LFI questionnaire. However, managers and employees who participated in the questionnaire mentioned social responsibility as one of the important national environmental factors for the implementation of TQEM in the LFI. About 80% of respondents mentioned that social responsibility is considered to be a new application in the LFI and that it should be considered to be a national environmental factor for the implementation of a successful TQEM philosophy.

In the TQEM literature (Twaissi, 2008), social responsibility is considered an important factor that measures the organisation with the external environment to improve citizenship and to recreate relationships. Khadour (2010) argued that social responsibility is good and companies survive by improving the quality of people's lives by creating a high quality of goods and services.

It can be seen that this result did not match the study's findings, although the literature mention the importance of social responsibility in TQEM implementation. The researcher reflects that this is for two reasons. Firstly, there is no law and there is a lack of governmental control and

of a plan to support this factor. Secondly, the LFI does not have a good understanding of the cultural issues that are related to this factor.

The national environmental factors for implementing TQEM in the LFI that are identified through this research can be summarised as follows:

- Technical capability;
- Organisational culture;
- Human resources;
- Competition;
- Government policy;
- Social responsibility.

7.2.4 Forth Objective: To Identify the Barriers to the Implementation of TQEM for Sustainability in the LFI

The research showed that companies are not moving in the right direction and towards better TQEM implementation. This indicates that managers in the LFI do not support the improvement of their businesses and they have a little willing to discuss and adopt new ideas and techniques, such as TQM and EMS. The barriers to implementing TQEM in the LFI that are identified through this research can be summarised as follows:

- *Lack of Top Management Commitment*

The major barrier to the implementation TQEM in the LFI is top management commitment. The researcher believes that top management should be attending environmental and quality management awareness programmes and learning about TQEM planning, preparation, vision and policy deployment, techniques, and tools. This is because top management cannot lead their organisations towards TQEM implementation without sufficient knowledge of it. Gill (2003) has stated that '*Leadership must take the organisation on a journey from its current state to a desired future state and deal with all the problems that arise along the journey*". These results are consistent with the literature on similar findings which have been concluded by Salegna and Fazel (2000); Sebastianelli and Tamimi (2003); Youssef, (2006); Irhoma et al. (2014). The findings relating to this major barrier are:

- Top management in the LFI are not moving in the right direction and towards better TQEM implementation. This indicates that managers in the LFI do not support the improvement of their businesses;

- Both interviews and questionnaire responses have revealed that top management has a lack of commitment in regard to accepting suggestions and they usually they do not have the knowledge and the tools to undertake the tasks that TQEM requires, which could improve the protection of the environment and the quality of their products and services;

- The questionnaire responses have revealed that top management has a lack of commitment in relation to accepting suggestions that might improve the quality of their products and services;

- The responses also show that they can accept changes and improvements. They also agree that this is currently one of the greatest barriers to TQEM implementation.

- *Misunderstanding of TQEM*

The qualitative analysis of the interviews with the Libyan managers supported the data gained from the quantitative analysis. Quantitative results confirmed that TQEM would not be successfully implemented in the Libyan environment, mainly because managers and employees have an inadequate understanding of the quality and environmental approaches and there is a lack of involvement in the improvement process by people. This indicated that most of the LFI is still running with a traditional, bureaucratic management style, as was reflected. The findings for this barrier are:

- The findings of this research work identified that managers in the LFI offer little encouragement to employees in order to understand TQEM;

- Managers and employees are still at a low level of understanding of TQEM implementation;

- The LFI is still running with a traditional, bureaucratic management style as reflected;

- The LFI has little knowledge of popular environmental management techniques, such as the ISO 14000 system.

- *Insufficient Training for all levels of Staff*

Data analysis shows that the respondents have a low level of training and they still need more effort to be focused on improving practices, especially human resources management, education and training, in order for there to be successful TQEM implementation. This barrier causes an effect on TQEM implementation, as was mentioned by most of the Libyan managers and employees. Most managers have not received formal environmental and quality management training. The findings for this barrier are:

- The LFI being researched has little knowledge about the training for TQM and EMS;
- Both questionnaire responses and interviews show that the respondents have a low level of training and they still need more efforts to be focused on improving practices, especially those in human resources management, education and training, in order for there to be TQEM implementation;
- The majority of managers and employees in the LFI did not understand what was really meant by vision, empowerment or the internal customer;
- Training for all levels of staff in the LFI is of fundamental importance and must be provided continuously, as mentioned by most managers and employees in the LFI.

- *Lack in Achieving a Knowledge of Customer Needs and Satisfaction*

Achieving a knowledge of customer needs and satisfaction is one of the important barriers that should be addressed for the implementation of TQEM in the LFI. Khadour (2010) and Saad et al., (2014) have emphasised that TQEM implementation cannot be successful without the end result achieving customer needs and satisfaction. Top management can support this. It was obvious that the LFI was not fully supported in regard to customer needs and satisfaction. This was confirmed by interviews and questionnaire responses. The move from a traditional management philosophy to a TQEM culture demands much from an organisation, it needs more efforts in order to reach a situation of customer satisfaction. The findings for this barrier are:

- Customers in the LFI are not satisfied with the products and services from the LFI being researched;
- The LFI do not have activities that are focused on satisfying their customer's needs;

- The LFI does not have a programme that works to enhance consumer loyalty on the basis of quality and environment. Their answers to this question therefore reflect their poor understanding of the customer's needs and satisfaction.

These results agree with those of Businina (2011) when he studied the effect of marketing programmes on the buying behaviour of Libyan consumers. However, this a little different from the findings of Graisa (2011), who investigated the needs and implementation of total productive maintenance (TPM) in the Libyan cement industry.

- *Lack of Support for the Employee's Participation and Suggestions*

Another barrier that has been investigated is the lack of support for the employee's participation and suggestions. Literature shows that the employee's participation is essential if a company is to achieve quality improvement and environmental protection. Successful employees' participation requires that managers initiate and maintain the process of involvement and provide access to the resources that people need in order to contribute. Encouraging employees and sharing their suggestions and ideas are critical factors that lead to organisational success. From the findings, it seems that the lack of support for the employee's participation is one of the most important factors impacting on TQEM implementation in the LFI. It seems employees in the LFI do not understand what is expected from them and that they have the freedom to be proactive within the company. The findings for this barrier are:

- The LFI are still unable to achieve high levels of employees' loyalty and satisfaction;
- The top management members does not have a much more open-minded style, nor do they educate themselves and their employees and motivate them so as to encourage them to achieve their full capacity in implementing environmental and quality management initiatives;
- Managers in the LFI do not encourage employees to undertake their individual responsibilities for environmental management and to initiate continuous improvement,

- *Lack of Information Systems*

From the questionnaire responses it has been realised that an information system is one of the most important barriers to implementing TQEM in the LFI. Both managers and employees in the LFI indicated that the use of information systems could improve quality management and

protect the environment. This finding agreed with the TQEM literature, many researchers state that information systems in organisations must be considered to be the key enabler of TQEM implementation, and they have added that a good information system could be an enabler in the drive for successful TQEM and continuous improvement. Moreover, it could have a key role in the TQEM initiative through the technology, strategic management, and human resources, (Youssef, 2006; Khadour, 2010; Irhoma et al., 2014). In the same context, Hassan (2006) has indicated that the use of information systems can help in TQEM implementation through online information about the environmental and quality management level; the enhancing of environmental and quality management awareness; the reduction of costs; the speedy processing of data, and its use for effective and efficient decision-making in the organisation.

- *Lack of Governmental Environmental Control*

The lack of governmental environmental control is one of the new and important barriers to implementing TQEM in the LFI. All three companies being researched agreed that the Libyan government could definitely improve the implementation of TQEM, and help Libyan organisations to overcome management barriers. They have still not supported the suggestion of developing environmental and quality management that leads to inefficient TQEM implementation in the LFI. The LFI are suffering from a lack of support from the Libyan government policy relating to environmental management.

The barriers to implementing TQEM in the LFI that are identified through this research could be summarised as follows:

- There is a lack of top management commitment;
- There is a misunderstanding of TQEM;
- There is insufficient training for all levels;
- There is a lack in the achieving of a knowledge of customer needs and satisfaction;
- There is a lack of support for the employee's participation;
- There is a lack of information systems;
- There is a lack of governmental environmental control.

