Appraising Project performance and Total Quality Management (TQM) practices in the Libyan oil and gas sector

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A thesis submitted in partial fulfilment of the requirements of Liverpool John Moores University for the degree of Doctor of Philosophy

October 2014

Declaration form

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ABSTRACT

The aim of this study was to appraise project performance and Total Quality Management (TQM) in the Libyan oil and gas sector. In achieving this aim , the study developed five objectives which are: to review current definitions and models of Project Performance in relation to theory and practices, to examine current definitions and models of TQM in a project context, to identify methodological norms in this research domain and propose a way forward , to analyse the interrelationship between TQM principles and project performance practices for oil and gas industry related projects and, finally, to model and propose the predictive value of TQM principles that could be used to enhance project management performance in the Libyan oil and gas industry.

The research adopted a mixed methods approach. An extensive literature review was conducted on the history of the oil and gas industry, review of the energy sector in Libya, socio-economic development in Libya, social context and human development in Libya, the current practice in the Libyan energy sector, the importance of TQM, leaders in the Quality Management movement, TQM and performance, project and PM performance and TQM and PM performance. A conceptual framework was developed from the literature. Subsequently, twelve semi-structured interviews were conducted with project managers and professionals from three oil and gas companies from different categories of the oil and gas industry. The conceptual framework was improved after the analysis of interview findings, and then a questionnaire was used to launch the next stage of the study. One hundred and thirty-one questionnaires were analysed by SPSS V16 in order to examine the relationship between TQM practices and project performance in the Libyan oil and gas industry related projects, and to predict the model of TQM practices to project performance in the Libyan oil and gas related projects.

Key findings of this research were that there was a positive significant relationship between TQM practices and project performance in oil and gas-related projects, and the interesting finding was that the hard TQM practices have more impact on Project Management Performance (PM performance) than the soft practices. Additionally, the predictive models were developed and the highest had a value of **(R^2=0.776)**.
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Consequently, this research has made an important contribution to PM performance in the oil and gas industry by developing a framework of TQM practices that positively impact on PM performance. The practical applications of this research mean that managers can focus on those practices to achieve maximum PM performance in the oil and gas industry. The study highlights opportunities for future research including more in-depth exploration of the TQM practices in other oil and gas industry categories as well as the impact of the interrelationships of the practices on insights into PM performance.

Keywords: Project management performance, total quality management, TQM practices, Libyan oil and gas industry

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Dedicated To:

This thesis would never have been completed without the help and support of my loving wife, Iman Ignebir, who has always been there patiently encouraging me, supporting me and giving me confidence in myself and for her patience with my regular travels to Liverpool and for taking on some of my responsibilities as a father to ease this road. This is dedicated to you Iman, my lifelong loyal and loving companion.

CHAPTER ONE

Introduction and overview of the study

1.1 Introduction

This chapter aims to provide an introduction to the thesis through a description of the study research problem and rationale for the study. The research aim and objectives are outlined. The scope of the study is described and how the research question links to the proposed methodology is introduced. The next part of the chapter outlines the structure of the rest of the thesis discussions.

1.2 Research background

The oil and gas industry is project-based to a high degree as its central assets such as petrochemical plants, refiners, Gas Oil Separation Plants (GOSP) and pipelines are built through projects involving tens if not hundreds of companies. These projects are classified as large-scale, complex and uncertain projects; their huge scale has been studied by several studies: megaprojects (Flyvbjerg *et al*., 2003; Davies *et al*., 2009; Gil and Tether, 2011, Ahola and Davis, 2012), giant projects (Grün, 2004) and large engineering projects (Miller and Lessard, 2001a, b; Ruuska *et al*., 2011). Oil and gas is still the main source of energy for the world and, as it is essential to daily life, the main concern of the oil and gas companies has become how to manage, organise and successfully deliver projects with high quality.

However, in the field of project management the importance of quality has become an essential part of the project life due to the complex nature of oil and gas projects. Project managers also appreciate the risk of the project because of its uniqueness, complexity and deliberate design details. The oil and gas sector is subject to pressure from different stakeholders, increasing its complexity. Thus, it is helpful to outline models that more accurately represent the complex and multidimensional reality of Exploration and Production (E&P) projects in order to facilitate their management (Salazar-Aramayo *et al*., 2013).

In today's competitive environment, quality is the key to the survival and success of any sector, organisation and company. Collectively, they can come closer to achieving ideal goals such as total customer satisfaction and so on only by continuous improvement. To meet the challenges of the new global environment, companies have started to bear in mind quality as a fundamental part of their strategic business plans. In order to succeed in the dynamic marketplace, companies and contractors must continually improve project management, the project quality and their own operation. Performance measurement is at the heart of the ceaseless improvement.

Most of the oil and gas companies became aware of utilising a Quality Management System to control project performance by setting a certain number of Key Performance Indicators (KPIs). The most famous and widely applied quality system is Total Quality Management (TQM). TQM is an approach that seeks to improve quality and performance which will meet or exceed customer expectations (Kaur *et al.*, 2013). In an effort to develop quality, various approaches to management of quality and non-stop improvement have been chased, most notable, and highly suggested approach, is the conception of TQM. Several organisations and companies have gained significant benefits of implementing TQM in terms of operating performance, customer satisfaction, financial results, and employee satisfaction (Brah *et al.*, 2002; Fuentes *et al.*, 2006; Kumar *et al.*, 2009b; Yang, 2006; Sila, 2007).

1.3 Research problem

The problem began a long time ago, when I was project manager in Arabian Gulf Oil Company (AGOCO), the biggest exploration and oil and gas producing company in Libya, which comes under the umbrella of the National Oil Company (NOC). I was managing several onshore downstream projects. These projects were very important to the Libyan oil and gas industry. The nature of the projects was considered to be the backbone to the industry, which was and still the main source for the Libyan economy, projects such as tyning-in of producing oil wells, design and installation of Gas Oil Separation Plant (GOSP) and gas utilisation projects. The lack of project management was very obvious and a lot of obstacles were encountered by project managers, such as no top management commitment, poor supplier management, bad communication between the engineering units and construction sites, no benchmarking, very bureaucratic manner of the Mother Company, NOC, and delays in paying the contractor.

In most Libyan companies there is an absence of a well-structured auditing management system, and no inspection mechanisms exist for the assessment of the quality of products and the services provided. Suppliers in this culture are insensitive to the needs of their customers and the general public. Irrespective of Libyan companies' poor performance and poor quality, survival is ensured by the state. The state has been the centre of power for more than 35 years and there has generally been no accountability on performance, either good or bad, at the sector or organisational level. This horrible situation made me start thinking of solutions through case study and coming up with solutions to the problem which I then suggested to the mother company, NOC.

During the first decade of the millennium, around 2005, the Libyan regime promised and planned to overcome that miserable situation, by utilising the modern management ways and copying developed countries. This effort was unsuccessful because the culture that was needed to change the attitudes of the people towards the new changes was not there. Nowadays, there is an urgent need for a radical reappraisal of traditional management practices within Libyan companies and important change and conversion in the system in which business is carried out in the Libyan environment, particularly in the area of quality management (Youseef *et al*., 2005).

The way in which the oil and gas companies operated, and the management approach that was adopted, was not a proper one. This is based on the fact that the management philosophy and approach would influence the organisation's performance. In reply to the challenges that Libyan companies are facing, TQM could be the key to competitive advantage in today's business environment (Drucker, 2001; Juran, 1995). TQM has been described by quality experts (Crosby, 1979; Dahlgaard *et al*., 2002; Deming, 1982; Ghobadian and Gallear, 2001,1997; Hansson, 2003; Zairi, 2002; Rahman, 2004) as a management viewpoint and a technique of thinking that has helped many organisations in developed and developing countries towards achieving world-class status. TQM can derive a competitive advantage in the marketplace as well as in operational processes. It emphasises lowering costs by reducing waste, focusing on variation, helping suppliers provide quality products and satisfying the customer with quality goods and services (Deming, 1986; George, 2002; Van Horn, 1997). TQM helps to generate a culture of confidence, participation, and teamwork oriented towards continuous improvement.

1.3.1 Identification of the research problem

Sekaran (2003, p.112) defines a research problem as: *"any situation where a gap exists between the actual and desired state".* According to Sekaran, experience is the most excellent foundation for responding to practical problems. The research focus of this study comes from the day-to-day management problems in Libyan oil and gas companies, caused mainly by the absence of quality implementation in the Libyan context. Figure **1-1** shows how the study problem was defined.

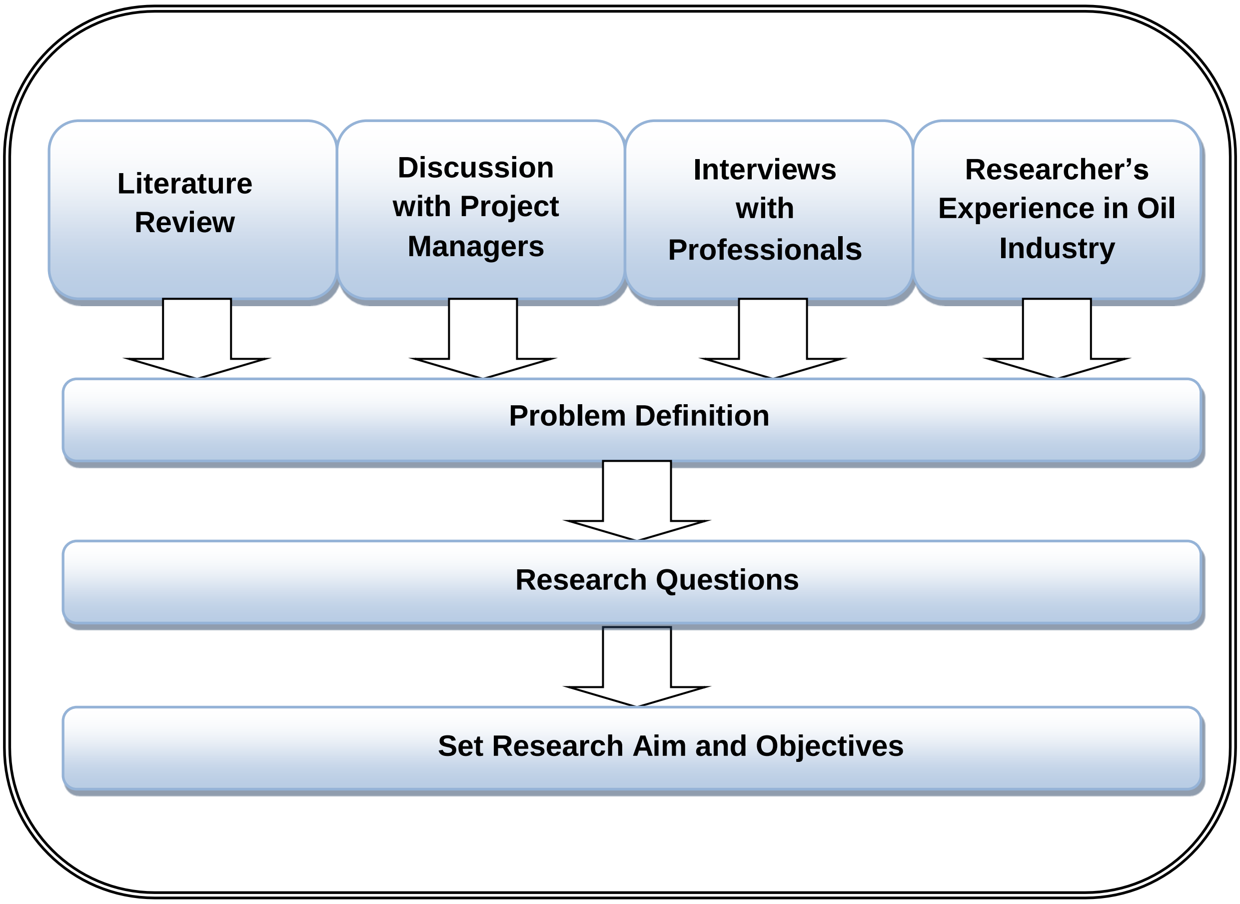

Figure 1-1: Research problem definition

Based on the researcher's experience with the Libyan oil and gas industry, and after a widespread literature review and consultation with professionals who have considerable practical experience in the same field, the following broad research problem was identified and will be addressed by this thesis:

- *To establish the level to which the concepts of Total Quality Management (TQM) and Quality Management Systems (QMS) can help Libyan oil and gas companies overcome their managerial problems and improve project performance.*
- *To define what sort of TQM implementation model would be established in order to direct Libyan oil and gas companies in applying TQM.*

1.4 Study questions

In accomplishing these objectives, this research will endeavour to answer the coming questions:

1. What are the current definitions and models of project performance in relation to theory and practices?
2. What are the current definitions and models of TQM in a project context?
3. What are the methodological norms in this research domain and how can we propose a way forward?
4. What are the interrelationships between TQM principles and PM practices for oil and gas industry related projects?
5. What are the models and proposed predictive value of TQM principles to PM performance in the Libyan oil and gas industry?

1.5 Research aim

The research aimed to appraise project performance and total quality management (TQM) practices in the Libyan oil and gas industry. The findings of the study are expected to comprise project management performance and TQM principles that could be utilised to enhance project performance in the Libyan oil and gas industry.

1.6 Research objectives

The main objective of this research is to appraise project performance and Total Quality Management (TQM) practices in the Libyan oil and gas industry.

However, other objectives of this study are to identify current definitions and models of PM performance and identify and establish current definitions and models of TQM in a project context. The purpose of this research is not only to enhance the developing body of knowledge on the oil and gas industry, but also to help the oil and gas sector's managers and professionals understand how to utilise TQM practices in order to achieve better PM performance, and to predict the value of TQM principles to PM performance in oil and gas industry related projects.

Consequently, the objectives of this study are as follows:

1. Review current definitions and models of project performance in relation to theory and practice.
2. Examine current definitions and models of TQM in a project context.
3. To identify methodological norms in this research and propose a way forward.
4. To analyse the interrelationship between TQM principles and project performance practices for oil and gas industry related projects.
5. To model and propose the predictive value of TQM principles that could be used to enhance project management performance in the Libyan oil and gas sector.

1.7 Novelty of the research

This research contributes to what is currently a limited amount of research on oil and gas industry related projects. Moreover, it contributes to what is presently a limited amount of empirical proof to discover the effect of TQM practices on PM Performance in the oil and gas sector. Thus, this research is a contribution to academic work which endeavours to come up with a conceptual model that assists to value TQM practices for PM performance in the oil and gas industry related projects, and, as a outcome, goals to analyse the performance of this industrial sector, given the current definition and models of PM performance, as well as current definition and models of TQM practices in a project context. In actual fact, there are limited serious academic researches on this subject and little endeavour has been made to examine the relationship between TQM practices and PM performance in the oil and gas industry related projects, and to develop conceptual frameworks for assessing the PM performance in the oil and gas sector. Consequently, this research can be considered as a contribution to the academic work and has established a framework that could help to address these matters

1.8 Process of the research

Full details of the research methodology carried out in this study are explained comprehensively in Chapter four. This section is concerned with the process of the research through which a good understanding of the relationship between TQM principles and PM practices in oil and gas industry related projects will be obtained.

In the search for a thorough understanding of the relationship between TQM practices and PM performance in the oil and gas industry, the process of the research has involved five elementary stages:

1) recognition of study problems/objectives,
2) development of study framework,
3) research methodology,
4) qualitative and quantitative data analysis, and
5) discussion and conclusion.

The study is organised in a way that allows the reader to easily follow the process. This is showed in Figure 1.2 which shows an overview of the research design.

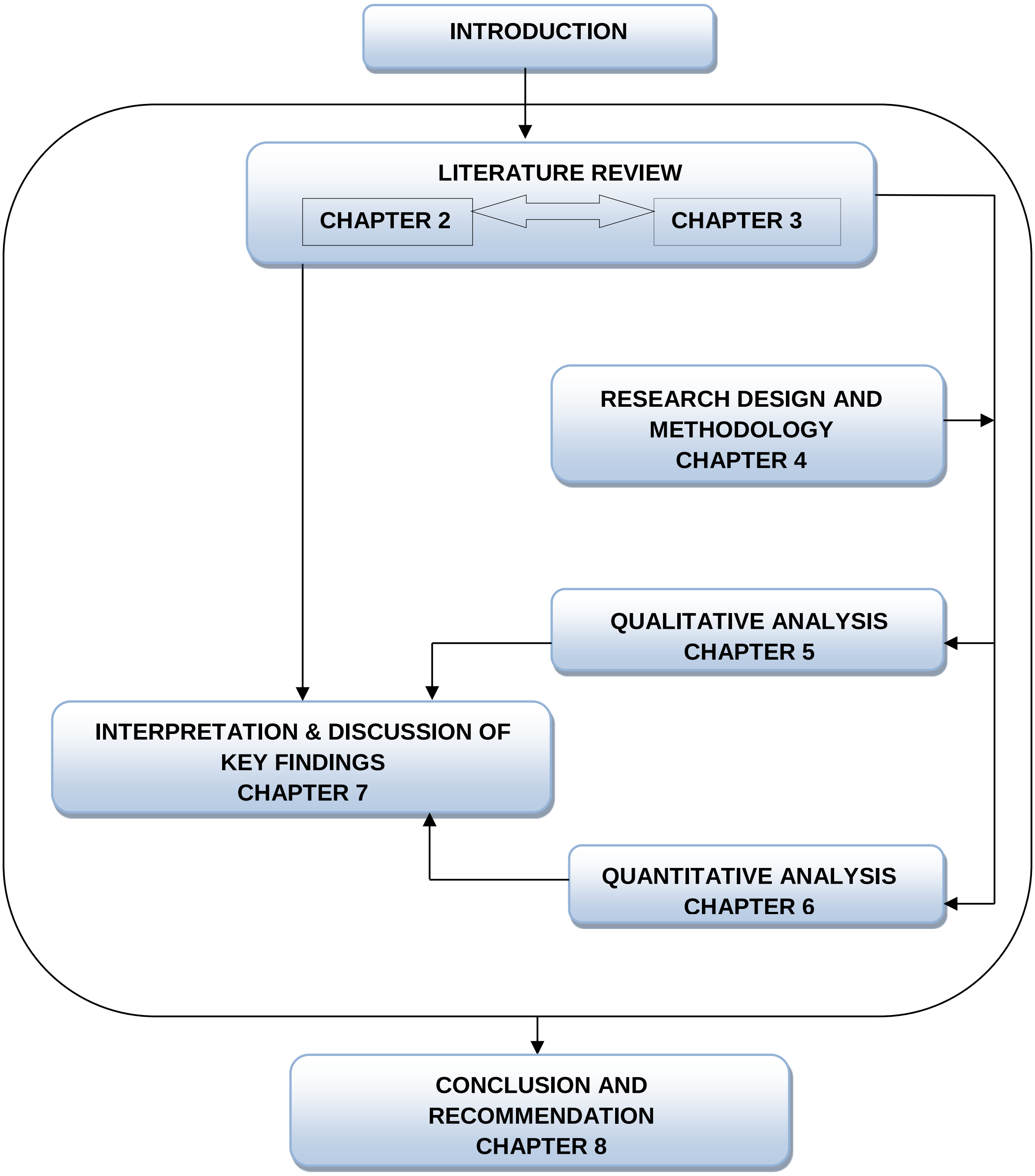

Figure 1-2: Design Overview of the Research

1.8.1 Classifying of research problem and objectives

Firstly, the procedure involved with the identification of the research problems and objectives, is shown in Figure 1.3. It is an extensive literature review which was conducted about the history of the oil and gas industry and its classifications (Chapter two). It shows a detailed review of important literature, related to the history of the industry. Chapter three delivers a complete analysis of the second part of the literature review on TQM and its importance, TQM and performance and project management performance. A review of literature on the current studies in oil and gas industry was also carried out.

1.8.2 Development of the study framework

Secondly, having recognised the issues with the research problem, the following process was to recognize a research framework and models that predict values of TQM practices to PM performance in the oil and gas industry related projects. Since this research gives a contribution by offering a framework and models for operationalisation of TQM practices in the oil and gas sector and ultimately clarifying TQM constructs, the use of semi-structured interview results with a mixture of a wide review of countless literature would aid in attaining a broader and more thorough understanding of the different TQM practices that would impact and improve PM performance in the oil and gas sector.

At this stage, the TQM constructs were addressed, and the findings of which were used in the last stage of the research. Both qualitative results of this phase of the study and survey respondents were employed to crosscheck the end results. Semi-structured interview results analysis and survey respondents' analysis were undertaken to highlight and confirm the significant impact of TQM practices in PM performance in oil and gas industry related projects.

1.8.3 Collection of data

Thirdly, in order to calculate the recommended research framework, testing was showed using semi-structured interviews and a mail questionnaire. On the other hand, this involves an oil and gas sector that has experience in project management. This type of research calls for knowledge about the ‘how’ and the ‘what’ components of TQM practices that impact PM performance. The ‘how’ parts of the research necessitate the use of qualitative procedures, while the ‘what’ parts are best examined using quantitative approaches. A triangulation approach is used in this study, which combines both qualitative and quantitative methods, is accepted. It’s accomplished through a semi-structured interview method to collect qualitative data and complementary use of mail questionnaire survey as the chosen quantitative method (see Chapter five and Chapter six for details).

Based on the literature review and interview results and analysis, a standardised questionnaire was established to gather data from a great sample of three oil and gas companies, one of which is overseas, and is classified as an owner company. The other two companies are UK based, with one classified as engineering and the other classified as construction contractors about the various aspects of the connection between TQM practices and the PM performance in oil and gas industry related projects. The survey tries to evaluate the importance and the impact of the TQM fundamentals that establish the structure and the models.

A key part of the study is dedicated to achieving an understanding of TQM practices extracted from the literature. Accordingly, concerns of significant to the study are connected to the operationalisation of important features of TQM being used in a real organisational setting. Three oil and gas companies were considered as the area of the research was chosen so that various issues of TQM usage could potentially be covered and characterised.

1.8.4 Analysis of data

The next process was data analysis. All quantitative data were analysed by content analysis method and **NVIVO 10**; analysis of all interviews is provided in Chapter five. The transcripts were coded with ideas and changed in order to simplify display, analysis and comparison. Displays were improved for the various dimensions of the TQM practices, briefing and summarising the answer given from each respondent and permitting a cross-case analysis. Procedures and conclusions of the analysis are stated in Chapter five. All the quantitative data were analysed using **SPSS 16**. Reliability of constructs, Descriptive analysis, Correlation analysis and Regression Analysis has been used to examine a series of research constructs. The reporting of the procedures and findings of the tests are then found in chapter six.

1.8.5 Discussion, conclusion and implications

The explanation and discussion of important findings are provided in Chapter seven. It presents an inclusive interpretation and discussion of qualitative and quantitative findings. The conclusion and implications of the research are finally reported in terms of theoretical and practical contributions are reported in Chapter eight. Key findings of the research are also recorded and discussed here. Recommendations for future research are also made to close the chapter

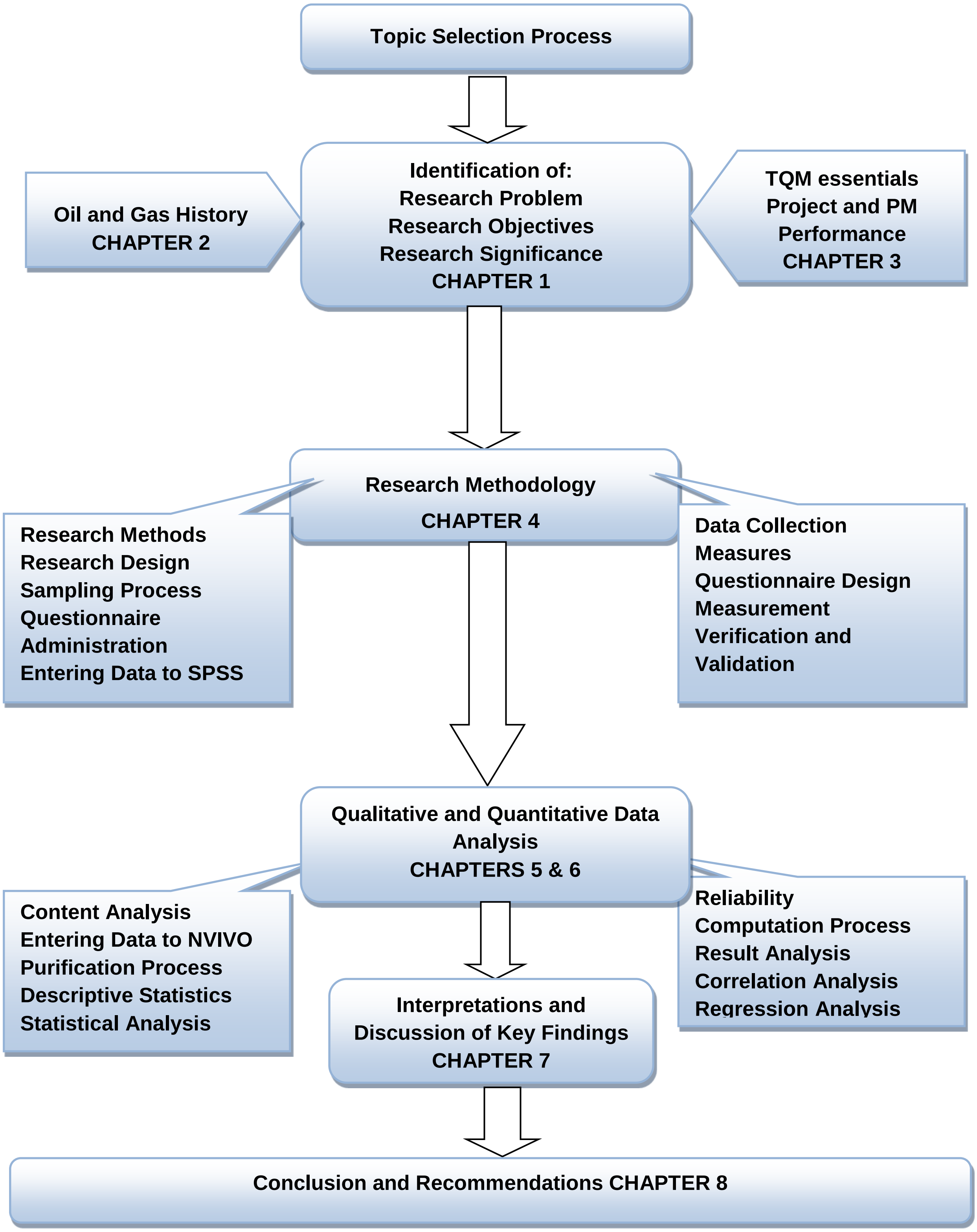

Figure 1-3: Process of the Research

1.9 Thesis structure

This thesis is structured into eight chapters, each giving an introduction to chapter contents and a brief picture to set the content and context, in addition to how it connect to other parts of the research summary. Chapter one served as an introduction, background and overview of the study problem, likewise it shows research objectives, importance and role of the research, research methodology, and thesis outline. Subsequently to this, two chapters (two and three) are devoted to the review of the related literature in order to construct a theoretical foundation upon which the investigation was carried out. Chapter two gives a general view and background about the history of the oil and gas industry and how it developed over a number of decades, as well as the current oil reserves and the countries that have them. Chapter three delivers an in-depth evaluation of the key elements of TQM with regard to specific concepts, their definitions, and its development. It also gives a broad literature review about TQM and performance in general and TQM and project performance. A complete section of this literature review is given to the project and project management performance.

Discussion of the research design and methodology employed in this study are found in chapter 4. The data collection methods used are also explained in this chapter. Chapter five deals with analysis of the preliminary findings of semi-structured interviews, i.e. qualitative analysis, and which methods were employed to analyse the date. Chapter six concerns the survey respondents, i.e. quantitative data analysis, and presents how the data were tested, descriptive analysis, reliability of the questionnaire constructs correlation analysis and regression analysis.

Chapter seven delivers an extensive understanding and discussion of both qualitative and quantitative findings. Chapter eight comprises the important parts of this study. A distinct role towards knowledge is made unambiguously in this chapter. The implication of the research findings for the theory and practice are discussed in detail. Limitations and recommendations for future research are finally given in the final section of this chapter.

1.10 Summary

The configuration of the study is outlined in this chapter. The background of the study and presentation of the research problems and objectives are introduced. Then the research was justified, the research process clarified and the thesis chapters defined. The thesis can continue with a meticulous description of the process of the research, based on these foundations.

CHAPTER TWO

2. Oil and gas Industry history

2.1 Introduction

This chapter will provide a brief historical overview on the uses of oil and gas over the past few hundred years, and how the oil and gas industry has flourished over the past few decades. The oil and gas industry has been categorised into different categories with an explanation of each section.

It is essential to have a look at the different types of oil and gas companies; for instance, major International Oil Companies (IOCs) that started at the beginning of the nineteenth century. I will also provide an explanation of the importance of National Oil Companies (NOCs) that have a large oil reserve, which comprise about 10 companies, and the companies that branch from them. Since the subject of the study is appraising project performance and total quality management in the oil and gas sector in Libya, it is essential to talk about the energy sector in Libya, oil and gas in Libya, the Libyan economy and the impact of the energy sector on it, and everything related to the themes of development, which mainly depends on the national income of the Libyan state. Nevertheless, it is vital to discuss the types of companies, such as the engineering sectors, which concern all the aspects of oil and gas, from prospect engineering, to the construction companies that deal directly with oil and gas construction sites. These companies will be the area of my research in the two phases of the study, and provide the analysis of the relationship between the quality management practices and project management performance in the oil and gas industry.

2.2 Oil and gas

Due to the importance of the oil and gas sector to the whole world as a principal source of energy in Nowadays, it is important to shed light on the history of this important source. According to Business and Economic Research Advisor (BERA, 2005/2006), oil and gas used for a long period of time stretching for hundreds of years, where it was extracted and then used by utilizing old and traditional tools, with the passage of time uses of oil and gas have evolved and become a key role in life and an integral part of global economics and then became the main source of energy. It can be said that the modern oil and gas industry began with the beginning of the nineteenth century; specifically in the U S and which later became a pioneer of the industry (BERA, 2005/2006).

Although there was a continuous search for replacing or making another source of global energy, oil and gas still remains the main source of it. In the last few decades, the demand for energy has increased, and the demand for making our environment clean has also increased. This demand has resulted in pressure on the industry to produce oil and gas of good quality and at reasonable prices. The oil and gas industry is one of the most complex and expensive industries, where it is in need of huge budgets. So, the most exploring and production companies are state-owned companies (BERA, 2005/2006). The petroleum industry is usually grouped into three major components: upstream, midstream and downstream, although midstream operations are usually included in the downstream category.

1. The upstream oil sector is a term used to define the activity concerned with the Exploration and Production (E&P) of crude oil and natural gas. The upstream section concerned with the activities of searching underground and underwater oil and gas fields, drilling of exploratory wells, and then operating the wells that recover and bring the crude oil and/or natural gas to the surface, as illustrated in Figure 2.1 below.
2. The midstream industry processes concerned with, stores of crude oil, markets and transports products such as crude oil, natural gas, natural gas liquids (LNGs, mainly ethane, propane and butane) and sulphur, as showed in Figure 2.1 below.

3. The downstream oil sector is a term used for describing the activities of the refining of crude oil, selling and distribution of natural gas and products derived from crude oil. Such products include liquefied petroleum gas (LPG), gasoline or petrol, jet fuel, diesel oil, other fuel oils, asphalt and petroleum coke. The downstream sector includes oil refineries, petrochemical plants, petroleum product distribution, retail outlets and natural gas distribution companies. The downstream industry touches consumers through thousands of commodities such as petrol, diesel, jet fuel, heating oil, asphalt, lubricants, synthetic rubber, plastics, fertilisers, antifreeze, pesticides, pharmaceuticals, natural gas and propane.

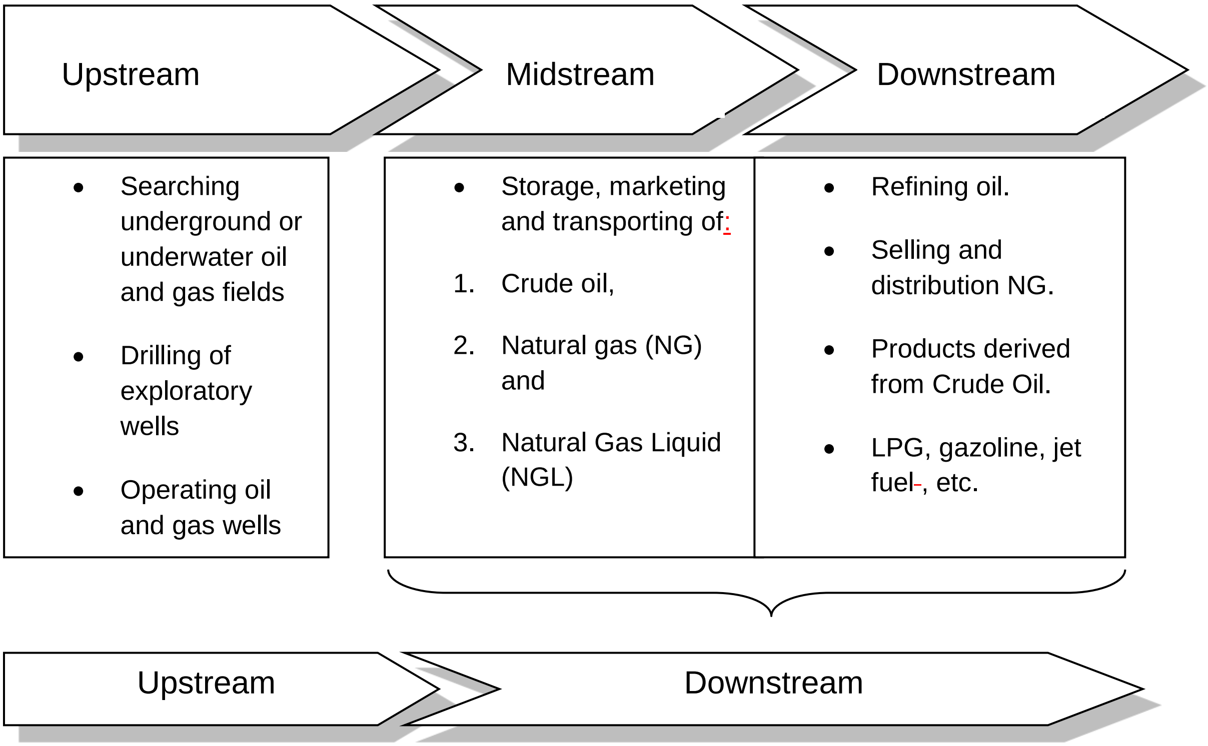

Figure 2-1: Sectors in the Oil and Gas Industry

The petroleum industry is complex. The complication of the industry mainly came from the owners (states) who controlled the oil and gas companies. More than fifty percent of the world oil and gas reserves are state controlled in the Middle East region (Petroleum Industry web site). In order to understand this industry, the oil industry separated into two main groups: International Oil Companies (IOCs) and National Oil Companies (NOCs).

2.3 International oil companies (IOCs)

IOCs, which was founded at the beginning of modern oil industry and they known in the oil and gas industry as the big five, all of which have extensive history that usually come to the late nineteenth century, when it was established. Most of the IOCs in the United States created from the breakup of Standard Oil, which was prevalent until 1911. IOCs faced many changes since 1990 due to the merger of a number of oil companies with each other, growing rise of National Oil Companies (NOCs) and the fluctuation of oil prices with the early nineties of the last century (Petroleum Industry web site, 2013). Despite of these changes, however, IOCs still achieved large profits compared to other emerging companies, (Jaffe and Soligo, 2007) stated:

> *"The so-called Big Five (BP, Chevron, ConocoPhillips Company, ExxonMobil, and Royal Dutch Shell) had $120.8 billion in profits in 2006 against 9.7 million barrels a day (b/d) of oil production. By contrast, the next 20 largest American oil firms had $31.2 billion in profits against 2.1 million b/d in oil production. In terms of operating cash flow, the Big Five registered $155 billion in 2006, compared to only $50 billion for the next 20 largest American oil firms".*

Table 2-1: International Oil Companies

Name	Location	Revenue (Billions of Dollars)	Reserve Size in Billions of Barrels
ExxonMobil	Texas – United States	383	72
Royal Dutch Shell	The Hague – Netherlands	368	20
BP/Amoco	London – United Kingdom	308	18
Total SA	Paris – France	229	10.5
Chevron	California – United States	204	10.5
ConocoPhillips	Texas – United States	198	8.3

Source: Petroleum Industry (2013)

The sizes of the oil and gas reserves are not the only approach to divide the industry. It is mostly regularly used in reference to NOCs whereas reserves size and industry section are both used to define IOCs (Petroleum Industry web site, 2013). According to the American Petroleum Institute and cited by (Petroleum Industry web site, 2013), splits the industry into five classes based on function. These divisions' assist to clarify why needing large petroleum (i.e. oil and gas) reserves does not automatically change into huge revenues and why the IOCs, regardless of their comparatively small reserve sizes in contrast to NOCs, control the market. Table 2.2 below show the industry segments:

Table 2-2: Five Categories Based on Function

Category	Function
Upstream	Exploration and development of crude
Downstream	Tankers, refineries, and consumers
Pipeline	Any hazardous pipeline, including petroleum, liquid CO2, etc.
Marine	For transport of petroleum by water
Service and Supply (General)	Equipment manufacturers, consulting firms, etc.

Source: Petroleum Industry (2013)

Most of IOCs are specialised in different sections of the oil and gas industry such as, downstream, upstream and marine, whereas all IOCs are participating in downstream and upstream operations which are the heart of the industry (Petroleum Industry web site, 2013). The upstream segments of the majority of IOCs are their main income sections. For Example, Royal Dutch Shell made two-thirds of its profits from exploration and expansion of crude (Petroleum Industry, 2013).

As a result of the IOCs being long period in the petroleum business, they build the required knowledge to discover and develop crude oil and gas. This makes them vital to the oil and gas sector, even to NOCs. As a result of market domination in this section, the IOCs do the most of the upstream activities and work in the industry and consequently develop the majority of their revenue from offering these services both for their own oil and gas reserves and to others including the NOCs (Petroleum Industry, 2013).

2.4 National oil companies (NOCs)

National Oil Companies (NOCs) are an oil and gas companies owned by national states of oil and gas producing countries and have large reserves of oil and gas as well, and are set up as any IOCs. This trend of NOCs has occurred for two reasons, according (Petroleum Industry, 2013) the reasons are:

> *The first reason for the rise of NOCs is political change. Countries in which large oil reserves can be found have slowly wrested away the rights of the IOCs that initially controlled the oil. Many military dictators in the Middle East have come to power in part because of their support for NOCs which promised to return oil income to the people rather than seeing it go to IOCs. Of course, in many instances, those promises were not followed through.*
>
> *The other reason for the rise of NOCs is the industrial progress. Many of the oil-rich nations have leveraged their incredible natural resources to negotiate profitable contracts with IOCs for extraction and development. The creation of*

OPEC was a direct response to the bargaining power of the IOCs. Like a giant union, OPEC has allowed oil-rich countries to put more pressure on IOCs to offer price concessions. The development of their own means for extracting and refining oil has also enabled NOCs to reduce their reliance on IOCs.