7.2.5 Fifth Objective: To Identify the Motivations for the Implementation of TQEM for Sustainability in the LFI

The findings of the current investigation show five motivations that include cost saving, increased production efficiency, the reduction of waste and pollution to the environment, the reduction of energy consumption, and the reduction of natural resource consumption, that have been chosen for study. This study has revealed key findings regarding the five motivations for implementing TQEM in the LFI that are as follows:

- *Cost Saving*

It has been shown that organisations have sought to improve performance and therefore profitability over time. Much attention has focused on reducing costs, while simultaneously enhancing productivity and quality. To achieve these improvements, both EMS and TQM have been developed as independent improvement operations. The findings for this motivation are:

- There are not enough programmes in the LFI for cost improvemen.;
- The LFI are given little importance to cost saving and the recycling of waste;
- The interviews and questionnaire responses confirm that recycling increases the environmental performance of the LFI and is therefore one of the foremost items that can contribute to its performance;
- Managers and employees have shown that the LFI needs to reduce costs and improve productivity, and also to increase customer satisfaction.

- *Increased Production Efficiency*

In the field visits to Libya, the researcher found that Libyan managers know that implementing any new mothed will lead to increased production efficiency which would include better corporate management, some increase in sales market shares, cost reduction in materials, protection for the environment, and better energy use. The findings could be summarised as follows:

- Top managers in the LFI have done litle to demonstrate their commitment, through a clean working environment, to act to increase production efficiency;
- The LFI does not have plans to increase its production efficiency;

- Managers in the LFI have little in the way of specific training to increase production efficiency;
- The LFI are not supportive enough of their employees to achieve productivity improvements.

- ***The Reduction of Waste and Pollution to the Environment***

The results from both interviews and questionnaire responses confirm that the LFI does not have any environmental policy planning in their companies, and their support of EMS is still very low. Although the recycling of materials provides some benefits or advantages to companies (Ambec and Lanoie, 2008), the LFI being researched is reaching low levels of achievement of EMS, including, for example, the reduction of environmental damage, in which these companies are particularly unsuccessful. The findings for this motivation are:

- There is no concern about the pollution to the environment in the LFI;
- Managing waste can aid in this goal, and the LFI should benchmark their processes to eliminate waste while, at the same time, simplifying their processes, and they should work continuously to improve all aspects of their operations;
- Managers in the LFI are not supporting the planning of environmental management and have given little importance to reducing and recycling waste. Therefore, waste in the LFI being researched has a high impact on the environment;
- There is clear evidence of a high level of dust pollution and its effect on the environment in the LFI.

- ***The reduction of Energy Consumption***

Generally, Libyan managers have the idea that implementing any approach which protects the environment will achieve some increase in sales market shares as well as cost reductions in material, energy and services. The findings of this motivation are:

- Reducing energy consumption is not a priority for the companies in the foreseeable future, for these reasons: the low prices of energy, the high cost of green technology, and the Libyan government policy needs to support the level of service quality in Libyan companies.

- It was found that the managers in the LFI have shown that improving the quality management of their products and services will drive the achievement of reduction the energy used;

- The LFI have not supported green products for the preservation of the environment and to reduce energy consumption.

- *The Reduction of Natural Resource Consumption*

It is important to secure alternative natural resource consumption, such as oil, gas and water. This, in turn, can help to maintain oil resources for future generations, and the reduction in oil consumption will reduce pollution. The findings for this motivation are:

- Although water is one of the most important natural resources, the LFI does not have a programme for water saving in their companies;

- There is no data about the costs of natural resources in the LFI;

- The reduction of natural resource consumption is not an important matter at this time in the LFI because of the availability of cheap energy in Libya;

- The LFI has little concern about the costs of natural resources in the future, it's not a very important matter at this time due to the cheap price of oil, gas and water in Libya.

- *Improved Environmental Performance*

Improved environmental performance is one of the new important motivations for implementing TQEM in the LFI. They confirm that companies should have procedures with which to check and revise environmental performance, a relationship of co-operation with stakeholders (government, clients, suppliers, etc.) for environmental protection, and to identify opportunities for improving environmental performance. Accordingly, it is obvious from the data analysis that the LFI does not support green products, and this may be damaging the environment. The Libyan government is not encouraging, as a regulator and a major client of the industry, more environmental practices, and it is promoting social and economic priorities, including improved food quality, safety, health, and the environment. A shift towards sustainable consumption patterns is, therefore, now imperative.

The motivations for the implementing of TQEM in the LFI that are identified through this research can be summarised as follows:

- Costs saving;

- Increased production efficiency;

- The reduction in waste and pollution to the environment;

- The reduction of energy consumption;

- The reduction of natural resource consumption**;**

- Improved environmental performance.

7.2.6 Sixth Objective: To Identify the Impact of Environmental Factors, Barriers and Motivations for the Implementation and Sustainability of TQEM in the LFI

In order to achieve this objective, applied quantitative approaches were adopted. These were applied so as to test the research hypotheses from the theoretical framework (please refer to Section 3.6). In this part of the research, the researcher illustrates the findings that emerged from the application of the quantitative approaches in order to identify how much of the variance in the independent variable can be explained when several independent variables are theorised to impact upon it simultaneously. Exploring the impact of environmental factors, barriers, and motivations as independent variables for implementation in the LFI is the sixth objective of the current research. The researcher tested three hypotheses:

- The national factors within the LFI impact on the potential to implement TQEM;

- The barriers within the LFI impact on the potential to implement TQEM;

- The motivations within the LFI impact on the potential to implement TQEM.

The researcher used questionnaires in order to collect the data. It is obvious that there is not enough information for the investigations of this study concerning the impact of individual TQEM implementation's outcomes. It is evident that there is a lack of investigations that study the impact of national environmental factors, barriers, and motivations for TQEM's outcomes (Khadour, 2010, Saad et al., 2014; Irhoma et al., 2014). The researcher therefore found that introducing this objective into the current study may contribute to the TQEM literature, in particular that concerning TQEM implementation in the Arab world. The three hypotheses have been presented separately with their findings and a related discussion.

Hypothesis 1: National Environmental Factors Within the LFI Impact on the Potential to Implement TQEM

The questionnaire findings in this current research indicate that environmental factors, including technical capability, organisational culture, human resources, competition, and government policy, have an impact on the potential to implement TQEM. This means that national environmental factors must be the expected result of the implementation of the TQEM in the LFI. The findings from this hypothesis demonstrate that the three independent variables (organisational culture, human resources, and government policy) have p-values below .005. This indicates that they make significant contributions to the explanatory power of the model. Since 'technical capability' has a p-value of .662 and 'competition' has p-values of .200.

The organisational culture, government policy, and human resources are independent variables, and are significant at the 1% level in explaining the variability in TQEM. In this context, the findings suggest that even though there is a positive correlation between national environmental factors (independent variable) and TQEM (dependent variable). Given the non-significance of the impacts of the national environmental factors on TQEM, a separate test was conducted for each of the national environmental factors' elements. As far as the specific national environmental factors' elements were concerned, a positive coefficient with TQEM was expected for three elements (organisational culture, human resource and government policy) and a negative coefficient for the other two elements (technical capability and competition).

Hypothesis 2: The Barriers Within the LFI Impact on the Potential to Implement TQEM

The questionnaire findings confirmed the hypothesis that barriers, including a lack of top management commitment, the misunderstanding of TQEM, insufficient training for all levels, the lack in achieving customers' needs and satisfaction, and the lack of support for the employee's participation, have an impact on the potential implementation of TQEM in the LFI.

The findings from Hypothesis 2 confirm that the four independent variables (the lack of top management commitment, the misunderstanding of TQEM, insufficient training at all levels, and a lack of support for employees' participation) have p-values below .005. This indicates

that they have a significant contribution to offer to the explanatory power of the model. Since a lack in achieving customers' needs and satisfaction has a p-value of 0.22.