Table 2.3 below shows the top ten NOCs starts from the biggest to the lowest. It is vital to note that the figures in the table are for liquid petroleum (i.e. Oil), and not for shale oil.

Table 2-3: National Oil Companies

Name	Location	Reserve Size in Billions of Barrels
Saudi Aramco	Saudi Arabia – Middle East	303
National Iranian Oil Company	Iran – Middle East	300
Qatar Petroleum	Qatar – Middle East	170
Iraq National Oil Company	Iraq – Middle East	134
Petroleos de Venezuela	Venezuela – South America	129
Abu Dhabi National Oil Company	Abu Dhabi – Middle East	126
Kuwait Petroleum Corporation	Kuwait – Middle East	111
Nigerian National Petroleum Corporation	Nigeria – Africa	68
Libya NOC	Libya – Africa	50
Sonatrach	Algeria - Africa	39

Source: Petroleum Industry (2013)

2.5 Energy sector in Libya

The energy sector in Libya depends on oil and gas. Solar energy and wind energy are not utilised even for domestic use rather than to utilise them to increase the national income. The oil and gas sector has been the Libyan government's main focus since the discovery of oil and gas in 1959. Since that time, Libya has relied on oil and gas as a main source for its energy sector; **section 2.11** has a detailed section about oil and gas in Libya. In last two decades, the strategy of the Libyan state has changed towards thinking of reforming the sector by utilising other resources, such as solar energy, wind energy and biomass.

According to a Regional Centre for Renewable Energy and Energy Efficiency (RCREEE, 2009) report, based on satellite data, a general solar map is available, but so far no detailed solar atlas has been developed, although Libya has a great potential for solar energy: in the coastal regions, the daily average of solar radiation on a horizontal plane is 7.1 kWh/m2/day whilst the radiation is 8.1 kWh/m2/day in the southern region. The average sun duration is of more than 3,500 hours per year. This is equivalent to a layer of 25 cm of crude oil per year on the land surface (Saleh, 2006). The total installed capacity of solar energy was only 5 MW in 2012 (RCREEE, 2012).

According to a RCREEE (2012) report, so far, no detailed wind atlas has been developed, but a general wind map based on satellite date is available. The average wind speed at a height of 40 metres is between 6 and 7.5 m/s. One of the several attractive locations along the Libyan coast is at Dernah where the average wind speed is around 7.5 metres per second (RCREEE, 2009). Although the wind potential in Libya is good, there is no real utilising of it to be another source of energy. Libya's biomass potential is limited. (Saleh, 2006): biomass energy sources are small and can only be used on an individual level as an energy source. It is not suitable for the production of energy.

2.6 Libya as a country

Libya is the second-biggest North African country (1,795,540 sq km). It is located between Algeria (982 km) and Tunisia (459 km) in the west and Egypt (1,150 km) in the east, bordering the Mediterranean Sea in the north and (from west to east) Niger

(345 km) and Chad (1055 km), and the Sudan (383 km) in the south. Virtually one hundred percent of its land territory is land area, apart from its access to the Mediterranean Sea (about 2,000 km of coastline); see Fig 2.2 for a map of Libya (Energypedia, 2014).

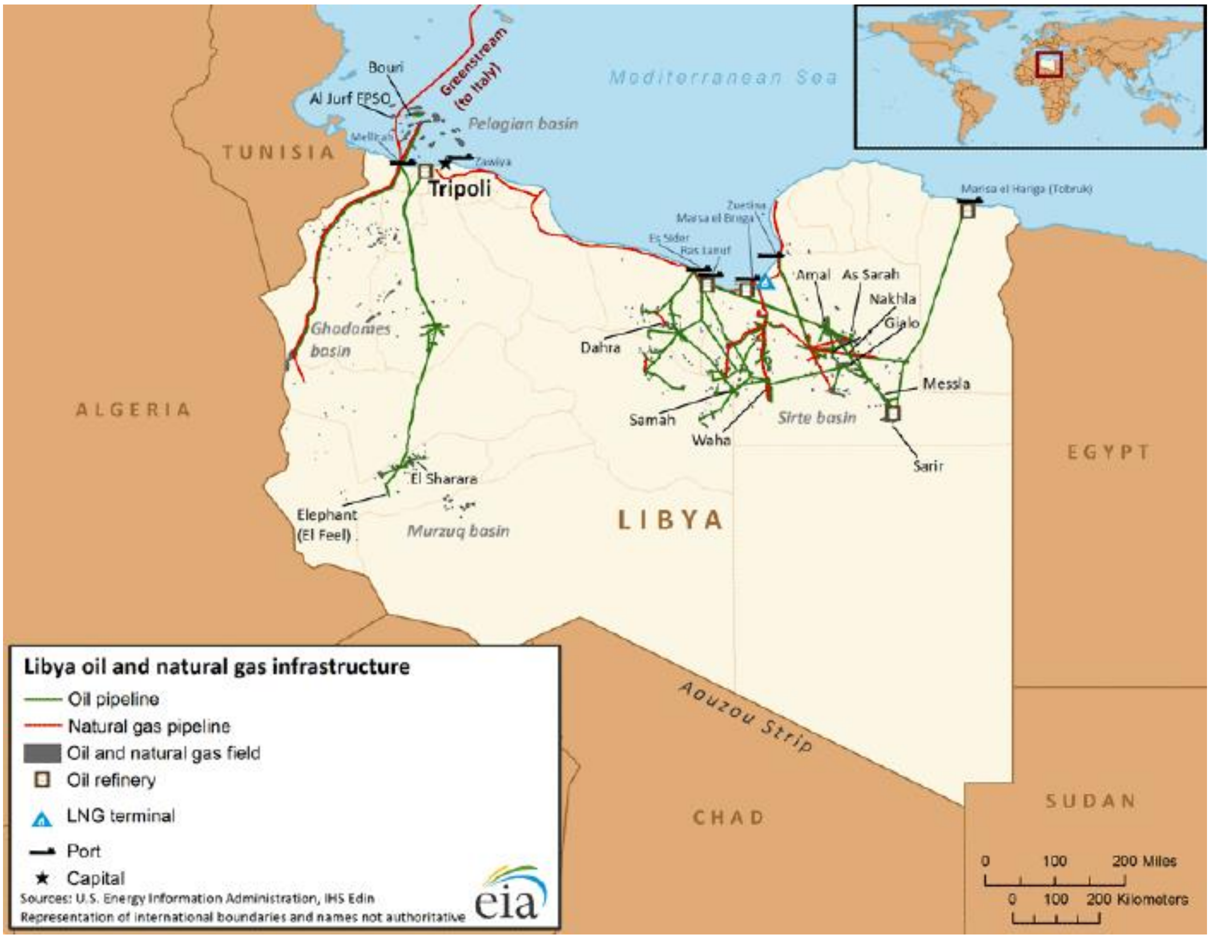

Figure 2-2: Libya's location

Source: U.S. Energy Information Administration (EIA) (2014)

Libya has almost no accessible water resources on the earth's surface, which is more than 90% desert or semi-desert. The Libyan climate ranges from Mediterranean along the coastline to extremely dry in the interior when going south. Although the barren, flat and undulating plains allow only a limited amount of land (1.03% of total territory) to be arable, Libya's soil is hiding great richness. Most prominent natural resources are petroleum, natural gas and gypsum. The first two natural resources especially are the main driving factors for the Libyan economy. Hydrocarbons contribute around 95% of export earnings, 65% of GDP and about 80% of government income (CIA World Factbook 2014). Table 2.4 below shows general data about Libya.

Table 2-4: General Data about Libya

Libya	
	
Capital	Tripoli
Region	Middle East & North Africa
Coordinates	27.0000° N, 17.0000° E
Total Area *(km^2)*	1,759,540
Population	6,201,521 (2013)
Rural Population	1,353,792 (2013)
GDP *(current US$)*	74,199,528,672.43 (2013)
GDP Per Capita *(current US$)*	11,964.73 (2013)
Access to Electricity *(% of population)*	100.00 (2014)
Energy Imports Net *(% of energy use)*	-132.06 (2011)
Fossil Fuel Energy Consumption *(% of total)*	98.74 (2011)

Source: Energypedia, (2014)

Libyan faces a number of extraordinary challenges, such as political, economic, cultural, demographic, regional and global challenges. It is vital to know how each of these challenges influences to the country's future as a whole. Also these challenges serve as significant chances for Libya, and urge Libyan policy-makers and organisations' top management to go outside the status quo to generate an even more concentrated and real environment for change. Libyans in order to keep pace with global developments they should not accept and surrender to the current situation. (Youssef, 2006).

2.7 Society in Libya

Libya has a small population relative to its area, as is shown in the table above: about 6.2 million people live in a huge land area, with about 90% of them living in north coast (i.e. Mediterranean coast about 2000 km long) which represent less than 10% of the area, primarily along the. 77.9% of the population is urban (BTI, 2012, p. 2), mostly located in the capitol Tripoli and Benghazi the second biggest city located in the east of Libya. Majority of Libyan people, around 97% is a mixture of Arabs and Berbers. The other Three percent are a mixture from the regional countries such as Egyptians, Tunisians, Turks, Italians, Greeks and small tribal of Tebou and Toureg who are considered nomadic tribes and rarely to stable in the southern province of Libya. (CIA World Factbook 2014).

Most Libyans follow the Sunni branch of Islam, which delivers both a spiritual guide for individuals and a keystone for government policy. Its tenets stress a unity of religion and state rather than a separation or distinction between the two, and even those Muslims who have ceased to believe fully in Islam retain Islamic habits and attitudes. According to the CIA World Factbook (2014), Less than one percent of the Libyans follows the Ibadhi doctrine, one of the doctrines of Islam and mainly located in Western province particularly in western mountains. The formal language is Arabic; other languages widely understood are English and Italian in most of the

Libyan cities. An ancient local language (Berber) is still used by the inhabitants of the oases and western mountain residents.

Table 2-5: Libyan Population age structure

Age	Percentage
0-14 years	26.9% (male 859,016/female 820,643)
15-24 years	18.2% (male 586,749/female 546,602)
25-54 years	46.1% (male 1,509,108/female 1,370,709)
55-64 years	4.8% (male 154,847/female 145,330)
65 years and over	3.9% (male 126,691/female 124,479) (2014 est.)

Source: CIA World Factbook, 2014

2.8 Socio-economic development in Libya

Libya has many features and points of power that qualifies it to be a state with a good level of socio-economic development. The most important of these factors and advantages are, rich with natural resources like oil and gas, accumulated capital reserve for investment, abundant workforce and finally its geographical location in northern Africa and among Mediterranean basin countries which linked it easily with Europe; see Figure 2.2 (Youssef, 2006). After the U N has lifted its sanctions on Libya in September 2003, followed by the United States in September 2004, In 2005 Libya began thinking merger and integration with the international community to develop and provide prosperity and well-being while preserving its Islamic and Arabic identity. This step requires from Libya think deeply in the national priorities in order to be able to take advantage of this opportunity to integrate with the countries of the world. (CERA, 2005). During late 2010 and the beginning of 2011, the Arab Spring emerged and Libya is one of the countries that were part of the Arab Spring. This resulted in a dramatic change within the country; it resulted in an unstable political and economic state. This has dramatically altered the country, which has put a halt on many of the previous systems that had started to work well for the country.

2.8.1 Libyan education system

Most of the world countries have agreed that investment in infrastructure of health and education systems will help and accelerate its development. These investments will heavily help in human capital development and improvement of these systems will find an effective workforce. Education and vocational and administrative training strengthens the people with the necessary skills to depart from poverty to state of welfare. Also, quality of higher education contributes to finding capable people to managing state affairs and improves the chances of finding effective management and development skills (UNESCO, 2005).

After Libya won its independence in December 1952, and after the discovery of oil and gas Libya has become one of the Petroleum Exporting Countries, the education system was taking an important aspect of the state of thinking, where the government began to establish universities and building schools and communicate with the world and neighboring countries to create a Libyan education system.

In 1969, when Colonel Gaddafi came to the power, Libya has developed goals to the Libyan education system for three decades which are seventies, eighties and nineties of the last century, namely to participate in economic and social development, and the second goal is to increase the culture of the community, and should be achieved through the development of skills and competencies and accelerate the development of human society (Youssef, 2006).

According to CIA-THE WORLDFACT BOOK, 2014, adult literacy levels are, 89.5% of total population, 95.8% male and 83.3% (2011 est.) which is considered high in compare with the countries of the region of Middle East and North Africa.

Libya currently is in a transitional period, after the 17th February 2011 revolution, and cracking down of dictatorship regime since 1969. Due to this situation the whole system is struggling to carry on. Given this, according to an ICEF monitoring report (2014, p.1):

> *"It is no surprise that Libya's education system is also struggling to rebuild and to meet the demand of a youthful country where the median age is 24.5 years old. Among Libya's highly urbanised population of 6.2 million people – the vast majority of which live in large cities in the North, Tripoli and Benghazi in particular – there are roughly half a million students enrolled in higher education".*

2.8.1.1 Quality of Libyan education system

It can be said that over the past forty-two years Libya has achieved some good results in the field of education, but the basic goals which was had been set that was mentioned in section 2.8.1 did not materialize as required. The nature of the previous totalitarian political system was a barrier to provide a strong educational system to monitor the quality of education and its development. The structure of the educational institutions were outdated and did not evolve since its inception in the sixties of the last century, which resulted in the poor quality of the educational process, as well as the lack of development of basic education curriculum in line with modern developments. Since the importance of the educational process in achieving prosperity and a strong economy Libyan people should have known about those issues in order to achieve their potential.

The Global Competitiveness Report (GCR) (2014-2015) ranks Libya 119th out of the 144 countries studied for its health and primary education system, and 102nd out of 144 countries studied for its higher education system. Schools facilities, teaching methods, and curriculums are not repeatedly benchmarked against any international standards or by any systems used in the region countries or other countries. Moreover, the links between research institutions and business do not exist in realty like the developed countries (UNESCO, 2005).

As a result of the lack of accurate and periodically information on the activities of education system and its quality because of the cover-up by the political system Gaddfi's era), It is clear that the education system in Libya has problems relating to quality of education, and that is obvious in the inputs of the educational process, such as curriculum, teachers and educational infrastructure, as well as the lack of reliable standards and objectives. There was no central authority for the overall planning and monitoring, the inability of the allocation of educational resources, and finally the lack of resources in specific areas. (CERA, 2005 and Youssef, 2006).

After the revolution of February 17, 2011, and begin to form a new Libyan government, the Ministry of Education contacted with the international institutions involved in education, such as UNICEF, in order to raise the quality of education in slightly larger scale. In April 2nd, 2013 the UNICEF revealed that cooperation with Libya about the quality of education, where the organization (UNICEF, 2013) has stated:

> *– The United Nations Children's Fund (UNICEF) today announced the development of "a high-level road map" for effective teacher management in Libya as part of the agency's continuing efforts to improve access to quality education for all children in the North African country.*
>
> *The new two-year initiative, to be funded by the European Union and elaborated under the leadership of Libya's Ministry of Education, will ultimately be implemented by UNICEF's Teachers Development Centre with a special focus on providing better education for Libya's most vulnerable children, including those affected by the country's recent conflict.*
>
> *"We believe that the high number of teachers available in Libya can be a driving force to increase the quality of education, but this will happen only if they are highly motivated, appropriately trained and supported," said Carel de Rooy, UNICEF Country Director in Libya, in a press statement.*

The project, which will run an estimated 3.1 million Euros, will study various aspects of the Libyan education system ranging from teachers' qualifications and in-service teacher training to recruitment, management and deployment.

In addition, it will provide "a high-level road map for more effective teachers' management and help coordinate a response to teacher development," according to the UNICEF news release.

"This is the ultimate goal of the Teachers Development Centre programme," Mr. de Rooy continued.

"Rethinking the teaching system in order to enhance teachers' competencies, status and motivation leading ultimately to better learning in Libya's classrooms," he added

As Libya was rebuilding its institutions it was seeking to rebuild the education system in order to keep pace with modern scientific developments and the trend towards sustainable development. That would have been done through the effective communication with the international community and its institutions.

2.8.2 The role of energy sources in the Libyan economy

Libya's economy is mainly based on the energy sector and which achieves about ninety-five percent of export earnings and accounted for eighty percent of the gross domestic product and nearly 99% of the state's income. This large oil & gas revenues as well as some financial investments along with a number of Libya's population achieves one of the highest gross domestic product per capita rates in the African continent: 11,964.73 US$ (2013) (CIA World Factbook 2014). UN/US sanctions since the late 1980s affected the Libyan economy; after they were lifted in September 2003, and removed completely in June 2006, Libya has made some improvement steps toward reform of economic file as a part of a wider movement to return the country to the international community. Public services including education, healthcare and other services contribute only 9% to Libya's GDP, but employ 51% of the formal workforce (UNDP, 2005). The construction and general service sectors have extended in the last five years and may well have a more share of GDP in case of a new government gives prioritises to the spending of the capital on development projects once political situation become stable and security troubles diminish (CIA World Factbook, 2014).

Libya imports about eighty percent of its food where the agriculture sector suffers from a desert climate where the poor soil and limited water resources.Higher oil prices over the last few years have led to an increase in export revenues and improved macroeconomic balances (GCR (2014-2015)) ranks Libya 41st out of the 144 countries studied for its macroeconomic system) but have done little to stimulate broad-based economic growth. In the final five years of Gaddafi's regime, some measures were taken to return parts of the economy such as retail to private ownership, in the form of partnership and joint ownership.

The Libyan economy is comprehensively dependent on revenue from extracting and selling natural resources, rather than generating products and services through investment and innovation. In other words, it is an economy based on inherited rather than created prosperity. In the final five years of Gaddafi's rule and immediately after cracking down on Gaddafi's regime, the Libyan leaders have repeatedly stated that the economy should expand beyond the energy sector and find other sources to create the conditions in which the Libyans themselves can generate new sources of wealth.

However, the sector of oil and gas is still the major player in the Libyan economy. Recently, in the last two years, The Libyan oil and gas sector during the past two years, announced to rounds exploration licenses and new exploration, which drew the attention of major oil companies, however in the absence of political stability, companies will not be encouraged strongly about the license application until the political situation settle on the one hand and the security situation of the other. At the same time, the modern global economy has produced new challenges for nations wishing to increase the standard and quality of living for their people. It has become very vital for nations to produce goods and services so that they are globally competitive. Economies such as Singapore, Turkey, Israel, Malaysia and Ireland have emerged through their emphasis on building the competitiveness of their economies in the global market.

The IMF, (2014, p. 14) report entitled Arab Countries in Transition: Economic Outlook and Key Challenges, in the Libya section, advised Libya on reforms for inclusive growth, and stated that, *"For Libya to move away from total dependency on oil, to a sustainable and inclusive path, it would be necessary to create the conditions for diversified, private-sector led growth".* Despite the political and security turmoil, important steps have been made to restrain current spending and create space for investment in infrastructure. A number of important energy and transport projects were completed in 2013 in difficult circumstances (IMF, 2014, p. 14). Going forward, efforts should focus on enhancing the business environment, upgrading the skills of the workforce through better education and training, fostering financial intermediation, and investment in physical, regulatory and institutional infrastructure.

Libya has suffered a lot of hardships in the era of Gaddafi because of his economic policy which adopted on the basis of a socialist economy, but after the February Revolution in 2011 it became clear that successive governments have intention to open a commercial activity and develop the economy on the basis of a market (CIA World Factbook, 2014).

2.8.2.1 Government's role in the local economy

Totalitarian political system and the central system through last forty two years had made Libya distribution state and have not had the opportunity of national institutions and local extraction of wealth, either through services produced by or through tax collection (World Bank Institute, 2005). Therefore Libya had become a central state in distributing budgets to the provinces at their request, which resulted in the deformation of the local provinces where it became a consumers, do not exist for efficiencies and the absence of a competitive market.

After Gaddafi's regime has been overthrow with the wake of the February 17, 2011 revolution, Libya entered in transition period to establish a new system that made the economy volatility and floundering on both the state level and at the provincial level. In 2011 the distribution of oil revenues caused contraction in real GDP by 60%, but the economy recovered quickly in 2012 due to the production and export of oil to the levels that existed before the revolution of February 17, 2011 (ADB, 2014). However, after the case of the political division, which began to emerge with clearly in 2014 influenced the Libyan economy negatively, African Development Bank report (ADB, 2014, p.5) stated: *"In March 2014, oil production levels reached a further low of 250,000 bpd. As a result, the budget is likely display a very significant deficit in 2014, threatening fiscal sustainability and putting pressure on the government's social and economic expenditures."*

2.8.2.2 Private sector and small and medium enterprises (SMEs)

In the mid-seventies of the last century and particularly in 1976 when the Gaddafi regime launched his economic theory, which depends mainly on socialism, all the private activities and SMEs shut and became the ownership of the State by the rule of law. Since that time to February 2011 the Libyan economy controlled by the state and became stated-owned enterprise (SOE), which means ineffective, unfair and non-transparent in the granting of contracts, and the culture of corruption had been spread and that depleted the oil income over the past four decades.

This situation has become difficult to find a suitable environment and suitable for re-private sector activity and the SMEs, and this is supported by the African Development Bank (ADB 2014, P.6), who stated in their report "*Private sector* *activity remains limited due to the volatile political environment, weak regulatory and institutional environment, lack of access to finance, and a weak banking system”*.

Recently, after the 17th of February 2011 revolution, and with the first National Transition Council (NTC) and first elected General National Congress (GNC), priority has been given to the economy through encouraging the private sector and SMEs.

2.8.2.3 Effect of agriculture sector in Libyan economy

In Libya, before the discovery of oil and gas reserves in the 1950s, the agricultural sector was contributing about 25% of Libyan GDP (Youssef, 2006). Agriculture sector in Libya had directly affected by the economic policy of Gaddafi’s regime, application of the socialist system, reduce labor, centralized distribution and subservience to the state, which made a number of farmers to stop production farms and treated them as private property for the purpose of entertainment and self-sufficiency.

The nature of Libya's geographical and scarcity of rainfall throughout the year and total reliance on groundwater were the obstacles to strengthen the agriculture sector, which made the Gaddafi’s regime in 1981 to begin the establishment of Man-Made River project (35 billion US$ budget of the project) to bring the cumulative groundwater in the south and transported it through the pipeline to the north to take advantage of them in the revitalization of the agriculture sector. Although the official figures issued by the Libyan state in 2003 indicate that between 4-5% of GDP and between 7-8% of total employment in the agriculture sector, however, there are studies that bucked this government statement and reported that many Libyans are working in the agriculture sector on part-time basis (UPA, 2000-2005). This spectator was supposed to enhance the Libyan economy and became the second sector in the country after the oil and gas, but the political system managed it in wrong direction.

2.8.2.4 Mismanagement of economic capitals

Gaddafi's regime Lack of interest in the file of the state economy and make it a second-class of his interest and pursue the principles of socialism were the reasons behind the deterioration of the Libyan economy, during the 42 years of Gaddafi's rule the economic development was a secondary to for the regime, African Development Bank (ADB 2014, P.5) said in its report (Libya: Country Re-engagement Note) "*Under the 42 years of Gaddafi's rule, the economic development was secondary to a political and social remoulding of the country's institutions*". Due to that, the Libyan economy process had become tied with bureaucratic instruction, unproductive financial and in-kind subsidies and finally state controlling over the key assets of the Libyan economy (Youssef, 2006).

Lack of planning and consultation was obvious feature of the Gaddafi'S regime in general and especially the economic file, where he performed a number of steps to reform the economy file, but with little avail as increased people's dependence on the state institutions and become overstaffed, which increased the burden on the state budget. In my opinion as a Libyan citizen and from my experience with Gaddafi's regime, the main weaknesses of the Libyan economy were and still are:

1. The reliance on the sector of oil and gas.
2. The political regime during Gaddafi's era.
3. Vary poor management efficiency in state institutions and some companies and the absence of a highly trained staff and labour force.
4. Absence of future studies and planning.
5. No contact with the international specialised consultancy companies.
6. Ineffective exploitation of natural resources.
7. Spread of corruption in the state institutions.
8. Mismanagement of economy file.
9. Untrained and uncommitted leadership.

Because of the deteriorating economic situation, Libya had been deprived from economic and social development, and the economy became totally dependent on oil and gas income. In 2005, seventy-five percent of government revenues and 95% of export revenues come from oil and gas (NOC, 2005). This situation, unfortunately still continued after the revolution of February 17, 2011, Central Bank of Libya (CBL) on 28th December, 2014 through press release declared that, in 2013-2014 about 28% of the budget was spent on salaries.

2.8.2.5 Future of economic development in Libya

Libya over the past 42 years during the Gaddafi's rule have not got a real economic development according to a deliberate development plans. Most of the projects carried out in that period were of a political nature in the first place, such as the agricultural project infidels and Man-Made River project. Squandered oil revenues in the Gaddafi's political adventures and deprived the Libyan people from truth economic development. Despite of that, Libya still has assets that can be invested in its future economic development, such as geographical location, human resources and scientific talent, oil and gas reserves and, solar energy.

Secretary of The General People's Committee for Economy and Trade, Mr. Shukri Ghanem, in an interview published on the WINNE website, stated that:

"*Libya has traditionally been a country of traders, merchants, and entrepreneurs with the cultural heritage of the Mediterranean traders and the caravan traders to the African continent*." (WINNE, N.D.).

In the final five years of Gaddafi's regime, Libya intended to restore trading links and political relations with its international partners in order to prosper in today's global world. It has taken substantial courage for Libya to change direction and "*Libyan businessmen have carried out vital projects that have produced very good profits in a few years,*" according to Mr. Shukri Ghanem (WINNE, N.D.). Some examples of potential for economic development are introduced below:

- **Reserves of oil**

Presently, Libya has increased oil reserves of 48 billion barrels in total, see figure 2.5 below. Figure 2.3 shows the country's oil fields, oil ports, refiners and operators. However, Libya remains highly unexplored and has superb potential for more oil discoveries. Additionally, in spite of years of producing the oil, about twenty five percent of Libya's total area is signed by agreements with the major oil companies, where the under-exploration areas of Libya is due mostly to sanctions as well as to severe fiscal terms forced by Libyan government during Gaddafi's era on foreign oil companies (NOC, 2005). In the final five years of Gaddafi's regime and after the lifting of the UN/US sanctions in 2006, Libya licensed international companies for new concessions for new oil explorations; unfortunately this activity stopped after the civil war in 2011.

Libya's oil ports, fields, refineries, and operators

Load ports	Region	Main fields	Refinery	Field operator	Lead foreign partners
Es Sider (Sidra)	central-east	Waha, Samah, Dahra, and Gialo		Waha Oil Company	ConocoPhillips, Marathon, Hess
		Mabruk (Mabrouk)		Mabruk	Total
Ras Lanuf	central-east	Nafoura		Agoco	none
		As Sarah/Jakhira b(C96), Nakhla (C97)[1]		Wintershall	Wintershall, Gazprom
		Amal, Naga, Farigh		Harouje	Suncor (PetroCanada)
Marsa al-Hariga (Tobruk)[2]	east	Sarir, Messla, Beda, Magrid, Hamada[3]	Ras Lanuf; Tobruk; Sarir	Agoco	none
Zueitina	central-east	Abu Attifel, NC-125		Mellitah	Eni
		Nakhla (C97)[1]		Wintershall	Wintershall, Gazprom
		Intisar Complex and NC74[4]		Zueitina Oil Company[5]	Occidental, OMV
Marsa al-Brega	central-east	Brega (Nafoura/Augila complex)	Marsa al-Brega	Agoco	none
		Nasser (Zelten), Raguba, Lehib (Dor Marada)[6]		Sirte Oil	none
Mellitah	west	El Feel (Elephant), mixed with condensate from Wafa and Bahr Essalam gas fields		Mellitah	Eni
Zawiya or Zawia (Tripoli)	west	El Sharara (NC-115) and NC-186 fields	Zawiya	Akakus	Repsol, Total, OMV
Bouri[7]	west	Bouri (offshore)		Mellitah	Eni
Farwah (Al-Jurf)[7]	west	Al-Jurf (offshore)		Mabruk	Total

[1]Oil from Nakhla (C97) is mixed with oil from Eni's Abu Attifel field.
[2]Most of the production from Agoco fields can be sent to Ras Lanuf and Marsa al Hariga (Tobruk).
[3]Oil from the Hamada field, which is located in the West, is sent to Zawiya. It is typically used domestically.
[4]Oil produced at NC74 is sent to Ras Lanuf.
[5]The Zueitina grade can also be sent to the Ras Lanuf terminal.
[6]Output from Lehib is mixed with output from one of Harouje's fields and sent to Ras Lanuf.
[7]Bouri and Farwah (Al-Jurf) are offshore loading platforms of Mellitah.
Sources: U.S. Energy Information Administration based on data from Energy Intelligence, Middle East Economic Survey (MEES), company websites, *Oil & Gas Journal*, and Lloyd's List Intelligence (APEX tanker data)

Figure 2-3: Libya's Oil ports, Fields, Refineries, and Operators

Source: U.S. Energy Information Administration (EIA) (2014)

- **Reserves of natural gas**

In last few years Libya has put plan of two goals to exploit natural gas reserves, the first goal was to use natural gas in power generation locally instead of oil to freeing it for export abroad. The second objective is to start in the exploitation of its gas reserves for export to countries of the European Union (i.e. Millieta project, export gas pipe line to Italy). According to the U.S. Energy Information Administration report (2014), Libya, in January 2014 has proven its reserves of natural gas were estimated about 55Tcf. Figure 2.4 shows the country's largely unexploited and unexplored natural gas reserves.

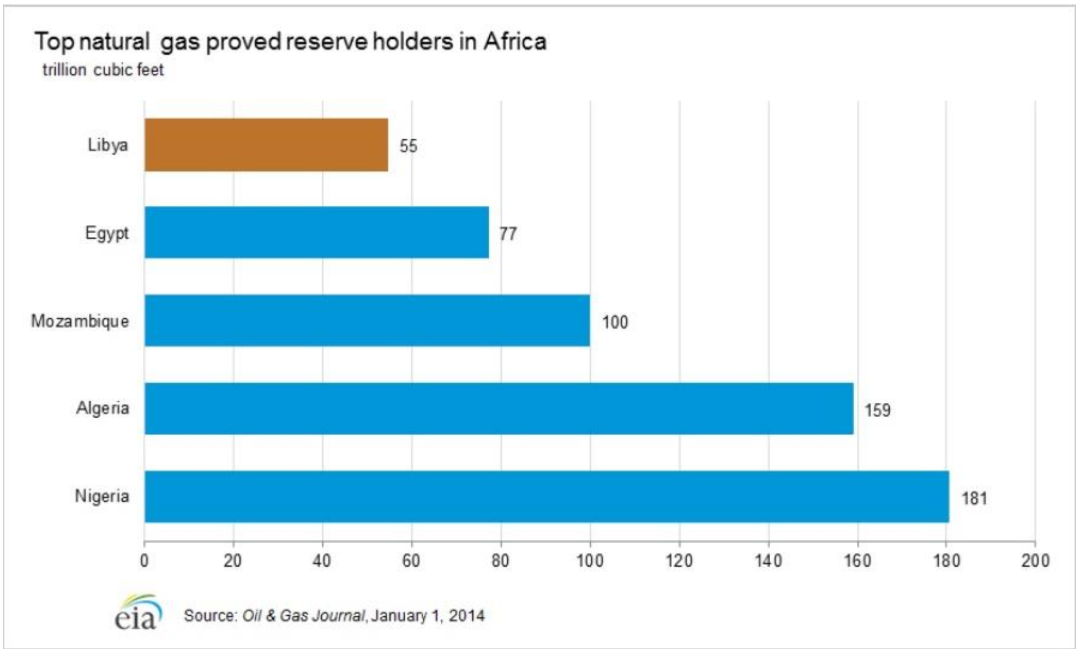

Figure 2-4: Top Natural gas proved reserve holders in Africa

Source: Oil & Gas Journal (2014)

According to the latest studies (see figures 2.3 and 2.4) which indicated that Libya's oil reserves rate has been increased, in addition to the presence of shale oil makes the productive capacity of over 3 mbpd in case of development of the infrastructure of the producing fields and good exploitation of shale oil reserves. Same situation for natural gas will be enough for domestic use and exporting as well.

- **Solar power**

Libya's geographical location in northern Africa and 88% of its territory is considered a desert; make it vulnerable to the sun throughout the year for long hours in the day. According to REVE (2013, p.1) magazine specialized in Wind Energy and Electrical Vehicle Review, wrote an article titled as Libya could produce more energy in solar power than oil stated that: *"Libya has an average daily solar radiation rate of about 7.1 kilowatt hours per square metre per day (kWh/m²/day) on a flat plane on the coast and 8.1kWh/m²/day in the south region".* This amount of energy was not utilised neither invested in economic development. This energy potential if utilised properly, Libya could produce around seven mbpd of crude oil in energy (REVE 2013).

- **Industry of tourism**:
  The tourist industry was not in the Gaddafi's regime agenda over the past 42 years of his ruling Libya. Despite the fact that Libya has enormous potential tourist, like its position in the Mediterranean Basin and possession of about 2000 km coastline, sobriety climate, archaeological cities since Greeks era in the east of the country and Roman cities, Leptis Magna and Sabratha in the west of the country, as well as the desert. In the case to taking this advantages of this potential by providing the needed infrastructure for this industry, reducing the bureaucracy and facilitate visa procedures for tourism would definitely support the economic development in Libya

- **Libya's location:**
  Libya's geographical location in northern Africa and the Mediterranean make it a strategic location for the marine and air navigation and communications between the northern and southern hemispheres, as well as the abundance of oil and gas, Needs of Europe to the energy have made it to be a business partner to Libya. Nevertheless, the Gaddafi's regime did not invest these advantages to be supportive of the Libyan economy. The opportunity still available to take an advantage of such potential if the infrastructure being developed as well as highly skills of human resources.

The conclusions are that Libya has enormous potential to benefit from them in finding real economic development that meets the aspirations of its people. On the other hand, the challenges now, after Gaddafi’s regime has cracked down, who neglected these potentials are:

1. Find a consensual political system to achieve stability and security of the citizens and safeguarded human rights.
2. Immediate and serious development plans to exploit these potentials.
3. Expedite the rebuilding of the infrastructure of the state.
4. Communication with the international community to benefit from their experiences.

2.9 Political governance in Libya

It is important to shed light on the historical background of the governments that came to rule Libya before talking about who governs Libya now. In the beginning of the last century, and specifically in 1911, the Italians cracked down the Ottoman Turks in western area of Libya Practically the capitol city Tripoli, and in 1931in the Eastern province around Benghazi. After defeating Italy in 1943 during World War II, Italy relinquished its holding of Western and Eastern provinces to British Administration and its Southern province to French Administration until 1949 (CIA World Book, 2014). Then Libya passed into UN administration and achieved independence in 1951. The United Kingdom of Libya (UKL) was the name for Libya that was recognised by the UN until September 1969. In the period of the UKL, oil and gas were discovered in Libya, and the country became a member of the Organisation of the Petroleum Exporting Countries (OPEC).

In September 1969, a group of military officers leaded by Col. Muammar al-Gaddafi planned a military coup and they succeeded in taking control of Libya. The legislation and the way of ruling were changed according to Gaddafi’s ideology, which is based on socialism. This regime controlled Libya for four decades in a dictatorial manner. During that period Libya lost a lot of its revenues because of Gaddafi, uunfortunately used them to support terrorist movements around the world and for the dissemination of his political ideas. Due to that, the UN and U.S.A. imposed sanctions on Gaddafi's regime, which isolated Libya from the international community. This insulation put Libya into the ranks of underdeveloped countries, which led to the congestion of people that burst in early 2011 to topple the Gaddafi regime in October 2011.

From 2011 up to now, Libya has been in a transition period to establish a democratic state; in this period Libya was governed by the National Transition Councel NTC until the first elected parliament, General National Congress GNC, in July 2012 elected Mr. Ali Zaidan as the new Prime Minster. Usually in fledgling democracies, dispute is to be the master rather than a reconciliation scene that produces stability. As a result of these differences, parliament did not continue ending the transitional period. Due to huge popular demands for early elections to elect a new parliament, at the end of June 2014 a new parliament was elected. But parliamentary sessions were unconstitutional violations, which led some violators of the new parliament to appeal to the Supreme Court, which ruled on the appeal on November 6, 2014, stating the invalidity of the parliament and dissolving it. This provision has increased the complexity of the Libyan scene, and thrust Libya into civil war and the United Nations has become the sponsor of the dialogue between the parties to the conflict in order to create a national unity government.

Currently in Libya, there are two parliaments and two governments and both sides claim to legitimacy, and the state and its institutions are at an almost complete standstill. Indubitably, this situation will have a straight impact on the economic and social condition and could lead to the collapse of the entire state.

2.10 Social context and human development in Libya

In this section of the study the researcher will cover human resources situation in Libya and its future, challenges of poverty, social services and labour problems, also a brief section about gender equality in Libya during Gaddfi’s era as well as the future Libya.

2.10.1 Constructing of human resources

According to Human Development Indicator (HDI, 2013) ranking, Libya ranked 55 out of 187 countries, placing Libya in the category of high human development. This indicator showed that life expectancy at birth in Libya has increased by about 15 years 5.1 years was for average years of schooling and 3.6 years were for predictable schooling years. In contrast, Libya in HDI of 2012 was overhead the average countries in the human development category, and ranking same level as Jordan, Tunisia and Oman which is above the average level in Arab countries (UNDP, 2012).

With regard to the health sector, the Ministry of Health has announced that carried out many institutional correction and reforms operations for the sector which has been neglected by the state in the era of Gaddafi. Ongoing reforms now included the establishment of national health accounts and the development of institutional capacities for the purpose of improving transparency are two of the priorities of the ministry's reform agenda. As a result of neglect by the state led to a lack of expertise designate these reforms. The ministry is looking for international expertise to implement those goals. These reforms are going very slowly, or almost stalled as a result of the ongoing political conflict now in Libya.

As reported by African Economic Outlook (AEO, 2014), the adult literacy was 84 percent comparing with the countries in the region which was considered high level. The weakness of the level was due to the poor quality of education system and was not associated with labour demand because of very bad education management during the era of past regime (i.e. Gaddafi’s regime). According to the 2014-15 GCR and cited by (AEO, 2014), score of Libya in health and primary education was 126 out of 144. HDI 2013 reported that 55.6% of adult females reached secondary or higher level of education in comparison to 44.0% of adult men. 16.1 years was the expected years of schooling in Libya which is considered high compared with similar of Arab states. Conversely, as stated by the 2014-15 GCI, the quality of the educational services in Libya was very poor which scored 148 out of 148 in terms of quality of the educational services and training as well. Overcoming the challenges of low-quality educational services is the main challenge facing the next government of Libya in order to be able to attend the wheel of development and to overcome the problems of unemployment, especially among young people.

2.10.2 Challenges of poverty, social services and labour

After the overthrow of the Gaddafi regime in October 2011 the first legitimate body which elected General National Congress GNC, which in turn, formed a new executive government of Libya. The challenges of poverty , social services and unemployment was one of the most important challenges faced by the elected government, who has announced activating of the National Identity Number (NID) as a first of nine steps associated with 2013 budget (AEO, 2014) , which in turn determines the correct number of employment as well as social and economic situation of Libya. The results of the activation NN came out in the begging of 2015 which reduced the salary budget to about 28% to invest them in other sector.