The four independent variables: the lack of top management commitment, the misunderstanding of TQEM, insufficient training at all levels, and a lack of support for employees' participation, as independent variables, is significant at the 1% level in explaining the variability in TQEM. In this context, the findings, as far as the five barriers were concerned; were that a positive coefficient with TQEM was expected for four barriers (the lack of top management commitment, the misunderstanding of TQEM, insufficient training at all levels, and a lack of support for employees' participation) and a negative coefficient for one barrier (a lack in achieving customer needs and satisfaction). From the results of the testing of the hypothesis on TQEM implementation, it can be concluded that a lack in a lack in achieving customer needs and satisfaction within the LFI has a negative impact on the potential implementation of TQEM.

The findings of the current study, and from the literature already produced on TQEM, indicates that barriers have an impact on TQEM implementation. Many studies in TQEM literature match the current study's findings, such as Hassn (2006) and Khadour (2010). They demonstrated that a lack of top management commitment, the misunderstanding, and a lack of training, impacts on TQEM implementation. In addition, Curkovic and Sroufe (2007) and Haish (2011), found in their studies that the implementation of TQEM is achieved through the lack of support for the employee's participation.

Hypothesis 3: The Motivations Within the LFI Impact on the Potential to Implement TQEM

From the results of the hypotheses' testing, it can be concluded that the five motivations, including costs saving, increased production efficiency, the reduction of waste and pollution to the environment, reducing energy consumption, and natural recourse consumption, impacts on the potential to implement TQEM in the LFI.

The findings from Hypothesis 3 have demonstrated that the three independent variables (cost saving, increased production efficiency, the reduction of natural resource consumption) have p-values below .005, the independent variables of the reduction of waste and pollution to the

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environment has a p-value of .005. This indicates that they have a significant contribution to the explanatory power of the model. Since reducing energy consumption has a p-value of 0.102.

The independent variables (cost saving, increased production efficiency, reduction of waste and pollution to the environment, and the reduction of natural resource consumption) are significant, at the 1% level, in predicting the variability of TQEM. In this context, the findings of the four motivations were shown to have a positive coefficient with TQEM motivations (cost saving, increased production efficiency, the reduction of waste and pollution to the environment, and the reduction of natural resource consumption) and a negative coefficient for one motivation (the reduction of energy consumption).

7.3 Framework Proposed for the Implementation of TQEM in the LFI

As the current research contributes to the establishment of a framework for the implementation of TQEM in the LFI, the seventh research objective is "to propose a suitable framework for the implementation of TQEM in the LFI".

7.3.1 The Purpose of the Proposed Framework

The researcher considered all the information that was generated by the interviews/questionnaire responses in order to propose a framework for TQEM implementation in the LFI. So, the results of this research propose this framework, taking into account the current situation of the industry in the country being studied.

The national environmental factors and the barriers and motivations that are discussed in Chapters 2 and 3, are comprehensive. In many respects, these complement one another and the researcher has considered it beneficial to blend these and to measure criteria, such as quality awards, ISO 9000, and ISO 14000 (Hassan, 2006; Curkovica and Sroufe, 2007; Khadour, 2010; Hsieh, 2012). Further, the opinions of the LFI's managers and employees were appropriate in identifying the environmental and quality management issues, the national environmental factors, the barriers, and motivations for the implementation of TQEM.

According to Aalbregtse et al (1991), a framework is defined as *"a clear picture of the leadership goal for the institution and should present key characteristics of the to-be style of business operations".* Hassan (2006) and Khadour (2010) have stated that, for TQEM's successful implementation, a systematic approach is needed in order to develop a framework. The framework should be simple, logical and comprehensive enough for TQEM implementation. The development of a sound implementation framework is crucial and should be one of the first things that should be done before TQEM is embarked upon.

The key objective of this TQEM framework, as presented in Figure 7.1, is to bring an attitudinal change to the LFI and to set the direction for the implementation of TQEM in the LFI. The process of implementation of this framework is expected to work more efficiently if there is strong commitment from management at all levels and from the employees.

7.3.2 The TQEM Framework in the LFI

The framework proposed in this research is structured on three main considerations, which have arisen from the national environmental factors, the barriers and motivations which impact on the potential for TQEM implementation in the LFI. These are adapted from models presented by several studies, e.g., Oakland and Marosszeky (2006), Youseef (2006), Ajinah (2009), Hassin (2009), Morath and Doluschitz (2009), Karapetrovic and Casadesu (2009), Khadour (2010), Hsieh (2012), these studies were carried out in several different countries.

Using Libya as a context, the current framework illustrates national environmental factors, the barriers and motivations for TQEM implementation and the impacting of these considerations on sustainability in that implementation. The previous issues of environmental and quality management are found to be solved in the implementation of a TQEM process in the LFI. However, a number of national environmental factors, barriers and motivations that prevent TQEM implementation in these companies were considered in the proposed framework. This framework provides a comprehensive basis for TQEM implementation that is appropriate to the LFI being researched as it represents a thorough integration of the qualitative and quantitative data. The framework (Figure 7.1) illustrates the areas of these three dimensions as well as the impacts on TQEM implementation for sustainability.

TQEM Implementation in the LFI

The national environmental factors of implementing TQEM in LFI
- Technical capability.
- Organizational culture.
- Human resource.
- Competition.
- Government policy.
- ■ Social responsibility.

The barriers to implementing TQEM in the LFI
- Lack of top management commitment.
- Misunderstanding of TQEM.
- Insufficient training for all levels.
- Lack in achieving a knowledge of customer needs and satisfaction.
- Lack of support for the employees' participation.
- ■ Lack of information systems.
- ■ Lack of government environmental control.

The motivations for implementing TQEM in the LFI
- Cost saving.
- Increased production efficiency.
- The reduction in waste and pollution to the environment
- The reduction of energy consumption.
- The reduction of natural resources consumption.
- ■ Improved environmental performance.

Impacts on TQEM Sustainability

Negative Impacts TQEM Sustainability

Factors Impacts TQEM Sustainability
- Technical capability.
- Competition.

Barriers Impacts TQEM Sustainability
- Lack in achieving a knowledge of customer needs and satisfaction.

Motivations Impacts TQEM Sustainability
- The reduction of energy consumption.

Positive Impacts TQEM Sustainability

Factors Impacts TQEM Sustainability
- Organizational culture.
- Human resource.
- Government policy.

Barriers Impacts TQEM Sustainability
- Lack of top management commitment.
- Misunderstanding of TQEM
- Insufficient training for all levels.
- Lack of support for the employees' participation.

Motivations Impacts TQEM Sustainability
- Cost saving.
- Increased production efficiency.
- The reduction of waste and pollution to the environment.
- The reduction of natural resources' consumption.

■ New Application in Libya

Figure 7. 1 TQEM Framework in the LFI

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As shown in Figure 7.1, the five national environmental factors, five barriers and five motivations for TQEM implementation, as stated in the literature, are shown, as well as one national environmental factor, two barriers, and one motivation which appear from the division of the factor of social responsibility (as the 6th factor national environmental factors); the lack of information systems and the lack of governmental environmental control into two barriers (as the 6th and 7th barriers), and improved environmental performance (as the 6th motivation) which have resulted from the empirical study of TQEM implementation in the LFI. The researcher is thus presenting this framework with 6 national environmental factors, 7 barriers and 6 motivations for TQEM implementation, which have been studied. However, the new factor (social responsibility), the two new barriers (the lack of information systems and the lack of governmental environmental control), the new motivation (improved environmental performance) were not clearly linked to TQEM implementation by the empirical study. These were not very evident from the empirical study. However, there was evidence from the empirical study that only 5 national factors, 5 barriers and 5 motivations are applied effectively within the LFI in order to implement TQEM.

On the other hand, from the framework above it could be said that the LFI has noticed a postive impact on TQEM implementation for the sustainability of the organisational culture, human resources, and the government policy in their companies. On the one hand, the barriers of a lack of top management commitment, the misunderstanding of TQEM, insufficient training for all levels, a lack of support for the employee's participation, have a postive impact on the TQEM implementation for sustainability. Finally, the motivations of cost saving, increased production efficiency, the reduction in waste and pollution to the environment, the reduction in natural resource consumption, have a postive impact on the TQEM implementation for sustainability. The next section explains the processes for the use of the TQEM implementation framework in practice. Figure 7.2 shows the processes of implementing TEQM in the LFI which consist of eight steps.