The second condition that accompanied the budget in 2013 was the removal of subsidies on basic commodities and fuel, and replacing them with cash in addition to the basic salaries with the beginning of 2016. That support was consumes 16% of the state budget which is about 11 billion Libyan dinars. These reform measures are going very slowly because of ongoing political conflict currently in Libya.

In 1982, the former regime put down a salary law which known as law 15/1982 for the public sector which has not been changed since then, LYD 150 was the lowest wage by this law. This status only changed in 2005 which brought about a moderate increase in the salary of the public sector. According to the International Monetary

Fund (IMF) and cited by AEO (2014), the annual salaries has been increase by 7.4%, which was below the inflation rate (10%). These increases in salaries and replace of subsides by cash will help to improve the social and economic situation of the people in the case of these applications applied with discipline. Labor organizations that are supposed to call for better situations to the workers in terms of wages and rights canceled in the mid-seventies of the last century by the Gaddafi regime and kept on only one organization, the National Federation of Trade Unions (NFTU). NFTU was controlled by Gaddafi to impose his views on them. Rearrange the situation of workers and labor organizations allowed them to work according to the new state laws is one of the most important challenges facing the new Libya.

2.10.3 Equality of genders

Libya is an Arab and Muslim country which makes for Libya privacy in terms of gender equality. The society is still classified as masculine although the former regime's attempts to reduce the gender gap and involve women in the labor market and political life. In accordance with African Development Bank (ADB, 2014) about 56 percent of females over the age of 25 receive higher education, the labor force of women aged 15 and older is estimated at about 15% compared to 75% for male. As reported by (GCR, 2013-2014) 132 out of 148 was a rank of Libya in terms of women sharing in the labor force.

According to (AEO, 2014), the young women and men who is about sixty percent of the population showed new aspirations, visions and eager to tackle the challenges and obstacles after 17th of February revolution. During the revolution which led to crack down Gaddafi's regime, so many Libyan women played major role in it. Libyan women participated in new political life, 16.5% of GNC are women and selected by people in general election held in July 2012. These steps respected by the international community especially the UN and human rights organisations as well. According the International Foundation for Electoral System IFES (2014), the participation of women on elected constitution committee which has been elected in

2014 is 35%. This participation of women will reflect their views and insist on their rights constitutionally. The future Libya will have a lot of changes in terms of equality of genders and will be constitutional and legal.

2.11 Oil and gas in Libya

Libya is an oil-producing country and has been a member of OPEC since 1962 after the country began exporting oil (OPEC, 2014). Libya currently holds the largest proved crude oil reserves, and is an important contributor to the global supply of light, sweet crude oil (EIA, 2014). As reported by the Oil and Gas Journal (OGJ,2014), Libya in January 2014, proved its crude oil reserves up to 48 billion barrels, which is considered as the largest endowment in Africa, accounting for 38% of the continent’s total, and the ninth-largest amount globally, see Figure 2.4 below. Libyan basins are six large sedimentary basins, which are Sirte, Murzuk, Ghadames, Cyrenaica, Kufra, and the offshore one, which the NOC believes has substantial undiscovered potential. Around eighty percent of country’s recoverable reserves are located in the Sirte basin, which also accounts for most of the Libya’s oil output (Arab Oil and Gas Directory, 2013 p. 256). A vast area of Libya remains unexplored, and unfortunately ongoing unrest has prevented a large-scale exploration programme.

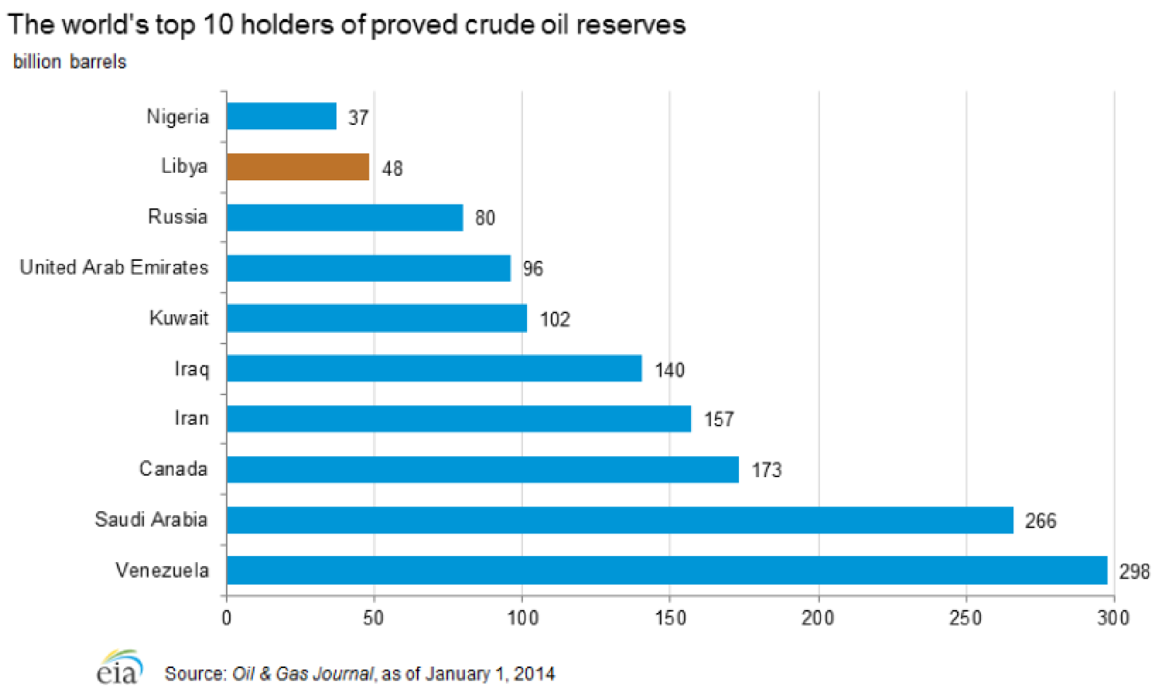

Figure 2-5: The world's top ten holders of proved crude oil reserves

Source: Oil & Gas Journal (2014)

According to a report prepared for the U.S. Department of Energy and the EIA by Advanced Resources International, Inc. dated June 17, 2013, about Shale Gas and Shale Oil Resource Assessment, Libya, with Russia, the U.S., China and Argentina account for two-thirds of the assessed technically recoverable shale produce.

2.11.1 Energy sources in Libya

Libya has 26 billion barrels, see Figure 2.6; this will give Libya more potential in the energy sector, which should be well exploited for coming generations. Libya's oil production fluctuated during the last four decades, and that is due to several reasons, which are: absences of oil facilities (i.e. GCs, GOSPs) upgrading, no authorisation for building new facilities, bad management and U.S./UN sanctions which impeded the investment and equipment needed to sustain oil production at a higher level. Libya's peak production was in mid-1970 when it reached up to 3 million bbl/d, and since that it has degraded and fluctuated. In final five years of Gaddafi's regime, production was between 1.7 – 1.8 million bbl/d. The EIA estimates that Libya's current effective production capacity is slightly below 1.6 million bbl/d (EIA,, 2014). The current political situations with the ongoing military conflict make production fluctuate and it remains under a 1 million bbl/d, ranging from 500,000 bbl/d to 900,000 bbl/d.

EIA/ARI World Shale Gas and Shale Oil Resource Assessment

World Shale Gas and Shale Oil Resources

Technically Recoverable Shale Gas Resources (Tcf)	
1. U.S. (ARI est.)	1,161
2. China	1,115
3. Argentina	802
4. Algeria	707
5. Canada	573
6. Mexico	545
7. Australia	437
8. South Africa	390
9. Russia	285
10. Brazil	245
11. Others	1,535
TOTAL	7,795

Technically Recoverable Shale Oil Resources (Billion Barrels)	
1. Russia	75
2. U.S. (ARI est.)	48
3. China	32
4. Argentina	27
5. Libya	26
6. Australia	18
7. Venezuela	13
8. Mexico	13
9. Pakistan	9
10. Canada	9
11. Others	65
TOTAL	335

- **Shale Gas.** U.S., China, Argentina, Algeria, Canada and Mexico account for nearly two-thirds of the assessed, technically recoverable shale gas resource.
- **Shale Oil.** Russia, U.S., China, Argentina and Libya account for nearly two-thirds of the assessed, technically recoverable shale oil resource.

2

Figure 2-6: World Shale Gas and Shale Resources

Source: Advanced Resources International, Inc. (2013)

Libya has proved natural gas reserve up to 55 tcf, see Figure 2.3, and is the fifth-largest natural gas reserve holder on the African continent (OGJ, 2014). According to the EIA (2014), prior to the 17th of February 2011 new discoveries and investments in natural gas exploration had been expected to raise Libya's proved reserves and Libyan experts projected them reaching 100 tcf. The NOC has announced plans to increase the country's natural gas production from offshore and onshore fields.

Libya's dry gas production grew substantially from 194 billion cube feet (Bcf) in 2003 to 594 Bcf in 2010 (EIA, 2014). Libya connected with Italy via the Greenstream gas pipeline for exporting dry gas from the Western Libya Gas Project (WLGP), which is operated by Eni and NOC through the Mellitha Oil & Gas joint venture. Natural gas production and exports have partial recovered since the Libyan people's uprising in 2011, but still remain lower than pre-uprising levels.

Conforming to Revenue Watch's Resource Governance Indicators (RGI, 2013) and cited by (AEO, 2014), which concerning in measuring the quality of governance in the oil, gas and mining sector, in terms of countries Libya positions 55 / 58. regarding institutional and legal bodies marks 11out of100, regarding documenting and reporting practices ranks 29 out of 100, regarding quality control and safety measure marks 15 out of100, and in terms of the enabling health and safety environment ranks10/100. These rates do not explain deficiencies and decline, which affected the oil industry in Libya only, but also, describes how the state governor grip on this strategic sector.

Libya is considered as the fifth largest reserve of shale oil in the world which accounts to nearly two thirds of the assessed technically recoverable shale oil. Other countries which also have this are Russia, U.S, China, Argentina, (EIA, 2014). Figure 2.6 below shows that Libya has 26 billion barrels of shale oil. This makes it imperative for the next the Libyan government and NOC to update the oil and gas law and speed in granting oil concessions of big companies in order to exploit these strategic reserves to become a key supporter of national revenue and economy. As is well known, that oil and gas are still the main source of energy in the world in spite of persistent attempts to find alternatives for them, Zhou (2013) and cited by Armor (2014) state that by 2040 there will be increasing demand for energy by an estimated 56%. This force on Libya to upgrade and develop the existing oil and gas facilities as well as to start from now building infra-structure for shale gas and shale oil.

Another source of energy (i.e. solar energy) available and can be exploited very well to provide energy for the domestic use, as the geographical location of Libya in northern Africa and the Tropic of Capricorn passes by them vulnerable to long hours of sunlight. Solar energy which known as the clean energy and environmentally friendly has become the focus of attention of energy expertise that the lack of impact on the environment compared to fossil fuel resources in addition to being a long-lived, green and sustainable resource. Zhou (2013, p8), stated that "*Efficiencies of various solar capture devices have been continuously improving and these devices need to capture a greater portion of the solar spectrum hitting Earth.*" This should encourage the Libyan energy sector to start immediately of utilising the solar energy for domestic use to reduce the use of oil as a source of fuel to provide electrical energy for use in domestic consumption.

To conclude the subject of energy sources in Libya, it is obvious that Libya has different energy resources which are; oil and gas reserves, shale gas shale oil and solar energy, which could be utilized to increase the national revenue. However, Libya facing long road to achieve that and could make it shorter if:

1. Libya overcame poor management of oil and gas projects.
2. Issued a new oil law keep pace with modern developments for the oil and gas industry.
3. The actual start in the exploitation of solar energy.

2.12 Policy issues relating to energy in Libya

After oil was discovered in Libya in the early 1950s, Libya became one of the Petroleum Exporting Countries. In 1955, the Libyan parliament released the first law regulating the production process, exploration licenses, foreign investors and international companies wishing to work in Libya. Work continued despite this law without any development or modification to keep pace with global changes. In 2008, Dr. Shukri Ghanem, the oil minister, issued a decision to form a committee for the development of the law issued in 1955 and develop it to meet global changes (Libya plans to issue a new law on oil and gas, 2010). After the overthrow of the regime in 2011 and the election of a new parliament and government, in March 2013, new oil minister Dr. Abdul Bari Arousi issued a decision to form a committee to change the oil law issued in 1955 and develop it so as to match the global changes (The first meeting of the committee in charge of reviewing the Libyan oil law, 2013). The EIA (2014, p. 4) stated that, even before the 2011 civil war, policy makers in Libya had been debating the content for a new hydrocarbon law. The last hydrocarbon law, passed in 1955, is outdated and does not include much information on natural gas development and Enhanced Oil Recovery (EOR) projects. The proposed new law aims to establish a unified national law that encompasses all aspects of the hydrocarbon sector. The delay in issuing a new legislation for the Libyan energy sector can be considered one of the main obstacles that restrain the developing of this sector, especially since nearly 75% of the area of Libya has not yet been explored (Youssef, 2006).

The renewable energy sources have ever since been considered to be of secondary relevance. Although the first efforts of initiating and developing a renewable energy sector occurred under the pre-revolutionary government, the pursuit of a diversified and sustainable energy sector has been limited. According to Energypedia (2014), the Renewable Energy Authority of Libya or REAOL has established a target of 10% renewables by 2025. However, due to unrest in political and security situations and uncertainty, this plan will be delayed.

2.13 Current practice in the Libyan energy sector

Talking about the energy sector in Libya means talking about oil and gas, as this sector is the main source of energy in Libya. Before the crack down of Gaddafi's regime, oil industry in Libya runs by NOC the state-owned company. The NOC was responsible for implementing Exploration and Production Sharing Agreements

(EPSA) with international oil companies (IOCs), as well as its own field development and downstream activities. Its subsidiaries include the Sirte Oil Company and the Arabian Gulf Oil Company (AGOCO). Throughout the past five decades, the NOC continued acting as the main body responsible for the oil and gas sector in Libya. However, the current conditions of Libya's situation have become more complicated because of the uncertainty in the political situation and the security and other reasons; for example: the NOC administrative works system has aged since its inception in the 1960s, the oil and gas law has not changed since the 1950s and the first law issued in 1955, and global changes in the industry enforce NOC to reform in order to keep pace with international developments.

In regard to the companies that are owned by NOC, they include Waha Oil Company (WOC), which was in the former US oasis and was then nationalised by the Libyan state at the beginning of 1970; AGOCO, which was BP, also nationalised in 1970; and Sirte Oil Company (SOC), which was ESSO, and was also nationalised by the Libyan state in 1970. These three major oil companies, which are considered to the backbone of the Libyan oil and gas sector, are still working with the old heritage administrative successor companies, whether the original American system or the English system, as well as with technical specifications and contractual terms still untouched since nationalisation of these companies. However, except for some minor modifications to develop the technical specifications after imitating Dr. Shukri Ghanem, President of the National Oil Corporation, which is not enough to keep pace with global changes, the major Libyan oil companies are weak in performance in the shade of rapid global developments. This situation, which I directly experienced, was the main motivation behind my thinking in conducting this research, which I hope to contribute to the development of the Libyan oil project performance.

2.13.1 Project performance practices in the Libyan oil and gas sector

As I mentioned in the previous section on the current practices of the Libyan oil and gas sector, Libya has failed to develop technical specifications and contractual terms to cope with the international changes and be in accordance with the latest technical developments as well as modern management applications for projects, making the performance in the oil and gas sector projects poor and less efficient. For example, and through practical experience as a project manager in AGOCO within this sector, after my visits to Libya in 2012 following the ousting of the former regime, I met a coordinator of an engineering and construction department in Arabian Gulf Oil Company, and asked him about the project performance and the related specifications and how to keep up with modern applications of project management. He answered me that the situation has not changed from the previous one, except in 2005, some of the technical specifications were updated, such as Health Safety and Environment (HSE) issues, but that this is not enough to keep pace with global developments. Project management practices in the Libyan oil sector still follow the British and American styles of project management since the British and American companies were operating the oil fields before they were nationalised in 1970 by the Libyan state. The crippling thing is that these practices have not been developed to keep pace with modern methods of project management. In addition to that, there has been partial intervention of some politicians in the decision making of top management of some oil and gas companies.

2.13.2 Project performance practices in the Oman oil and gas sector

Before writing about project management practices in one company in Oman, it is better to give a brief introduction about the founding and history of the company. Petroleum Development Oman (PDO) is the foremost exploration and production company in the Sultanate. We account for more than 70% of the country's crude oil production and nearly all of its natural gas supply. The company is owned by the Government of Oman (with a 60% interest), Royal Dutch Shell (34%), Total (4%) and

Partex (2%). The first economic oil find was made in 1962, and the first oil consignment was exported in 1967 (PDO, ND).

Through this study's interviews with project managers of PDO, I found that PDO used British and US specifications; details of the interviews will be discussed in Chapter five. According to an EIA report (2014, p. 2), Occidental Petroleum has the largest presence of any foreign firm and is Oman's largest independent oil producer. Other major players with interests in Oman include Shell, Total, Partex, BP, CNPC, KoGas, and Repsol, which is clearly mixed between Americans, British and Europeans. Project Management Practices in PDO are somewhat similar to project management practices in NOC; differences may only be confined to the political system and the vision of each country regarding the oil and gas sector. The following table, Table 2.6, shows the similarities and dissimilarities between the two companies.

Table 2-6: Similarities and Dissimilarities between Libyan and Omani Oil and Gas Sectors

Practices	LIBYA / NOC	OMAN / PDO
Position in UN Human Development Index (HDI)	55	56
Culture	Arabic / Muslim	Arabic / Muslim
Political intervention	Partial	None
OPEC	Member	Not member
Current Production	350,000 – 900,000 bbl/d	970,000 bbl/d (EIA)
Oil Fields	Onshore + 2 Offshore	Onshore
Technical Specifications	U.S., European and British	U.S., European and British
Work force	Local + Overseas	Local + Overseas

bbl/d = barrels per day EIA = Energy Information Administration

It is clear from the table that there are similarities between the two countries in terms of culture and there is a great affinity between them in the United Nations Indexes (HDI) of development, as shown in Figure 2.7 below. The only difference is the intervention of some politicians of the state in decision-making processes of the corporation, which can be found in Libya and but not in the Sultanate of Oman. However, as for the oil and gas sector in both countries, there is a very great similarity between the kind and nature of the work of the oil companies, and that is primarily what concerns the researcher in this research.

Human development index (HDI)

Download the data

Human development index (HDI)

A composite index measuring average achievement in three basic dimensions of human development—a long and healthy life, knowledge and a decent standard of living. See Technical note 1 for details on how the HDI is calculated.

Source: HDRO calculations based on data from UNDESA (2013a), Barro and Lee (2013), UNESCO Institute for Statistics (2013b), United Nations Statistics Division (2014), World Bank (2014) and IMF (2014).

Data in the tables are those available to the Human Development Report Office as of 15 November, 2013, unless otherwise specified.

HDI Rank	Country	1980	1985	1990	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013
55	Libya	0.641	0.654	0.684	0.745	0.772	0.778	0.784	0.789	0.794	0.799	0.753	0.789	0.784
56	Oman	..	..	..	..	0.733	0.693	0.701	0.714	0.728	0.780	0.781	0.781	0.783

Figure: 2-7 UN – Human Development Index

Source: UNDP (2013)

With regard to project management practices in the United Kingdom, the vast majority of companies follow the latest project management practices such as TQM, Six Sigma and quality standards such as ISO 9001. From eight semi-structured interviews with project managers in two different companies in terms of specialisation (the first specialised in the field of construction and the second in the field of engineering), the practices of project management were made clearly according to the latest specifications and modern styles. Details of the interviews are presented in Chapter five of this study. The reason behind conducting interviews with British companies was, most of the oil and gas projects were implemented in either in Libya or Oman by overseas companies, including British companies, which follow the advanced techniques in project management practices.