7.3.3 Processes of Framework Implementation (Steps of the LFI TQEM Framework)

To resolve the current problems of environmental and quality management, and to successfully implement TQEM for sustainability in the LFI, the researcher developed a processes with which to bring the quality management and environmental management together in order to form a total quality environmental management system, which is a management system that includes such elements as leadership, customer focus, full employee involvement and commitment, and continuous underlying improvement. It is designed to help the LFI to get started and to move step by step towards a TQEM culture, and also to pay attention to the standards of work and environmental protection that are expected of the LFI, including agreed TQEM objectives, the sharing of relevant information, training programmes, and performance criteria.

The processes of implementing TQEM consist of eight steps. First, in order to have effective TQEM implementation, the efficiency of this step is Awareness Step (step 0) is a function and motivation for managers' commitment and for employees to enhance their sustainability in considering how to understand TQEM and know the important of EMS and TQM to implement the TQEM successfully. Second, based on Step 0, a TQEM steering team must be established in the LFI, Preparation Step (step 1). Third, after Awareness and preparation steps, the next step is the Implementation Step (step 2). Fourth, there is a cycle of Plan-Do-Check-Act (PDCA), which consists of 4 steps. The (PDCA) is a method recommended for implementing TQEM in the LFI (see Section 3.7). This cycle starts with the Plan (Step 3), which includes data analysis to prepare a plan of action that is proposed to improve TQEM implementation in the LFI. Fifth, after a plan step has been agreed, the next step is the Do Step (step 4). This step involves deciding which plan to undertake and to start on a small scale with a pilot programme, to ensure that the problems of TQEM implementation are resolved. Sixth, is the Check Step (step 5). In this step, the impacts of implementing the improvement plan are used and the results of actions are checked to assess whether the objectives have been achieved if compared with the plan. Seventh, things move to the Act Step (step 6), during this step, the LFI Act on the information. If the change has succeeded, the plan is standardised; if not, the cycle is continued in order to improve it. The last step (step 7), during this step th LFI will translate the systems discussed in the previous steps into TQEM by insuring full quality/environmental management. Figure 7.2 shows the steps of the LFI TQEM framework.

Step 0 (Awareness)
. Top management attend basic course, workshop and conference.
.Understanding what environmental and quality management are.
. Knowing why environmental and quality management is important.

Step 1 (Preparation)
. Forming an EMS department.
. Preparing project environmental and quality management plans for all levels of work.
. Establishing the steering team for TQEM in the LFI and preparing TQEM training.
. Creating TQEM Culture and vision.
. Reviewing TQEM motivations.
. Encouraging the employees' suggestions for implementing TQEM.

Step 2 (Implementation)
. Reviewing the preparation of environmental and quality management plans and measuring performance.
. Developing TQEM policy and a plan to set objectives, policy and planning draft.
. Communication between the top managers and international EMS agencies.
. Adopting new information systems to promote high-level TQEM planning and information for managers and employees.
. Stakeholders' considerations of the impact of the industry's activities on the EMS.
. Implementing TQEM techniques such as ISO 9000 & ISO 14000.

Step 3 (Plan)
. Reviewing and revising legislation for TQEM initiatives.
. Reviewing EMS performance criteria.
. Ensuring everyone understands TQEM.
. Developing TQEM policy and plan to set objectives, policy and plan draft.
. Identifies energy and environmental issues.

Step 4 (Do)
. Start of improvement processes.
. Creation of relationships with stakeholders, suppliers, and customer.
. Investigating the current system is meeting the TQEM requirements.

Step 5 (Check)
. Check aware of regulation.
. TQEM analysis (strengths and weaknesses).
. Adapting LCA in terms of raw materials, waste, emissions, and energy).
. Checklists toxic emissions output matrix.

Step 6 (Act)
. Analyse the results obtained from the Check Step.
. Returns to the Plan step if the analysis show that the implementation has not been effective.
. Ensure that TQEM can be continually implemented.

Step 7 (Integrating)
. Achieved improved for environmental protection and product and service.
. A decrease in waste resource.
. Sustainable competitive advantage.
. Continuous improvement the TQEM at all LFI levels.
. Satisfy customer needs and satisfactions.

Feedback (reviewing from Stage 0 if a problem occurs here)

Feedback (reviewing from Stage 3 if a problem occurs here)

Figure 7. 2 TQEM Implementation Processes in the LFI

From the Figure, above, it has become evident to many of those in the LFI who have been affected that they need to move towards environmental protection and quality improvement. Adopting these TQEM steps requires a significant change in the organisational culture and management philosophy following the Libyan market's change from being a closed to an open market system. The LFI should look for a way to develop best practice approaches in order to support a transformation leading to better performance. These processes provide a solution that will result in more effective interaction between TQM and EMS. Implementing TQM and EMS systems has thus become a 'hot' topic for research and practice. Accordingly, the process consists of eight steps and is designed to help the LFI get started and move step by step through TQEM implementation for sustainability. It is essential to restart the PDCA cycle, which is the most important part of the implementation. Implementing TQEM is like the PDCA cycle – never-ending!

This is a significant development from the previous steps using a control-type role so as to incorporate environmental and quality management into the TQEM. This phase brings EMS and TQM together to support the company's business and, in so doing, it aims to overcome the independent EMS and TQM operations that lead to competitive demand for resources or priority of attention.

The LFI's issues in both environmental management and quality are presented in Sections 6.4. It must be pointed out that the issues in the two areas are not independent, but interrelated. This is because, today, their products' impact on the environment is an important measure of a company's performance, and, hence, should be included in the company's quality management framework. On the other hand, the environmental management must be implemented within the company's quality management framework, without which proper environmental management cannot be achieved (Saad et al ., 2015).

 The related literature indicates that several EMS approaches are advocated, and some suggest that the development of EMS may proceed alongside the establishment of other management tools, for instance, total quality management (Hassan, 2006; Hsieh, 2012; Saad, 2014; Bernardo et al., 2009) .General behaviour is changing and is developing into a more proactive approach to environmental practices, rather than the old reactive one, as companies are beginning to recognise that the relationship between environmental quality and opportunities for economic growth, with improved environmental performance, can impact positively on profits (Khadour 2010).

Finally, from the proposed framework, it can be said that the survey determines that TQEM could be implemented in the LFI. A TQEM implementation framework that has been elaborated following those used in developed countries may not suit the situations in developing countries due to the differences in cultures, social structures and economies (Kadour 2010). The successful implementation of TQEM will have a profound effect on the production systems of countries such as Libya. However, TQEM will necessitate a shift in thinking about the environment. EMS itself requires attention to environmental impact, while TQEM requires responsible resource use and waste minimisation. The production systems must also incorporate sustainability into their philosophy as they seek to increase their output and profitability. Achieving such development without negatively affecting the environmental system requires the adoption of a philosophy of responsibility for the environment. The implementation of the new approach in the LFI will take at least eight years before significant results were achieved. This was related to a variety of reasons, but rested heavily on the way in which organisational learning occurred.

7.4 Chapter Summary

This chapter has presented discussions and findings that have emerged from quantitative and qualitative investigations. As presented previously, the research has aimed to achieve seven objectives. The chapter has considered environmental and quality management issues in the LFI; national environmental factors; barriers to, and motivations for the implementation of TQEM in the LFI. The impact of national environmental factors, barriers and motivations for the implementation of TQEM in LFI are considered and, finally, the chapter proposes a framework and processes for the implementation of TQEM in the LF.

CHAPTER EIGHT: CONCLUSION, CONTRIBUTION, AND FURTHER RESEARCH

8.1 Introduction

The present research is an investigation of the implementation of total quality environmental management (TQEM) in the Libyan food industry. It seeks to explore the current situation, environmental and quality management issues, national environmental factors, and the barriers, and motivations for implementing TQEM in the LFI. The methodology includes a number of aspects, including the theoretical and philosophical assumptions on which the research is based. The stance that has been taken, or the underlying theories and philosophy of the present research, is reviewed in Table 8.1.