2.14 Engineering companies in oil and gas

The nature of the oil and gas industry dictates that the highest quality of engineering activities must be carried out in the engineering part of the projects. As the industry is complicated and has a lot of its branches linked together, the engineering work is required to be specialised, and should go through several stages, starting from conceptual, pre-feasibility and feasibility study, Front End Engineering Design (FEED), detailed engineering, approval stage and final procurement and construction; the chart below shows these stages and how they are linked together.

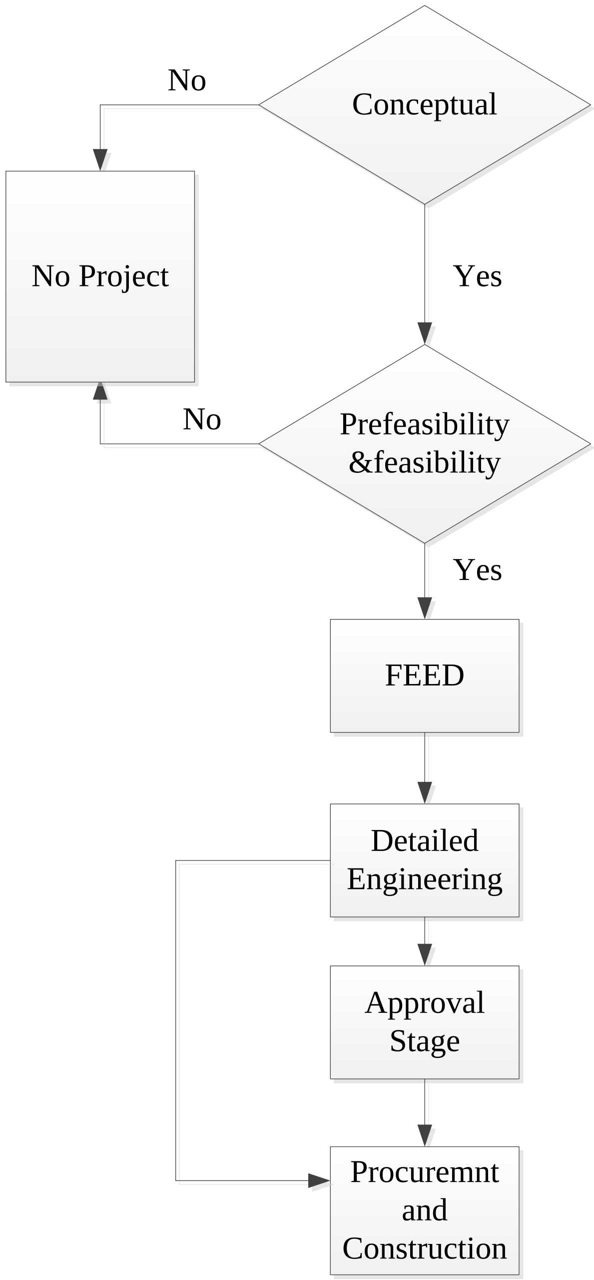

Fig 2-8 Engineering Stages

Figure 32.8 above shows stages at the start of each project and which are considered to be the pillar of each project; this needs very good project management in order to guarantee good completion of the project in the construction stage. To secure good engineering work, project management should be controlled properly aiming for high performance.

2.15 Construction companies in oil and gas

Construction activities start from the end of engineering work, as shown in Fig 2.9. The company is required to produce a project construction plan which includes all project activities, in order to create the following up of the construction work between the owner and the contractor. The construction work and activities should be reported daily by the contractor and followed up by the owner. These reports will form the monthly report, which should then be compared to the original project plan. This comparison will direct the project manager in the actual life of the project and its current status in terms of budget, time and quality that should be compared with the KPIs issued from the engineering work. The good project management by the construction contractor will lead the execution of the project within proposed time, budget, quality and Health and Safety Environment requirement (HSE) as well as other KPIs. The environment of the oil and gas sector, as previously mentioned above, has a lot of activities that need to be carried out by project management in order to make them happen. The construction activities have a number of stages that require good management in order to finish the project with high performance; these stages are illustrated in Figure 2.9 below.

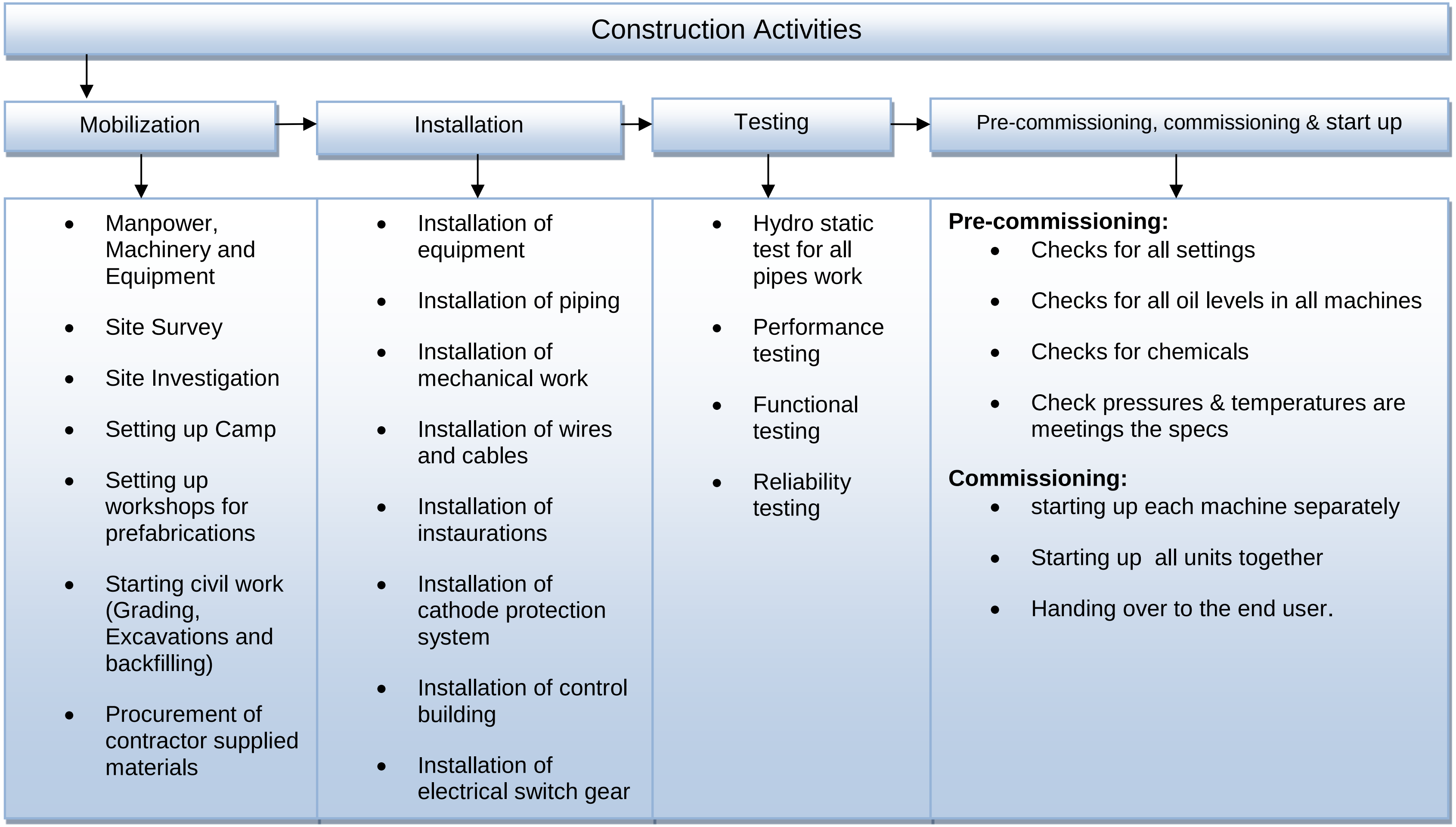

Figure 2-9: Chart of Construction Activities

2.16 Area of research

This study will focus on upstream and downstream categories. To cover these two classes, three companies have been chosen from both. The owner company is classified as upstream and the engineering and construction companies are classified as downstream.

The natures of the oil and gas companies are considered to be categorised into two broad groups: Cat-A is the owner companies, which own the oil and gas fields and produce a plan of investment within their concessions and fields to commence production. Cat-B, which is the service companies, can be classified as engineering companies which are specialised in designing the process systems and other systems; also some of them are specialised in project management. The second type of service companies is the construction contractors, who are specialised in the fabrication and construction of the systems and petrochemical plants. The third is Engineering, Procurement and Construction companies, which is recognised as EPC companies. These companies regularly take on projects as lump sum projects, and a lot of Quality Management practices seem to be applied in their daily activities.

The owner companies, in order to produce oil and gas, usually award projects to engineering companies and then award the project to construction companies. That process is executed according to the owner's quality system, or any recognised quality system such as TQM, Six Sigma, ISO, etc., and it aims to get 100% performance of the project. The remaining companies are construction companies, having their own quality system or other recognised quality systems. Figure 2.10 shows the company categories and their relationships: company A, is an owner, company B an engineering contractor and company C a construction contractor.

The philosophy of the three companies in obtaining their targets is utilising project management, and this is considered to be a rich environment for doing research and exploring the daily practices of PM. Figure 2.10 below shows how these three companies are linked together.

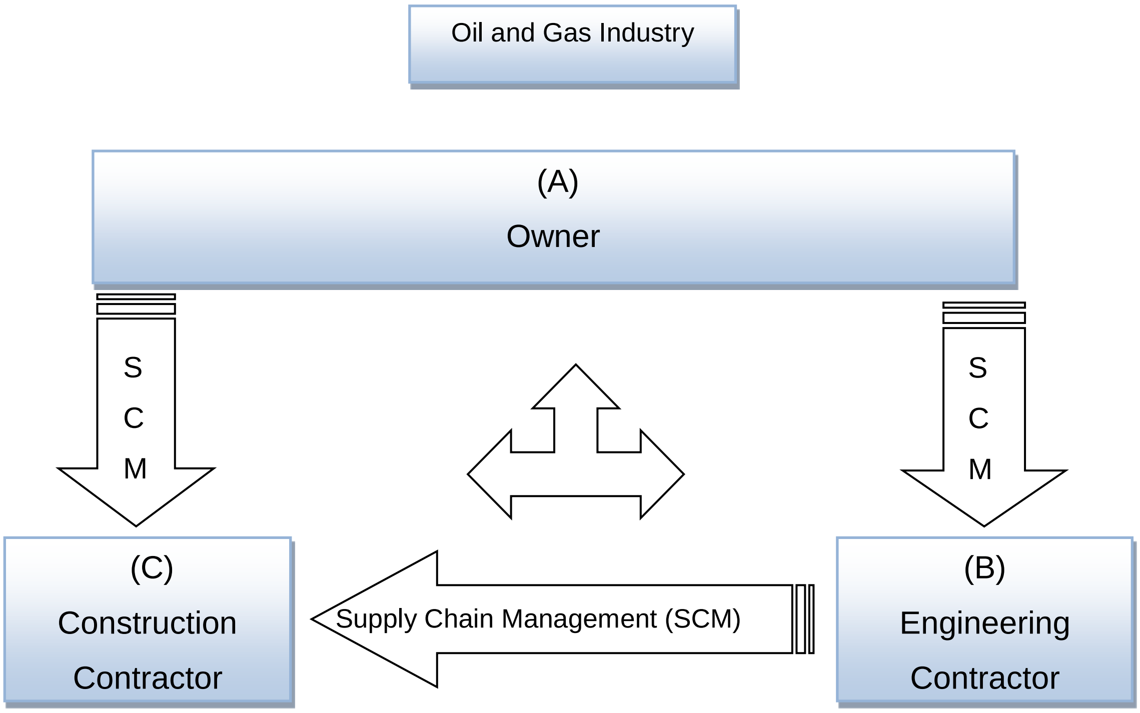

Figure 2-10: Nature of the Companies and their relationship

2.17 Summary

In this chapter the researcher explained about the oil and gas industry from a historical point of view and how it has changed over the past few years. After that, brief information was given about the major international oil companies as well as the ten national oil companies and the volume of oil that is in reserves. Also, the chapter provided a brief summary about the energy sector in Libya, oil and gas in Libya, the Libyan economy and the impact of the energy sector on it, social context and human development in Libya, the current practices in the Libyan energy sector and comparison between current project performance practices in Libyan oil and gas to practices in Oman and the UK. Furthermore, I explained about the engineering and construction companies in the oil and gas industry and the activities that are carried out by project management.

CHAPTER THREE

3 Literature review

3.1 Introduction

Over the last decade Project Management Performance (PMP) has become a central preoccupation of organisations over all industrial sectors. Today the perception of quality is not limited to products, but also incorporates the productive, organisational and design functions that may be allied with a meticulous product or service, as well as the people that are involved in these processes. Total Quality Management (TQM) is a management philosophy that involves all aspects of quality that are of interest to both the consumer and the organisation. Globally, the TQM approach has shown itself to be a feasible way of cutting costs, increasing productivity and improving quality. In this chapter, **section 3.2** gives a brief history of the different views, concepts and importance of TQM. **Section 3.3** gives an explanation of the TQM approaches from the different perspectives of quality leaders and quality awards, and their relation to ISO 9000. **Section 3.4** presents the previous studies and research that focused on the impact of TQM on performance, and also shows which particular practices of TQM have a direct effect on performance. These practices can be used as a guide to measuring PMP for the current. **Section 3.5** provides the definitions of project and how to measure the project success. PMP has been researched thoroughly within the earlier studies. **Section 3.5** explores how TQM practice impacts PM performance from the different views of previous studies, and its relation to PM performance. Section **3.7** provides the development of a conceptual framework**.** Section **3.8** provides a brief summary of this chapter.

3.2 Importance of TQM.

Why is quality important? According to Dale *et al.* (2007, p. 12), *"to answer this question, just consider the unsatisfactory examples of product and/or quality services that you, the reader have experienced, the bad feelings it gave, the resulting actions taken and the people you told about the experience and the outcome*".

Sterman *et al*. (1997) concluded that, with the time, TQM decreases costs, increases quality, and rises productivity and profitability. This is persistent with Deming explanation (1982) and quality achievement outcomes. TQM is a combined management philosophy and set of practices that stresses, amongst other stuffs, nonstop development, meeting customer's requirements, decreasing rework, long-term rethinking, improved employee involvement and teamwork, process reformat, reasonable benchmarking, team-based and group problem solving, continuous measurements of outcomes, and strong relationships with suppliers (Powell, 1995). TQM is a philosophy of management that helped managing companies and organisations to develop their whole efficiency and performance on the road to attaining world-class position for the past twenty years (Zhang *et al.*, 2000; Yusof and Aspinwall, 2000, 2001). *"Total Quality Management (TQM) is a philosophy that involves everyone in an organisation in a continual effort to improve quality and achieve customer satisfaction"* (William, 2005, p. 398).

Berry (1991) defined TQM as a total corporate focus on meeting and exceeding customers' prospects and significantly decreasing costs causing from poor quality by implementing a new management system and company culture. TQM has commonly been recognised as a *"management philosophy and a way of thinking"* to convert an organisation's position to a first-class level (Yusof and Aspinwall, 2000, p. 281). The implementation of TQM usually consists of the philosophy from Deming's 14 points, Juran's 10 steps and Crosby's 14 steps, which are categorised as soft TQM, and tools and techniques which are categorised as hard TQM (Fenghueih and Chen, 2002). TQM can be understood to be a strategic action that focuses on managing the total organisation to provide clients with products or services that satisfy them, through the mobilisation of individuals, management leadership and the cohesion of all the resources of the firm (Escrig-Tena, 2004). TQM is well-defined as both a philosophy and guiding principles that represent the foundations of a continuously improving organisation (Moghaddam and Moballeghi, 2008).

TQM has been known and used throughout past decades by companes, associations and organisations around the world to grow a quality attention and increase organisational performance (Hanson, and Klefsjo, 2003). TQM incorporates fundamental management methods, existing developments, and technical tools under a disciplined attitude (Talukder and Ghosh, 2004). Management duty must constantly decrease waste and develop the quality of every action in the organisation and company and this contains all tasks, for instance engineering, procurement, sales, transportation, distribution methods, accounting, customers services , etc. (Kruger, 2001). Hides *et al.* (2000) concluded that adopting a TQM philosophy has been shown to be beneficial to any business although problems (e.g. resource limits) restrict the implementation of a full TQM programme.

Philosophy of TQM stresses on the role of the customers either internal or external and suppliers, and the participation of employees in chase of unceasing improvement (Chang, 2006; Claver *et al*., 2003; Oakland *et al.*, 2002; Kanji, 2002; Karia and Asaari, 2006). In spite of some disparagement, TQM has grown extensive acceptance in both the business and academic communities (Longenecker *et al.*, 1994; Claver *et al.*, 2003; Chang, 2006). Prajogo and Sohal (2003) claimed that the overall implication is that TQM certainly provides a sound systemic foundation for managing quality on which organisations can further build their competence and capabilities as well as other strategies to achieve multidimensional competitive advantage, including innovation. Terziovski and Samson (1999) stated in their study that, based on the quality management literature, the following definition of TQM has been articulated for use in their study: TQM is a philosophy that embraces concepts, methods, tools and techniques to form a language which is understood and applied as a business strategy at the “top-floor” and as a functional strategy at the “shop-floor”. This approach assists organisations to integrate business activities in leadership, people, and customer focus, planning, quality assurance of processes, and information and analysis. These activities when effectively linked together would lead to a sustainable world-class performance in satisfaction of customers, operating performance, employee relations and business performance.

Prajogo and Sohal (2004) reported that TQM has been widely accepted as a management model if the approach is implemented successfully. TQM is also understood as a competitive advantage source (Douglas and Judge, 2001; Hackman and Wageman, 1995 and Powell, 1995), modernisation and innovations (Singh and Smith, 2004), new organisational culture and change (Irani *et al.*, 2004). Practicing TQM may not only touch financial performance straight (Kaynak, 2003), but also in some indirect means such as growing innovation (Singh and Smith, 2004), change of organisational culture (Irani *et al*., 2004), market effectiveness and competitiveness (Chong and Rundus, 2004), overall organisational performance (Powell, 1995), market share growth (Kaynak, 2003), employee confidence (Rahman and Bullock, 2005), and efficiency and productivity (Kaynak, 2003; Rahman, 2001;Rahman and Bullock, 2005). Douglas and Judge (2001) used intuitive procedures of financial performance (alongside expert-rated performance measures). Study results showed that the TQM implementation was positively and pointedly related to both observed financial performance of a hospital and its industry expert-rated performance. It looks that the level to which the whole TQM philosophy is applied is strongly correlated with financial performance perception (Kaynak, 2003). Demirbag *et al.* (2006) concluded that, when a TQM plan is applied correctly, it yields to an assortment of benefits such as better customer satisfaction, understanding customers' needs, better internal communication, improved problem solving and less errors.

Leonard and McAdam (2004) concluded that adopting TQM is seen by some companies as a necessity, to ensure that they are perceived as being on a par with corporate peers in their adoption of leading-edge business improvement issues. Total quality management has had a significant impact on the approach to management in Western economies since its promotion as a concept in the USA in the 1980s (Vinzant and Vinzant, 1999).