Table 8. 1 The Methodology Approach to the Present Research

Research Philosophy	Mainly Positivism	This research, the theory is tested by observation; it seeks to explain relationships between variables; it frequently utilises quantitative data; it employs controls to allow the testing of hypotheses.
Research Approach	Deductive	Deductive approach allows the researcher deduce the study's hypotheses based on known facts (theories), to test them in empirical ways by using statistical methods.
Research Strategy	Survey	The survey allows the researcher easy comparison and statistical analysis.
Research Method	Qualitative and quantitative	Semi structured interviews (face-to-face) allows the researcher to produce more information and understand the issues being investigated. The questionnaire (hand delivered and self-completion questionnaire) allows the researcher to collect information from all managers and a large number of employees.
Research Sampling	Multi sampling technique	All participants were Libyan top-mid-low level managers and sample of employees'.

8.2 Research Summary

This research has been undertaken in order to investigate TQEM implementation in the LFI. In Chapter 1 the researcher considers the present situation in the Libyan food industry, paying particular attention to its production and its impact on the environment. He then considers the benefits that may accrue from the importance of the food industry to Libya's economy, the opening up of the market to international partners, the consequent need for improvements in quality and environmental control, and the need to introduce management techniques, such as TQEM. The researcher outlines the purposes and results of his research trip to Libya in 2010, and notes the means by which he undertook his field research. The researcher outlines the problems that the food industry has suffered in recent years. As a result of his initial fieldwork, he puts forward the notion of a TQEM framework that should be implemented in the Libyan food industry in order to address its deficiencies. The researcher lays out his research aims, which are intended to assist the LFI to increase the volume and quality of their production and to attend to the resulting problems for the environment, while still enabling their competiveness in relation to external competitors. The research's objectives are outlined and the researcher justifies the research's rationale. The methodology used in the research is briefly outlined and the structure of the thesis explained.

Chapter 2 engages with TQEM (Total Quality Environmental Management). It explains that TQEM is the result of the merging of EMS and TQM to offer more effective interaction between the offerings of the two systems by integrating them. A brief discussion of the background to TQEM is offered, together with an outline of the benefits it presents to a variety of the facets of the overall management. Similar outlines are offered for EMS and TQM and the pros and cons of each system are evaluated. Various prizes have been offered, which the author suggests have assisted in the implementation of good practice in relation to these management systems, for instance, the Deming Prize and the Malcolm Baldrige National Quality Awards, The European Foundation for Quality Management Awards, are discussed and their effects evaluated. A section on ISO then follows, together with a discussion on the barriers to TQM implementation. The relationships between EMS and TQM systems are examined.

Chapter 3 embodies a conversion stage in the current research between the literature review (Chapter 2) and the data analysis and results (Chapters 5 and 6).

The conceptual framework was designed to serve as a guideline for the nature of the current research's objectives. Utilising a review of the literature that is available on TQM and EMS (outlined in Chapter 2), it attempts to offer a framework that can be used for their implementation. The deficiencies that the author has noted in previous TQEM studies are considered and these are used as a foundation on which to develop the national environmental factors that are needed to implement TQEM. The barriers and motivations that he has observed to be present in the Libyan context are deliberated upon and the research framework used in this present research is proposed. This chapter thus provides conceptual framework on which to develop a comprehensive view of TQEM implementation, integrating the relevant theoretical and empirical research studies that has been reported on in the appropriate literature. It illustrates how the research concepts adopted are operationally measured, by specifying the measurement types.

Chapter 4 offers the reader the research methodology used in this research, how such methods are used and a justification of that use, together with the theoretical and philosophical concepts that underpin them. The various components that make up the methodology, both quantitative and qualitative, are discussed. There is an examination and justification of the way in which his samples were chosen for the research itself. The resulting data are also examined and the author explains how he deliberated on and analysed these data. He offers answers to questions relating to the validity of the data obtained and discusses the problematics associated with his fieldwork process.

Chapter 5 examines the data obtained from the interviews that were undertaken with top, midlle, and low management in the LFI. These interviews related to the barriers, and motivations for, the implementation of TQEM. The quality and environmental techniques that are implemented are studied, together with comparisons with other manufacturers. Machinery was seen to be outdated and maintenance was not considered to be being given sufficient attention, thus causing a lack of competitiveness in both the internal and external markets and delays in production due to breakdowns. Top management are not believed to have adequate levels of commitment to addressing problems or the implementation of TQEM, nor do they give enough encouragement to employees in order to implement TQEM. Training is insufficient at all levels, and customers' needs are insufficiently addressed. Marketing implementation is at an early stage and consumer research and product design are largely ignored, the main pressure is on sales and promotion.

Pollution caused by the production process is also not addressed, and top management members interviewed seem to believe that the government should recognise the benefits of managing environmental pollution. The general viewpoint was that waste was the major problematic factor in regard to the production process, both in regard to the raw materials used and the energy consumed.

Chapter 6 analyses the data that has resulted from the quantitative research undertaken (the questionnaires). Having described the steps used in the data analysis, the chapter breaks down the results into sections. These begin with the demographics of those who completed the questionnaires (in terms of age, gender, educational level, current position and the number of years of their experience in the LFI). Data analysis of the environmental and quality issues, national environmental factors and the barriers and motivations in the LFI is then undertaken. A final section tests the hypotheses. The chapter shows that TQEM is often misunderstood and, once again, shows the lack of commitment that it is felt top management gives to implementation, etc. Similarly to the qualitative material obtained from the qualitative research, there is shown to be a lack of consideration of the customers' needs and satisfaction, as well as both a lack of training for TQEM implementation at all levels, and a failure to support employees' participation in this implementation. Environmentally, it was shown that a majority of respondents answered 'never' to questions relating to the implementation of cost saving initiatives (production costs, waste, energy), with a large number responding 'don't know'. Motivations for cost savings were negative. For those questions that related to improved productivity (cleanliness, increased efficiency and the discovery of training needs), there were also negative responses. This negative response also applied to the waste reduction motivation. The fourth motivation, which related to energy consumption, cleanliness of machinery, etc., also drew negative answers, in the main. In relation to resource consumption it was shown that, on the whole, the LFI does not have a programme for reducing the consumption of resources, including water, even though 70+% said that improved use of resources was one of the major reasons for implementing TQEM. Finally, the hypotheses are tested.

Chapter 7 presents discussions and findings that relate to the LFI's current situation, attending to the seven Objectives that were previously set out. These discussions and findings are based on data obtained from the quantitative and qualitative investigations undertaken. The chapter has sections that consider environmental and quality management issues in the LFI; national environmental factors that impact the LFI and the barriers and motivations that impact the

implementation of TQEM in the same industry. In Section 7.2.6, the impact of environmental factors, barriers, and motivations for the implementation of TQEM that aim at sustainability in the industry are considered and, finally, the chapter proposes a framework and process for the implementation of TQEM in the LFI.

8.3 Conclusions

Based on the analyses of the qualitative and quantitative data, as presented in Chapters five and six, which are discussed together in chapter seven, the following summary of the main findings and conclusions was derived. In order to investigate the research problem and fulfil the research objectives, this research seeks to answer the following questions:

1. What is the importance of integrating EMS and TQM into TQEM to improve the LFI's performance in moving towards sustainability?.

2. What are the expected national environmental factors, barriers, and motivations for the implementation and sustainability of TQEM in the LFI?.

3. What is the proposed framework for the implementation of TQEM in the LFI?.

4. Which practical suggestions and recommendation are proposed to aid the LFI's preparations for TQEM implementation?.

The answers to the four research questions, above, were found as a result of conducting this research are follows:

Question 1: this question was answered through an extensive literature review. The researcher discusses the relevant literature on EMS and TQM to determine what it is from previous work that makes a significant contribution to TQEM's implementation. I have thus identified the concept that is TQEM, the historical background to the EMS and TQM movement. Further, the environmental management techniques and their impact assessments are discussed. Barriers, and motivations for the implementation of TQM and EMS, and linking TQM with EMS, were reviewed. The relationdhip between EMS, TQM and TQEM in sustainability are discussed in Chapter 2.

Question 2: this question was answered by comparing previous studies that have been conducted and that are used as reliable measurement instruments for TQEM implementations. Five national environmental factors, five barriers, and five motivations are identified as being critical for successful TQEM in the LFI. The results of this investigation suggest that addressing the framework will increase their chances of success within the Libyan context.

Question 3: this question was answered by developing a TQEM implementation framework. The findings of this study provide a framework for TQEM implementation in the LFI, considering the current situation of the industry in the country of study (Libya). The framework produced is based on theory outlined in the literature review. In the empirical examination, the research findings from the interviews and questionnaires that were conducted within the LFI were employed.

Question 4: this question was answered by proposing some suggestions and recommendation for aiding the LFI's preparations for TQEM implementation. Based on the findings in Chapter 7, recommendations are categorised into three levels:- managers, the LFI authorities, and the Libyan government, so as-to resolve the issues in environmental and quality management, and to help the LFI prepare for TQEM implementation.

After the researcher had defined the research problem and questions, seven research objectives were set. These research objectives are:

1. To explore the current situation in the LFI in comparison with other competitors in the Libyan market.

2. To identify the environmental and quality mamagement issues for the integration of TQEM in the LFI.

3. To identify the national environmental factors relevant to the implementation of TQEM to sustainability in the LFI.

4. To identify the barriers to the implementation of TQEM for sustainability in the LFI.

5. To identify the motivations for the implementation of TQEM for sustainability in the LFI.

6. To identify the impact of the national environmental factors, the barriers, and the motivations for the implementation and sustainability of TQEM in the LFI.

7. To propose a suitable framework for the implementation of TQEM in the LFI.

The seven research objectives, above, that were found as a result of conducting this research, are as follows:

8.3.1 Conclusion for Objective 1

The researcher conducted semi-structured interviews with the general, operational, and quality managers in the LFI so as to achieve this research objective in order to generate general information about the current situation in the LFI. The main purposes of this objective is to identify the current quality techniques implemented and to compare them with other competitors, and the machinery in these companies. The findings of the interview analysis showed that the LFI give little support to environmental and quality management programmes. Most interviewees confirmed that the LFI use the quality ISO 9002- 2000 system and the Libyan National Quality Standards (LNQS), see Table 5.1. The LFI had also not paid enough attention to their external and internal customers. Managers emphasised that the LFI's need to update and renew machines, see Table 5.2. Further findings from the interviews with the Libyan managers highlighted that the LFI are suffering from competing with the foreign products, which have a high quality and low prices. In this interview five barriers and five motivations were identified and ranked based on the managers in LFI knowledge in their companies.

8.3.2 Conclusion for Objective 2

This objective has been achieve by investigating both environmental and quality management issues so as to help the LFI achieve a high level of quality and a sustainable environment. This objective was reached by presenting the results from a questionnaire that investigated environmental and quality management issues in the LFI. It finds that the major issue relating to environmental and quality management in the LFI is that top management in this sector does not provide sufficient support for new environmental and quality management, and also that there is no concern about the pollution of the environment. The questionnaire shows that quality management exists at only modest or poor levels. There is also evidence from the LFI that has shown that their machines were incapable of adhering to new quality programmes that may have an impact on the environment. The LFI has little environmental awareness and has not

given enough importance to the reduction and recycling of waste. The opinions of the LFI's managers and employees are identified in relation to issues of environmental and quality management. The investigation's results were used to establish a framework for total quality environmental management (TQEM) implementation in the Libyan context, so as to improve quality and provide more environmental protection.

8.3.3 Conclusion for Objective 3

The investgating of national environmental factors in the implementation of TQEM for sustainability in the LFI is discussed in the following key points section.

A. Technical Capability

The findings from this study have indicated that although the machines in the LFI existed to produce a satisfactory product, they still needed updating and renewing through a better system in order to achieve higher levels of productivity and efficiency. The analysis has indicated that the three companies mainly had old machinery which was likely to have higher rates of machine breakdown.

B. Organisational Culture

In Conclusion, findings show that managers and employees in LFI need more training and workshops to enable them to be aware of the importance of the process of TQEM's development and implementation. Environmental and quality management training should be provided to all levels of managers and employees, as the training will enhance their environmental culture; amend their knowledge through any new strategies and techniques that are adopted. These help to increase their skills for the programme and to ensure the continuous improvement.

C. Human Resource

The Libyan managers and employees mentioned that the LFI need to regularly keep the employees up-to-date, so that they can efficiently participate in the approaches to environmental and quality management. A summary of the findings that relate to this factor has indicated that most managers and employees in the LFI need to provide training programmes, such as managers' and employees' skills, communication skills, improvements

in relation to health, safety, and the environment. It could thus be concluded that there should be focus on the human resource factor as a separate factor from training in the Libyan context.

D. Competition

Summarising the keys findings relating to competition shows that the LFI needs to adapt a new system/network through which to sort out its relationships with the international and national suppliers, who should be evaluated and selected based on their capabilities and their commitment to service quality. The LFI should pay attention to their external and internal customers. This is reflected in the overall planning of environmental and quality management efforts.

E. Government Policy

It is concluded that the LFI are suffering from a lack of support from the Libyan government in relation to environmental and quality management. This means that the Libyan government have no awareness of the significance of environmental protection, quality production and services, sustainability and global environmental issues to their stakeholders and local people.

F. Social Responsibility

The researcher did not measure this factor in the questionnaire. It was mentioned by the managers and employees in the LFI. Consequently, this factor is considered to be a new application that has not generally been studied in Libya, and particularly not in the LFI. Managers at all levels need to adapt new information systems in their departments so as to encourage them to have a high degree of social responsibility in TQEM planning and the information given to employees, and to provide all the information needed by the customer on the products and services provided by the company.

8.3.4 Conclusion for Objective 4

The investgating of barriers to the implementation of TQEM towards sustainability in the LFI is discussed in the following key points section.

A. Lack of Top Management Commitment

Managers and employees in the LFI confirm that the lack of top management commitment is one of the most important barriers to TQEM implementation. The lack of top management commitment is one of the reasons for the failure of TQEM implementation. Managers at all three companies do not have enough control of quality production, environmental protection and machinery operation. However, managers in the LFI were willing to discuss this problem, hoping to achieve a possible solution.

B. Misunderstanding of TQEM

The summary has indicated that the LFI have a limited knowledge and understanding of TQEM. According to the results of the interviews and questionnaires, the managers and employees in the LFI have little in the way of knowledge for the improvement of environmental health and safety. The LFI have little knowledge of popular environmental management techniques (e.g., the ISO 14000 system).

C. Insufficient Training for all Levels

Findings have indicated that managers and employees need training and workshop initiatives to qualify them for an awareness of the importance of the process of TQEM's development and implementation. Environmental and quality management training should be provided at all levels for managers and employees, as the training will enhance their environmental awareness and amend their knowledge through any new strategies and techniques that are adopted. These help to increase their skills in relation to the programme and in order to ensure the continuous improvement that is required by a formal TQEM.

D. Lack in Achieving a Knowledge of Customers' Needs and Satisfaction

The lack in the achievement of customers' needs and satisfaction is the fourth of the barriers and measures how well the LFI defines its customers and determines their needs, and satisfaction, in order to investigate TQEM implementation. The finding indicates a low level of customer satisfaction, as they do not work to enhance customer loyalty on the basis of environment and quality.

E. Lack of Support for Employees' Participation

The findings have indicated that the lack of support for employees' participation is one of the most important barriers that needs to be studied in the LFI, since they contribute to its growth and success. The data obtained from the Libyan managers and employees show that Libyan mangers are not encouraging their employees to achieve their full capacity in implementing environmental and quality management initiatives. It is concluded that Libyan managers do not motivate their employees to undertake their individual responsibilities for environmental management and to initiate continuous improvement.

F. The Lack of Information Systems

This barrier was not measured by the researcher in the interviews and questionnaires; however, it emerged from the questionnaires and was mentioned by 55% of the respondents. Both managers and employees in the LFI confirm that the lack of information systems was one of the important barriers to the implementation of TQEM in the LFI. Moreover, using a high level of information systems in the LFI would increase its performance in making decisions. It can be concluded that this barrier is considered to be a new application that has not generally been studied in Libya, and particularly not in the LFI.

G. Lack of Government Environmental Control

This barrier emerged from the questionnaires and was mentioned by 60% of the respondents. This factor is considered a new application that has not generally been studied in Libya, and particularly not in the LFI. Libyan managers and employees in the LFI confirm that encouraging government environmental control may solve environmental issues, so the Libyan government should encourage change within a new framework for the implementation of environmental and quality management.