The theoretical foundations and methods of total quality, however, support its use for both manufacturing and services. Although the literature addressing total quality management has been developed separately for products and service sectors, the founders of quality management reveal that quality concepts are universally applicable. In addition, quality awards have been established to generate awareness and interest in quality improvement in both service and manufacturing sectors. For example, the Malcolm Baldrige National Quality Awards (MBNQA) programme, established by the US Congress in 1987, includes seven categories that could be applied to any organisation, whether in manufacturing or services (Bell and Keys, 1998). These seven categories on which applicants are evaluated are: leadership, human resource management, strategic planning, information and analysis, quality assurance of products and services, quality results, and customer satisfaction (Stevenson, 2002).

Most organisations have, however, become enamoured with the framework, vision, and techniques subsumed in the rubric of TQM because of the results it has reliably produced in a variety of business environments. However, contemporary literature in regard to quality management tends to be over whelming manufacturing-oriented; there are far fewer empirical studies regarding the service sector (Sureshchandar *et al*., 2001). Escrig-Tena (2004) concluded that TQM is a competitive factor capable of exerting an influence on the firm's results. With regard to the contributions of the competence-based perspective (CBP), the effect of TQM on results is justified because TQM makes it possible to obtain a competitive position thanks to its value and uniqueness. It also allows the obtained advantage to be maintained, thanks to the capacity of TQM to generate a set of performance standards and routines within the firm that encourage continuous improvement and the creation of knowledge.

Gadenne and Sharma (2009) showed in the study literature that researchers have also tried to distinguish between the soft and hard practices of TQM. Soft practices of TQM and have to do with behavioural characteristics and commonly deal with people (HR) features such as leadership, teamwork, training and education, empowerment, human resource operation, customer focus and satisfaction, faithfulness and loyalty, contacts with suppliers and professional connections, integration of the voice of the customer and supplier, communication, performance awards, quality culture – “positive attitude towards quality, cultural barriers” – and social responsibility (Lewis *et al*., 2006a, b). Hard practices of TQM However are exercised with tools and systems that are essential to guide the execution of soft practices (Black and Porter, 1996). Hard TQM practices commonly cope with benchmarking, quality systems, quality assurance, flexibility, just-in-time, zero defect, continuous improvement and innovation, information and performance measurement, process management, strategic planning, process control, and product/service design (Lewis *et al*. 2006a). As different to soft aspects of TQM, which are intangible, hard aspects of TQM are systems-oriented and are easier to quantify.

3.3 Quality movement

Historically it can be said that quality movement began in the early twentieth century, where manufacturers included quality processes in quality applications (ASQ). In 1924 when Walter Shewhart produced a theory of statically quality to control the quality of products, that move was seen as a revolution in the field of quality management to find ways to control the quality of products. That concept was developed in Japan in 1940 by Americans Joseph M. Juran and W. Edwards Deming who focused more in developing the organization process rather than concentrating on inspection.

In the seventies the competition in the Industrial revolution between the major countries in particular the United States and Japan increased, especially in the automotive industry and electronics. The United States came up with concept of the entire organization, not just the direction of statistics, and ever since then that trend became known as total quality management (ASQ). In the nineties, TQM has been described as a heresy by the business leaders, and the TQM term began to fade slowly in the United States, but the practices of it still continues within the organizations.

At the end of the twentieth century and the beginning of the twenty first century, Total quality movement has matured beyond the total quality. New quality systems evolved which were built on the foundations of Deming, Juran and Japanese quality practitioners. Those systems moved beyond manufacturing to the service sector, health, education and other sectors of the government as well (ASQ).
According to ASQ article titled as Beyond Total Quality, these are some examples of this maturation:

- *In 2000 the ISO 9000 series of quality management standards was revised to increase emphasis on customer satisfaction.*
- *Beginning in 1995, the Malcolm Baldrige National Quality Award added a business results criterion to its measures of applicant success.*
- *Six Sigma, a methodology developed by Motorola to improve its business processes by minimizing defects, evolved into an organizational approach that achieved breakthroughs – and significant bottom-line results. When Motorola received a Baldrige Award in 1988, it shared its quality practices with others.*
- *Quality function deployment was developed by Yoji Akao as a process for focusing on customer wants or needs in the design or redesign of a product or service.*
- *Sector-specific versions of the ISO 9000 series of quality management standards were developed for such industries as automotive (QS-9000 and ISO/TS 16949), aerospace (AS9000) and telecommunications (TL 9000) and for environmental management (ISO 14000).*
- *Quality has moved beyond the manufacturing sector into such areas as service, healthcare, education and government.*

- *The Malcolm Baldrige National Quality Award has added education and healthcare to its original categories: manufacturing, small business and service. Many advocates are pressing for the adoption of a "nonprofit organization" category as well.*

3.3.1 Quality movement leaders

In the context of writing about the quality movement and its inception, it is inevitable to write about the pioneers of this movement and their contributions to it. The historical narrative about these characters will cover most important contributions they have made to the quality movement, which is considered the basis of the renaissance and development of the quality movement. The following table 3.1 includes the most prominent of these figures, period and the most important contributions.

Table 3-1: Quality Movement Leaders

Leader's name	Period	Contributions
Dr. Walter A. Shewhart	1891 - 1967	According to Jim (2009), Shewhart's contributions are: 1. Founder of process quality control 2. Improved quality can be gained by concentrating on production process rather doing extreme inspection, set that principle in his famous book, 1931(Economic Control of Quality of Manufactured Product). 3. In 1933, Shewhart's charts adopted by the American Society for Testing Materials (ASTM).
Dr. W. Edwards Deming	1900 – 1993	William Edwards Deming was an American electrical engineer, statistician, professor, author, lecturer, and management consultant (Wikipedia, W. Edwards Deming). Deeming's contributions were very significant to the renaissance of Japanese industry after World War II, where his theories and ideas was applying in the time period between 1950 to 1960 from the last century, which led to the rise of Japan economically and became known as the Japanese economic miracle, and Japan ranked the second largest economic power in the world and that thanks to Deming's ideas that inspired them (Lectures and Meetings). Most important contributions of Deming were the developments of the principle of quality management categorized up by (Youssef 2006, p62) to seven principles are: *(1) The system of intense knowledge,* *(2) The Plan-Do-Check-Act Cycle,* *(3) Prevention by process improvement,* *(4) The chain reaction of quality improvement,* *(5) Common and Special Cause variations,* *(6) The fourteen points, and* *(7) The deadly and dreadful management diseases.*

Dr. Joseph Juran	1904 – 2008	Juran's most important contributions in the field of quality management is the foundation of the trilogy management approach, which includes quality planning, quality control and quality development. According to (youssef2006, p. --) are as follows: ***Quality Planning**: Identify who the customers are, determine the needs of those customers, transilate those needs into our language and develoe a product features so as to meet our needs and customer needs.* ***Quality Control:** Prove that the process can produce the product under operating conditions with minimal inspection and transfer the process to operation.* ***Quality Development:** Develop a process which is able to produce the product and optimise the process.*
Dr. Philip Crosby	1926 - 2001	It can be said that the most important contributions of Crosby in the quality movement is"four absolutes of quality". According to (Creech, 1994, p. 478), Crosby's form the foundation of his process are: • *Quality is conformance to the requirements: Management must communicate in clear and strong terms to employees all the actions that are required to run an organisation, produce a product or service and deal with customers and help them abide through leadership, training and building a culture of cooperation in the organisation.* • *Prevention is the system of quality: Prevention is the only way that produces quality since eliminating errors after they occur is costly. Crosby's method for prevention involves training, leadership, discipline and example. Consequently, management must obligate itself to a culture that is prevention-oriented.* • *Zero defects are the performance standard: This is according to Crosby's fundamental view about quality and its generation. Management has a responsibility to supply employees with the tools, skills and other resources to enable the production of zero-defect products and services.* • *Price of non-conformance is the measure of quality: Crosby considers that if management obeys these "four absolutes of quality", they will succeed in reducing the costs as quality improves.*
Dr. Armand V. Feigenbaum	1922 - 2014	According to(Wikipedia, Armand, V. Feigenbaum), Feigenbaum contributions to the quality body of knowledge includes: • *"Total quality control is an effective system for integrating the quality development, quality maintenance, and quality improvement efforts of the various groups in an organization so as to enable production and service at the most economical levels which allow full customer satisfaction."* • *The concept of a "hidden" plant—the idea that so much extra work is performed in correcting mistakes that there is effectively a hidden plant within any factory.* • *Accountability for quality: Because quality is everybody's job, it may become nobody's job—the idea that quality must be actively managed and have visibility at the highest levels of management.*

		• *The concept of quality costs* Feigenbaum stresses a system method to quality and his philosophy is concise in his three phases to quality which are **Quality Leadership**, **Modern Quality Technology** and **Organisational Commitment** (Youssef, 2006)**.**
Kaoru Ishikawa	1915 - 1989	Ishikawa's contributions to the quality body of knowledge are: • Key role in the development of the Japanese quality strategy (ASQ, Ishikawa). • Founder of "Quality Circle" in 1960's in Japan (Youssef, 2006). • Definer of seven tools of quality management which are, **the Pareto chart, the cause and effect diagram, the stratification, the check sheet, the histogram, the scatter diagram, and the Shewhart control chart** (Ho and Fung, 2008). Ishikawa was one of quality management philosophers ,who positively impact on the quality movement. According to (Youssef 2006) some elements of his philosophy are: ➢ *Quality begins with education and ends with education.* ➢ *The first step in quality is to know the requirements of customers* ➢ *Quality control is the responsibility of all workers and all divisions.* ➢ *Put quality first and set your sights on long-term profits.* ➢ *Top management must not show anger when facts are presented by subordinates.*
Genichi Taguchi	1924 - 2012	Like other pioneers of quality movement, Mr. Taguchi had distinctive contributions to the quality movement, according to American Society of Quality "*Genichi Taguchi is well-known for developing a methodology to improve quality and reduce costs, known in the United States as the "Taguchi Methods." He also developed the quality loss function".* According to (Wikipedia, Genchi Taguchi), some of his Key elements of his quality philosophy include: *1. Taguchi loss function, used to measure financial loss to society resulting from poor quality;* *2. The philosophy of off-line quality control, designing products and processes so that they are insensitive ("robust") to parameters outside the design engineer's control; and* *3. Innovations in the statistical design of experiments, notably the use of an outer array for factors that are uncontrollable in real life, but are systematically varied in the experiment.*

In the study of the quality movement leaders and their contributions, it is necessary to know that we have to keep in our mind that these philosophies and their approaches have drawbacks and limitations Kess *et al* (2001). However it should be known that they were a base for Launching philosophies of quality and consider them as starting point and source of aspirations for us to develop new quality philosophies.

3.3.2 Quality prizes

Quality awards was and still vital and playing essential role in stimulating industrial companies and institutions to implement quality management, in order to achieve competitiveness and quality in theirs producers and services. According to Ghobadian and Woo (1996) and cited by (Youssef, 2006, p67) in which he described the primary purpose of quality awards is the ability to:

- *Rise alertness of TQM because of its significant influence to higher competitiveness;*
- *Encourage methodical self-assessment alongside established principles and market alertness instantaneously;*
- *Stimulate sharing and spreading of information on successfully expanded quality strategies and on benefits derivative from applying these strategies;*
- *Encourage understanding of the requirements for the accomplishment of quality excellence and successful placement of TQM; and*
- *Reassure firms to announce a continuous improvement process.*

There are many quality prizes in most countries of the world, but the most prominent prizes are five in accordance with encyclopedia of business which are:

1. Japan's Deming Prize
2. The United States' Malcolm Baldrige National Award
3. The European Quality Award
4. The Canada Awards for Excellence
5. The AKAO.

The Japan’s Deming Prize: In 1950, the Japanese Union of Scientists and Engineers (JUSE) had generated the management award and named in honour of Dr. W. Edwards Deming, which is the first major prize in the quality management field . The awarding of this prize began in 1951 and still awarded to those who have distinguished contributions in the field of quality and reliability of products. According to Encyclopedia of Business the JUSE's Deming Prize Committee manages two types of awards honoring Deming: the Deming Prize and the Deming Application Prize. Deming Prize for individuals or group of people is given to those who have exercised and contributed to the awareness of TQC. Regarding Deming Application Prize, only given for companies that have achieved successes attributed to the application of TQC.

The (JUSE) has put some criteria’s for this award, either for individuals and groups or to the organizations and companies, according to (JUSE), these criteria are:

1. Senior management and leadership, vision, and strategies.
2. TQM frameworks.
3. Quality assurance systems.
4. Management systems of the elements of the company.
5. Human Resource Development.
6. Effective Use of Information
7. Total quality management concepts and values.
8. Scientific methods.
9. Regulatory powers (the core technology, speed and vitality)
10. Contribute to the realization of the objectives of the company

The Malcolm Baldrige National Quality (MBNQ) Award: according to Encyclopedia of Business the MBNQ had been created by the U.S. Congress in 1987 largely as a equivalent to Japan's Deming Prize and administrated by the U.S. Department’s National Institute of Standards and Technology (NIST). The main goal of the MBNQ Award is to increase U.S. alertness of TQM and to officially identify successful quality management systems. The MBNQ Award judge’s results companies have shown through management practices in seven precise areas, which are leadership, information and analysis, strategic planning, human resource focus, process management, business results and company performance, and finally customer focus and satisfaction. Table 3.2 shows the ASQ description of these seven criteria.

Table 0-2: Descriptions of the seven criteria of the MBNQ Award

Leadership	Examines how upper management leads the organisation and how the organisation leads the public and practices good citizenship.
Strategic planning	Examines how the organisation establishes strategic directions and how it defines key action plans.
Customer and market focus	Examines how the organisation builds and maintains strong relationships with customers.
Measurement, and knowledge management	Examines the organisation, active use, analysis and improvement of data and information to support key organisation processes, and the organisation's performance management system.
Human resource focus	Examines how the organisation's work systems and employee learning and motivation support employees to improve and utilise their maximum potential in arrangement with the organisation's overall objectives and action plan.
Process management	Examines how the organization designs, manages and develop main and key processes.
Business results	Examines the organisation's performance and improvement in its key business areas: such as, customer satisfaction, financial, operations, supplier and partner performance and marketplace performance.

Source: ASQ (N.D.).

The European Quality Award (EQA): according to Encyclopedia of Business, by 1990 the European Union felt that they fallen behind Japan and U.S. in the acknowledgment of quality management. The European Foundation for Quality Management (EFQM) in support with European Organization for Quality and European Commission decided to create its own award which will be equivalent to the Japan's Deming Prize or MBNQ Award. In 1992 the the first winner of EQA was presented to honour the most successful exponent of TQM (Youssef, 2006). EQA vary in the nature of their awards board which is invented for business leaders as well as academics.

The EQA, juries candidates on nine criteria which are leadership, people management, policy and strategy, resource management, process management, customer satisfaction, people satisfaction (defined as the perception of people toward the organization), influence on society and business results. These nine criteria are the pillars of European Foundation for Quality Management Model EFQM Excellence Model, see Figure 3.1. Watson (2002, p. 7) and cited by (Youssef, 2006) stated:

> *The five criteria on the left-hand side of the figure are called "Enablers" and are concerned with how the organisation performs various activities. According to Hillman (1994, p. 29), the enablers are those processes and systems that "need to be in place and managed to deliver total quality".*

The other four criteria on the right of Figure 3-1 focused on the "Results" the organisation or company is accomplishing with regard to different stakeholders. These nine criteria are prejudiced to show their singular significance but the totality of the scores for these criteria creating up the enablers and results each represents 50% of the total (Youssef, 2006)

Hendricks and Singhal (1996) have empirically examined the correlation between the adoption of holistic Models, such as Organizational Integrated Quality (OIQ) and EFQM Excellence Model, and improved organizational results, the result were positive linkage. Herman Van Rompuy (2012), President of the European Council. *"The EFQM Excellence Model provides a framework that encourages cooperation, collaboration and innovation that we will need to ensure this goal is achieved"*.

The EFQM Excellence Model offers a framework allowing organisations and companies to define their present level of excellence and where they want to focus development efforts. Furthermore, the Model services to guarantee that business decisions unite the needs of all stakeholders and are aligned with the organisation's aims. The organisations and companies using the EFQM Excellence Model as a common reference tool in their moving towards the excellence which they looking for. Consequently, the users of the Model consider it as a reference with a set of performance improvement tools in order to achieve excellence and sustain results.

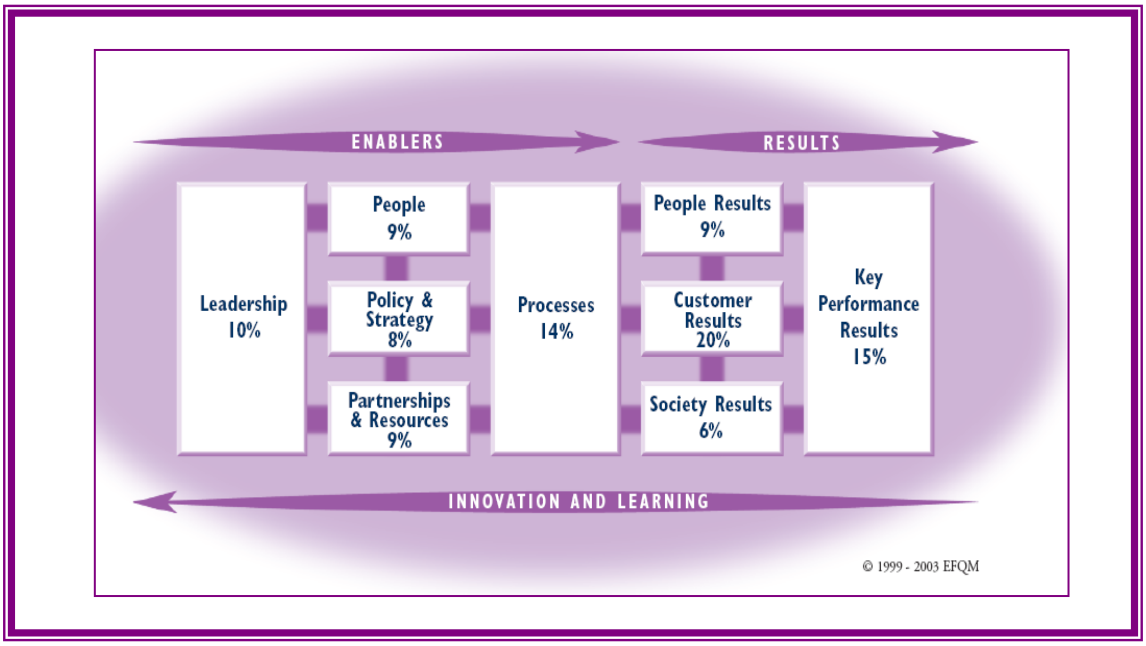

Figure 3-1: EFQM Excellence Model Criteria

Source: ISO Organisation (1999)

Table **3.3** below provides a description of the EFQM model Nine Criteria.

Table 3-3: Description of the Nine Criteria for EFQM model

Enablers	**Description**
Leadership	Develop and facilitate the achievement of the mission and vision.
Resources	Excellent organisations plan to manage external and internal resources in order to support policy and strategy.
Policy and strategy	policies, plans, objectives and processes are developed and deployed
People Management	manage, develop and release the full potential of their people at an individual, team-based and organisational level
Processes	Managing the organisation through a set of interdependent and interrelated systems.
Results	**Description**
People satisfaction	Measure and achieve outstanding results with respect to their people.
Customer satisfaction	Excellence is creating sustainable customer value.
Impact on society	Comprehensively measure and achieve outstanding results with respect to society.
Business	Measure and achieve outstanding results

Source: (Youssef, 2006)

The Canada Awards for Excellence (CAE): In 1983 the federal government of Canada had created award for excellence and called a Canada Award for Excellence (CAE) and after a decade of creation of the CAE actually in 1993, the administration of the award had been given to National Quality Institute (Encyclopedia of Business). As any other quality award has criteria, the CAE have been judging candidates on seven criteria, which are; leadership, planning, customer focus, people focus, process management, supplier focus and organizational performance. CAE has been open to public as well as to the private sector organizations that contributed to country's economic success (Encyclopedia of Business).