8.3.5 Conclusion for Objective 5

The investgating of motivations for the implementation of TQEM for sustainability in the LFI is discussed in the following key points section.

A. Cost Saving

The findings have revealed that in relation to saving costs in the LFI, both managers and employees are not taken into account in trying to understand the important roles of saving costs in the LFI. The LFI needs to collect the data related to costs, which it can use to seek improvement opportunities. This is because, without investigating the data on costs, actions cannot be effective and environmental and quality issues cannot be solved. The LFI have given very little consideration to the costs involved, particularly waste management costs that necessitate TQEM investments in the first place (e.g., waste water, air emissions, energy and hazardous waste).

B. Increased Production Efficiency

The findings confirm that the LFI needs to move towards improving efficiency and implementing best practice management systems and needs to provide a safe, clean working environment to increase production efficiency. Managers in the LFI are not involved enough in determining the training needs to increase production efficiency and, also, they give little encouragement to employees to control and improve the plans that relate to production efficiency.

C. The Reduction of Waste and Pollution to the Environment

Both interviews and questionnaires have indicated that the LFI do not have a programme for setting up internal material recycling systems and they do not have programmes for recycling and waste. There is also no policy for the re-use or recycling of materials, such as cardboard and empty food bags.

D. The Reduction of Energy Consumption

It is concluded that the LFI does not have a programme for the reduction of energy consumption and it is suffering from not having a system for the promotion of energy conservation and more efficient energy management. Equipment and machinery in the LFI have not leant towards systems which help to reduce energy consumption. Libyan managers and employees confirm that reducing the amount of energy that is used in the LFI is not a priority for companies in the foreseeable future, due to the low prices for energy and the high cost of green technology.

E. The Reductions in Natural Resource Consumption

Findings have indicated that the LFI do not have a programme for the reduction of natural resource consumption and they do not have the system needs to modify the production process so as to reduce natural resource consumption.

F. Improved Environmental Performance

This motivation is considered to be a new application that has not generally been studied in Libya, and particularly not in the LFI. About 70% of the responses said that implementing TQEM with the aim of improved environmental performance is one of the important motivations for implementing TQEM in the LFI.

8.3.6 Conclusion for Objective 6

One of the critical findings of this study which has emerged is the impact of national environmental factors, barriers to and motivations for the implementation and sustainability of TQEM in the LFI. It can be concluded that national environmental factors in the LFI enables them to increase and successfully improve TQEM implementation. The findings show that the organisational culture, the human resources, and government policy have a positive impact on TQEM implementation for sustainability in the LFI.

There is clear evidence that there are a number of barriers which impact on the implementation of TQEM in the LFI. The findings have indicated that the lack of top management commitment, the misunderstanding of TQEM, insufficient training at all levels, and a lack of support for employees' participation have a positive impact on TQEM implementation in the LFI.

On the other hand, the cost saving, increased production efficiency, the reduction in waste and pollution to the environment, and the reduction in natural resource consumption have a positive impact on TQEM implementation in the LFI.

8.3.7 Conclusion for Objective 7

This objective has proposed a framework for the implementation of TQEM in the LFI. The findings of this study have been used to establish a framework which takes into account the current situation. This framework is explained by the process for the implementation of TQEM

in eight steps and it is designed to help the LFI get started and move step-by-step to TQEM sustainability. The framework may be generalised to other companies in Libya and to other developing countries. Figure 7.1 demonstrates and summarises this proposed framework. Figure 7.2 shows TQEM implementation processes in the LFI.

8.4 Research Contribution

The main aim of this research is to investigate the implementation of TQEM in the LFI. It has been found that TQEM's application in relevant literature is difficult to implement directly in the Libyan Industry, due to many factors and barriers that are discussed in this thesis. As mentioned previously, the main contribution to knowledge is in developing a framework that can help in the LFI. This research contributes to creating a better level of environmental and quality management and to developing a framework for the implementation of TQEM in the LFI. As a result of the initial fieldwork the researsher puts forward the notion of a TQEM framework that should be implemented in the LFI in order to address its deficiencies. The researcher lays out his research aims, which are intended to assist the companies in the LFI to increase the quality of their production and to attend to the resulting problems for the environment, while still enabling their competitiveness in relation to external competitors. This research provide a number of contributions at academic and practical levels. The following sections present the academic contributions, practical contributions and contributions to the LFI of this study.

8.4.1 Academic Contributions

The study has contributed to empirical evidence on the academic knowledge in the following areas:

- This research contributes to the existing knowledge by investigating the implementation of TQEM in a different context (i.e., the Arab/North African context) to the one in which the quality and environmental theory was developed. This study contributes to identifying the key issues of quality and environmental utilisation in the LFI. This study appears to be the first to investigate the implementation of TQEM in the Arab world in general, and Libya, in particular, with the originality of being the first conducted in this sector. This raises the environmental management system as an

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important gap in research that needs to be addressed in this part of the world (i.e., Libya).

- In this context, the gap between TQM and EMS can be addressed by considering options for integrating TQM and EMS. Some studies have first considered TQM and then EMS, (Salomone, 2008). Others have taken EMS first and TQM second (Bernardo et al., 2009). This study has considered TQM and EMS together. In the current research, TQM and EMS were considered simultaneously using the case of the LFI. The reason for this is that, to date, unlike in most developed countries, there has been little evidence of TQM or EMS being introduced into industry in Libya (Youssef, 2006; Hokoma, 2009; Hassin, 2009).

- This study provides empirical evidence of the nature of the impact of the national environmental factors, barriers, and motivations for the TQEM implementation (refer to 7.2.6). The research also studies the national environmental factors, barriers, and motivations for TQM and EMS implementation, when they are compared with previous studies, and it seeks to reveal additional national environmental factor barriers, and motivations for implementation that might have been neglegted from previous studies.

- The study gives attention to social responsibility as an important national environmental factors. This factor has not been studied in Libya previously (refer to 7.2.3).

- The study gives attention to lack of information systems and the lack of government environmental control as important barriers to implementing TQEM in the LFI. These two barriers are considered as a new application in the LFI and should be considered as barriers to implementing a successful TQEM (refer to 7.2.4).

- The study gives attention to improved environmental performance as one of the important motivations for implementing TQEM in the LFI. This motivation has not been studied previously in Libya (refer to 7.2.5).

- It is intended that this research provide ideas and insights for LFI managers in order to encourage them to see the benefits that TQM and EMS can bring to them, and how the integration of TQEM will be of most benefit to them. Rather than seeing such production innovation as an unnecessary cost, it is intended to bring to them a more positive acceptance of this philosophy and also to provide a framework for them to use in order to develop their TQEM implementation, while considering environmental and quality management issues in the LFI.

8.4.2 Empirical Contributions

The current investigation's findings match what has been introduced in the TQEM literature. This study has demonstrated that a high quality of service with environmental protection is required to improve a company's performance. This study provides a number of contributions at the empirical level:

- TQEM is mainly designed in the developed world, and it is not clear if it is being implemented in most of the developing countries (Al-Nofal et al., 2010). Further, in developing countries there are limited theories and framework for TQEM implementation that are empirically implemented (Ajinah, 2009, Saad et al., 2014). The development of a new framework which is designed specifically for a developing country and its particular types of organisations (LFI) will form an original contribution to the knowledge on this subject. The findings that contribute to the development of a framework for the implementation of TQEM in the LFI will then be useful as a comparative study for the developing world.

- This study provides evidence to the LFI that both TQM and EMS seek to increase the quality of operations. TQM's cost saving goal of minimising errors in a 'right first time' approach, can be seen to be viewed as being in conflict with the philosophy of EMS, which can incur costs by preventative measures to minimise environmental impacts, and which will impact on profitability. However, once a company has made the philosophical shift in thinking for the prevention of either error or environment impact, the benefits of both EMS and TQM can be seen, and both have been incorporated into the philosophy of many companies globally.

- It provides empirical evidence the adopting and implementing TQEM helps the companies' in competitive advantage. It is evident that the strategic benefits of TQEM programmes are proven to contribute to a greater return in an organisational culture. This research has considered how a framework can help the companies to enhance their sustainability so as to consider how to implement TQEM. The processes of framework implementation (the steps in the LFI's TQEM framework) have been developed by the researcher to be used in the successful implementation of the TQEM.

- As the gaps in the TQEM research are identified, above, this research contributes to establishing a framework for existing knowledge by facilitating both an understanding and the encouragement of the implementation of TQEM in the LFI. This framework

will assist Libyan companies to increase their performance and to improve the quality of their products and services. In addition, it supports their capacity to overcome the challenges and changes from all over the world. It can also be used by the top management in order to face the significant changes in their management philosophy, attitudes and behaviours.

- This framework is intended to help Libyan companies to get started and to move gradually towards TQEM implementation so that the country can enter the global markets. The framework that has been developed is based on the TQEM frameworks that have been advanced and examined in the literature, using the data produced from the first phase of the fieldwork. This proposed framework, then, examined through phase two of the fieldwork.

- The results of this research highlight the importance of the impact of national environmental factors, barriers to, and motivations for the success of TQEM implementation. This research will help to fill the gap in the literature on TQEM in Libya, this study is one of the few research projects that has, to date, been conducted in the developing world context. It is hoped that it will help the researchers in Libya to develop their knowledge in the field of environmental and quality management.

- To date, notable, but also limited, advances in the implementation of TQEM have been seen in Libya. Whilst limited, these changes are nonetheless significant, and it is expected that these will become more widely diffuse in the Arab world. However, this framework goal remains to find ways to implement TQEM that will be acceptable and therefore successful in Arab operational culture.

8.4.3 Contributions to the LFI

- By proposing a framework for the implementation of TQEM, while taking into account the current situation in the LFI. This study understands the current situation for implementing TQEM in the LFI. One of the main research objectives was to explore the current situation in the LFI.

- This study contributes to proposals for ideas and insights for the LFI managers by use of which to develop their implementation of TQEM, while also considering environmental management and quality issues.

- In developed countries it is widely recognised that adopting TQM and EMS at the same time results in cost saving, defect reduction, efficiency improvement, and environmental/quality improvement. Using this framework in the LFI leads to improvement in the corporate image; the gaining of marketing advantages; adaption to the requirements of customers and other stakeholders (e.g., the government and local communities) and the possibility to enter new markets.

- A framework established in this study allows LFI to control its significant impacts on the environment, such as reduce the risk of pollution incidents, ensure compliance with relevant environmental legislation and continually improve its processes and operations.

- As its own domestic market is also opening up to foreign imports, its home producers will have to compete with goods and services from the developed world, which have considerable price economies, higher quality and higher environmental standards due to their full integration of TQEM into production. As yet, therefore, there is little acceptance in Libyan companies of the advantages that TQEM can bring, nor is there the acceptance of environmental responsibility in relation to production. To become a viable participant in the global market place, this study helps Libyan companies to adapt and change so as to come into line with modern global standards that are being set by the developed world. The LFI, in particular, is likely to become one of the first industries in the country to wish to trade globally, so this provides an excellent opportunity for such a study.

8.5 Research Recommendations

The fourth question of the research, given in Section 1.4, is what practical suggestions and recommendation are proposed in order to aid the LFI in preparations for TQEM implementation. The LFI needs to consider all the recommendations in the following suggestions. Based on the findings in Chapter 7, recommendations for successful implementation of TQEM in the LFI are categorised into three levels:- managers, the LFI authorities, and the Libyan government, so as-to resolve the issues in environmental and quality management, and to help the LFI to prepare for TQEM implementation.

8.5.1 Libyan Managers

1. There should be training and workshop initiatives to qualify LFI managers and employees for an awareness of the importance of the process of TQEM's development and implementation. Environmental and quality management training should be provided at all levels to managers and employees, as the training will enhance their environmental awareness and amend their knowledge about any new strategies and techniques that are to be adopted. These help to increase their skills for the programme and to ensure the continuous improvement that is required by a formal TQEM;

2. Encouragement of the employee's participation and suggestions is an important issue for implementing TQEM; thus the LFI should pay attention to satisfying those employees and to enhancing their suggestions within the company;

3. An environmental department should be established for the LFI, and the management structure should be improved in order to provide a higher level of authority for this department;

4. Good relations and communication should be established between the LFI's top managers and international EMS agencies so as to have more information about their responsibility for the evaluation and improvement of management systems and for leading the environmental drive;

5. Managers at all levels should adopt new information systems in their departments so as to promote high-level TQEM planning and information for employees and to provide all the information needed by the customer about the products and services of a company;

6. Managers in the LFI should encourage their employees to satisfy customers' requirements and to meet their expectations, activities focused on satisfying their customers, and works to enhance consumer loyalty on the basis of distinctive quality, care for the environment, and a shared commitment to social values.

8.5.2 The LFI's Authorities

1. The LFI needs to adopt a new system/network to sort out relationships with international and national suppliers, who should be evaluated and selected based on their capabilities and their commitment to service quality;

2. The LFI should pay attention to both their external and internal customers. This should be reflected in the overall planning of environmental and quality management efforts;

3. An impact assessment of the LFI needs to be carried out by using Life Cycle Assessment (LCA). This method's stages include the LFI's extraction, production, transportation, processing, and distribution practices. The LFI therefore needs to adopt the LCA method so as to control environmental impact;

4. The LFI needs to revise the ISO 9000 certification processes and apply the ISO 14001 requirements to guarantee an improvement in environmental performance;

5. The LFI should develop a strategy for implementing TQEM by apply training programs to keep employees up-to-date on a regular basis, so they can efficiently participate in the most recent strategies and approaches to TQEM implementation;

6. LFI could establish learning centres where managers and employees attend classes, and they should develop a comprehensive learning curriculum, offering them a wide range of well thought out offerings that are designed to support their knowledge and professional development.

8.5.3 Libyan Government

1. Libyan government agencies should raise awareness of the significance of quality production and services, environmental protection, sustainability and global environmental issues with stakeholders and local people;

2. The Libyan government should establish new regulations that encourage Libyan managers to take strong responsibility for environmental issues that cause risks to health, safety, or the environment;

3. The Libyan government needs to review their legislative framework and environmental policies in order to ensure that they are current and provide a clear vision, mission, and strategy.

4. The Libyan government needs to produce manuals to provide training on the environment, seeking external advice and support from specialised environmental agencies. This can be achieved through the publication of handbooks and guidelines;

5. The Libyan government should allocate more funds to sponsoring workshops, sessions, and training for TQEM implementation (economically, environmentally and socially) both nationally and internationally;

6. The Ministry of Libyan Industry (MLI) should support Libyan factories in delivering the latest technology, which supports the local company's contribution to environmental protection.

8.6 Recommendations for Further Research

- This study could be replicated in other sectors: banking, education, health, etc., to establish TQEM implementation in those organisations.
- Social responsibility is one of the national environmental factors which should be studied in further research in order to evaluate its importance in the TQEM context.
- Researchers in developing countries, and in the Libyan context, should study the lack of information systems and the lack of governmental environmental control as TQEM barriers.
- Researchers are recommended to investigate the improved environmental performance as TQEM motivations.
- Future research is needed to identify the impact of the social responsibility factor, the lack of information systems and the lack of governmental environmental control, and the improved environmental performance for implementation and sustainability of TQEM in the LFI.
- Researchers could extend the framework to include other TQME environmental factors that were not studied here such as: process management; customer behaviour; product

design. Moreover, investigation could be undertaken on the lack of vision and planning; the lack of the understanding of continuous improvement; the weakness in supplier relationships and its impact in the application of TQEM. The framework could be expanded to involve other TQME motivations, such as competitive advantage.

- The framework that has been developed is based on existing TQM and EMS knowledge, along with information gathered in the semi-structured interviews and questionnaires in the LFI. The framework of this study was tested by three hypotheses and confirmed the research findings that was suitable for the framework. Other researchers could conduct the sample to other companies and validate the framework.

8.7 Chapter Summary

This chapter has summarised the findings of this research project and drawn conclusions from them. It recapitulates on each of the chapters individually and then offers suggestions for the use of their findings in the LFI's implementation of TQEM. Finally, the chapter offers suggestions for future possibilities for research, utilising the findings here in order to suggest possible research will help to fill the perceived gaps in both the academic literature and the practices of TQEM application.

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