Akao prize: According to Encyclopedia of Business the Quality Function Deployment QFD Institute created the Akao prize. The prize specialized only in individuals who contributed to the advancement of QFD and it follows the shape of Deming award. The award named for Dr. Yoji Akao who won Deming award and one of the important developers of QFD field.

3.3.3 Quality planning

Quality planning is defined as a systematic process that translates quality policy into measurable objective and requirements, and lays down a sequence of steps for realising them within a specified time frame. A quality plan defines how an organisation will achieve its quality objectives. It describes the quality objectives and identifies the quality assurance and control activities to be performed in day-to-day company operations. ISO 9001 requires top management to:
"... ensure that the planning of the quality management system is carried out ..." (refer to clause: *5.4.2 Quality management system planning*).

Quality planning within the company level is the responsibility of a quality management group and process group, to set the QA objectives and process description to develop a quality management system, to produce at the end the process improvement plan as well as a quality management system. While, at the project level, the project manager and quality representative have the main responsibility for the quality plan of the project, to set the goals and resources with the monitoring of the quality management system, to follow and develop the project, to end up with a quality project plan.

Dale *et al*. (2007) stated that planning and organisation feature in a number of facets of the improvement process including:

- Creating a strong lasting strategy for TQM which is combined with other strategies such as information technology, production/operations and human resources and also with the business plans of the organisation.

- Distribution of the policies through all levels of the organisational hierarchy with objectives, targets, projects and resources agreed with those responsible for ensuring that the policies are turned from words into actions.
- Building product and service quality into design and processes.
- Developing prevention-based activities (e.g. mistake-proofing devices).
- Putting quality assurance procedures into place which facilitate closed-loop corrective action.
- Planning the approach to be taken for the effective use of quality systems, procedures and tools and techniques, in the context of the overall strategy.
- Developing the organisation and infrastructure to support the improvement activities. This includes allocating the necessary resources to support them. While it is recommended that some form of steering activity should be set up to provide direction and support and make people responsible for co-ordinating and facilitating improvement, the infrastructure should not be seen as separate from the management structure.
- Pursuing standardisation, systematisation and simplification of work instructions, procedures and systems.

A project quality plan describes the tailoring of an organisation's quality management system for a particular project. Quality planning allows quality to be designed into the deliverables of the project before the first task has begun. It is therefore done during the development phase of the project life cycle. It may involve identifying standards or best practices.

3.3.4 Quality Control (QC)

According to ISO 9000:2005, Clause 3.2.10, Quality control QC, is a procedure by which individuals review the quality of all aspects involved in production. QC defined by ISO 9000 as *"A part of quality management focused on fulfilling quality requirements".*

This method seats an stress on three facets:

1. Components such as controls, job management, well-defined and well-controlled processes, documentation of archives measures, and performance and integrity
2. Competency, such as experience, skills, knowledge, and qualifications
3. Soft factors, for instance confidence, organisational culture, personnel, honesty and integrity, motivation, team life and spirit, and quality relationships.

There was a trend for individual advisers and organisations to title their own exclusive methods to QC; Table 3.4 below shows the notable ways to QC, a few of which finished up in general use:

Table 3-4: Notable approaches to quality control

Term	Estimated year of formerly use	Explanation
Statistical quality control (SQC)	1930s	The applications of statistical methods (control charts and approval sampling) to QC (Juran 1995, p. 556).
Total quality control (TQC)	1956	Feigenbaum (1956) and (Ishikawa, 1985, pp. 90-91) stress participation of divisions in addition to production (i.e., finance, human resources, accounting, purchasing, design, marketing, sales).
Statistical Process Control (SPC)	1960s	SPC is the use of control charts to screen an single industrial process and comment performance to the operatives accountable for that process. Stimulated by control systems.
Company-wide quality control (CWQC)	1968	Japanese-style total quality control.
Total Quality Management (TQM)	1985	It is a Quality movement creating in the U .S. Department of Defence that practices the methods of statistical quality control(STC) to enterprise nonstop organisational development (Evans and Lindsay 1999, p. 118).
Six Sigma (6σ)	1986	Six Sigma is a set of techniques and tools for process improvement. It was developed by Motorola in 1986. STC functioned to business strategy. Created by Motorola. Tennant (2001, p. 6).

Quality control is used to develop the quality of products or procedures by focusing on such outputs as rework decisions, acceptance decisions, and modification of processes. It is also done during the execution phase of the project life cycle. Rework means that a product does not meet standards, cannot be delivered to the end user as a deliverable, and must have extra work done to it to bring it up to standards. Acceptance means that the product does meet standards and can be delivered to the end user as a deliverable. Process adjustments are made to corrective actions taken to the methodology in efforts to increase acceptance and decrease rework (GTPM, Lesson 7).

Phillips (2008) stated that, in project management, QC necessitates the manager of the project and the project team to examine the achieved work to guarantee its configuration with the scope of the project. In fact, projects classically have a committed QC group which emphasises on this part. This process, i.e. QC, has expanded from the examination action in terms of the difficulty of approaches and systems engaged in controlling quality. QC measures headed to better process control and rarer existences of non-conformance. Accordingly, the theory of TQM has its origins in statistics. The extended use of science and technology made a key influence to quality development. With more organisational improvement derived the QC stage (MBA Student Text).

3.3.5 Quality Assurance (QA)

Quality Assurance (QA) is a way of avoiding mistakes or defects in manufactured products or services and avoiding problems when delivering solutions or services to customers. Discovering and resolving a problem after a non-conformance has been generated is not an operative way to reducing the original cause of a problematic situation. A long-lasting and non-stop development in quality can only be accomplished by guiding organisational achievements in the direction of planning and avoiding difficulties from occurring at source again. This thought points to the third step of quality management development, which is QA. ISO 9000 defines quality assurance as:

"*A part of quality management focused on providing confidence that quality requirements will be fulfilled*".

In general, QA is recognised as a prevention-based scheme which develops product quality by insertion stress on product and design of the process. The method emphasised exposure of error at the source of mistake. Stress was on the whole production series from plan and design to marketplace, and the input of all functioning divisions. Quality planning and enhancement confidently originate when top management add avoidance as opposite to discovery in organisational policy and goals, and start to accommodate the development of hard work of different divisions (Al-Marri, 2005). Quality assurance wishes to be a central part of all of an organisation processes and functions from a conception of an idea and during the course of the life cycle of the product or service: determining the customer needs and requirements, planning and designing production, delivery and after-sale service. The goal must be to get each person in the organisation to take personal responsibility for the quality of the process for which they are accountable.

Quality assurance is what needs be done during the actual tasks to guarantee that the standards identified during quality planning are met. It is therefore done during the implementation phase of the project life cycle. There are some tools available for a project manager to assure the quality of products. One is quality audits, a structured review of quality with an eye towards improving performance. Another is benchmarking, comparing methods or products with others of recognised quality. Thus, a benchmark is not something created in the project, but something recognised by the project and used for comparison with products or methods in the project. Sometimes benchmarks may be recognised throughout an industry. Other times they may be identified uniquely for use in one particular project.

Dale *et al*. (2007) stated that the main objective of quality assurance is to build quality into the product and/or service during the upstream design and planning processes and in this way give assurance to a customer that a product and/or service will perform as they expect. Quality function deployment, FEMA, design of experiments, design reviews, design manufacturability/assembly and quality audits are all part of an advanced product quality planning process, and of considerable assistance in the pursuance of this goal. Quality assurance activity which is planned and managed along these lines will strengthen an organisation's TQM efforts. Schemes for developing and managing quality have progressed quickly in modern years. Throughout the last twenty years, simple examination actions have been restored or complemented by QC, QA has been advanced and developed, and now many organisations and companies, using a procedure of nonstop and companywide development, are working on the way to TQM. In this development, four objectively separate phases can be recognised: inspection, QC, QA and TQM (Dale, 2007, p. 23). Figure 3.2 below shows the four levels in the evolution of TQM.

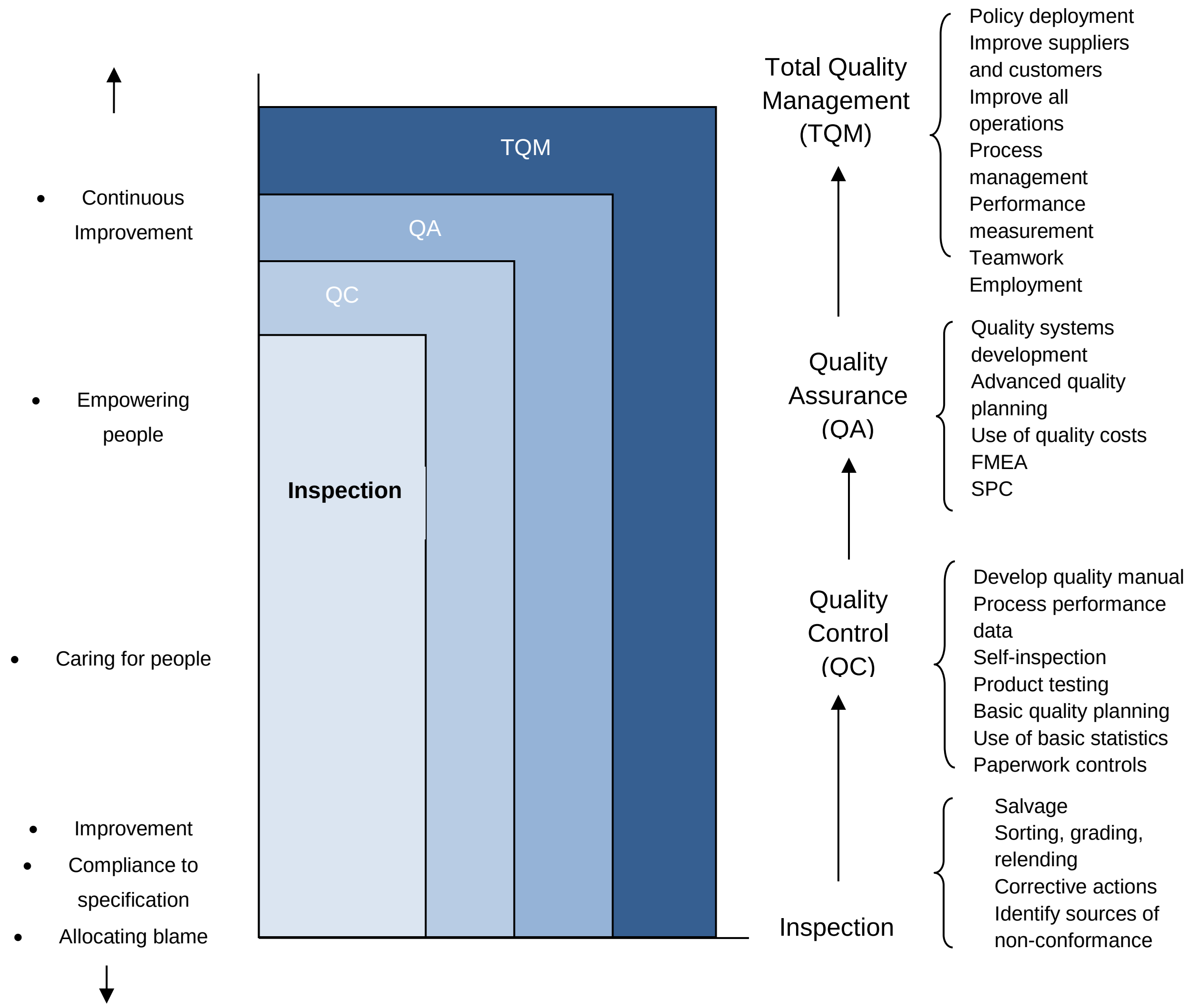

Figure 3-2: The four levels in the evolution of TQM.

Source: Dale (2007, p. 24)

3.3.6 Quality management system

A quality management system is defined accordance BS EN ISO 9000 (2000) and cited by (Dale, *et al.* 2007, p.280) as:

"*A management system to direct and control an organization to quality"*

A quality management system (QMS) is a collection of business processes dedicated on accomplishing quality policy and quality purposes to meet customer requirements. According to Dale *et al.* (2007), the QMS must define and cove all aspects and facets of an organization's operation from identifying and meeting the need of customers' requirements to design, planning, purchasing, manufacturing packaging, storage, distributions, installation, fittings and services together with all related activities executed within these functions. QMS to be comprehensive, operative and effective should cover all these activities and aspects and should be done according to the company or organization strategies (Dale *et al*. 2007).

It was obvious from the definition that the management system guiding the organisations and companies to the quality which wanted by the customers and other stakeholders, the guidance came through a series of standard's known as ISO series concerned with QA and QMS. ISO series expressed as the organizational arrangement, rules, procedures, processes, practices and resources required to implement quality management in order to provide consistency. According to the official website of International Standards Organization (ISO), the ISO family defined as:

> *"The ISO 9000 family addresses various aspects of quality management and contains some of ISO's best known standards. The standards provide guidance and tools for companies and organizations who want to ensure that their products and services consistently meet customer's requirements, and that quality is consistently improved."*

(Dale *et. al.*2007, p.288) stated three ways of using the series of ISO standards which are:

1. *Provision of guidance to organizations to assist them in developing their quality system.*
2. *As a purchasing standard (when specified in contracts).*
3. *As an assessment standard to be used by both second-party and third-party organizations.*

Table **3.4** shows the functions of ISO 9000 family of standards and their various parts.

Table 3-5: ISO 9000 Functions of the standards and their various parts

Standards and guidelines	Purposes
ISO 9000 latest edition in 2005	Quality management systems - Fundamentals and vocabulary
ISO 9001 latest edition in 2008	Quality management systems - Requirements
ISO 9004 latest edition in 2009	Quality management systems - Guidelines for performance improvements
ISO 19011 latest edition in 2011	Guidelines on Quality and Environmental Auditing

Source: (Dale *et al.* 2007, p288)

Suzik (1999) concluded that the wright implementation of ISO 9001 will result to improvements throughout steady operations, and the ability to recognize the problems will be easy, in case each organization or company should prepare its own way of adopting it in order to implement an effective and successful quality methodology.

ISO 9001 have five main requirements element, namely:

1. Quality management system.
2. Management responsibility.
3. Management of Resources.
4. Product realisation.
5. Measurement, Analysis and Improvement.

ISO 9001 fundamentals and the sections requested by each element are showed in Table 3-5 below.

Table 3-6: ISO 9001:2000 implementation requirements

ISO9001:2000 Requirements	
1.Quality management system	
General requirements Documentation requirements	The organisation shall identify critical processes and elaborate controlled procedures including a quality manual
2. Management responsibility	
Management commitment Customer focus Quality policy Planning Responsibility, authority and communication Management Review	Top management shall demonstrate its commitment to the QMS, establishing policies, objectives and plans and ensuring the achievement of customers' needs and legal requirements. The organisation shall define responsibilities and authorities and establish an effective internal communication system.
3. Resource management	
Provision of recourses Human Resources Infrastructure Work environment	Top management must identify where resources are needed and provide them in a timely manner, including human resources, infrastructure and continual education.
4. Product realisation	
Planning of product realisation Customer-related process Design and development Purchasing Production and service provisions Control of monitoring and measuring devices	The organisation shall identify, plan and implement processes under controlled conditions to realise the service/products. Purchased products should meet the organisation's specifications. Customer requirements must be identified and assured during the process
5. Measurement, analysis and improvement	
General requirements Measurement and monitoring Control of nonconforming product Analysis of data Improvement	The organisation must implement methods to monitor measure and analyse processes and customer satisfaction. Non-conformities must be identified and corrective actions taken. Continual improvement and preventive action should be pursued.

Source: Frequently Asked Questions (N.D.) About ISO 9000 web site

For companies and organizations who aspiring to apply the quality management system, should considered the registration and implementation of ISO 9001 as a first step toward TQM. Dale *et al.* (2007, p.292) stated that "*The organizations should* *treat ISO 9001regesitartion as a precursor to developing its approach to TQM"*. The ISO 9000 series or the quality management system are the start toward the improvement and the world class which most of the companies and organizations seeking to achieve it. Figure 3.3 below shows how ISO 9001 transfer the uncommitted companies and organizations toward the world class one.

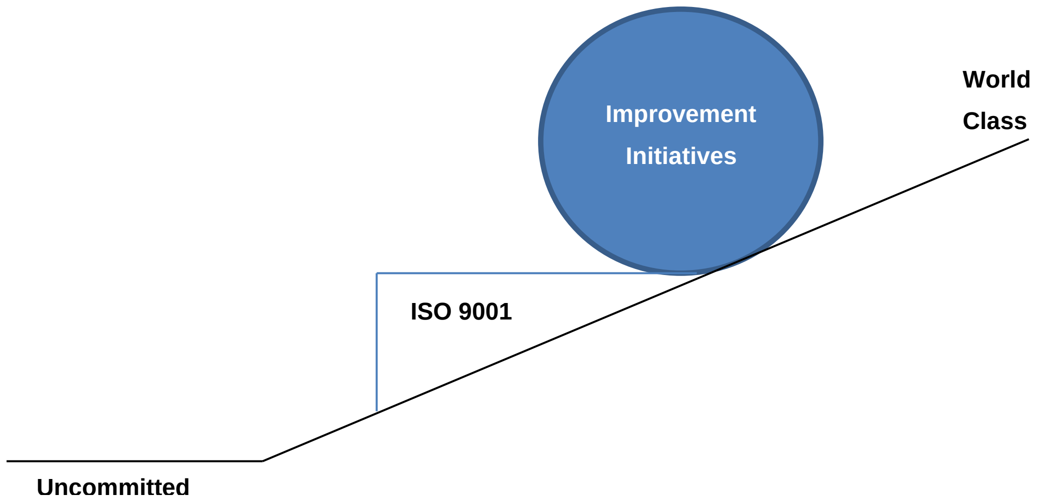

Figure 3-3: Quality improvement and the ISO 9000 series

Source: Dale *et al.*(2007, p.302)

QMS is an essential pillar in a company's approach to TQM and it helps to guarantee that any improvements and developments made are remained in place (Dale. *et al.* 2007). Several studies stated that when the organisation pursues authorisation for reasoning outside regulatory or customer necessities and realises the principles as an chance to arrange and develop their core processes and quality by stressing customer requirements, employee participation and nonstop developments can simply and progressively transfer to the TQM employment phase (Dale *et al.,* 2007 and Poksinka *et al.*, 2002).

3.4 TQM and performance

The emergence of TQM has been one of the major developments in management practice. The recognition of TQM as a competitive advantage is widespread around the world, and today very few companies (especially manufacturing) can afford to ignore the term TQM. It is broadly recognised in professional literature and exercise that companies have to emphasise their strategy progressively more on quality to enhance their performance effectiveness and competitiveness. Several researchs have defined how TQM applications affect companies' performance (e.g. Flynn *et al.*, 1995; Black and Porter, 1996; Choi and Eboch, 1998; Samson and Terziovski, 1999; Sun, 2000). Though, dissimilar studies added mostly similar TQM practices as their input and numerous operative performance measures as their turnout.

Meanwhile the beginning of the MBNQA framework in 1995, various investigators have founded their TQM literature on seven fundamentals: leadership, customer focus, information and analysis, strategy and planning, process management, people management, and business performance. These fundamentals might be further branded into four facets which are leadership, employee relations, customer and supplier relations, and product and process management (Jung and Wang, 2006). TQM has been labelled as a new technique of thinking about organisations management and an inclusive way to develop entire organisation performance (Terzioviski, 2006). Measurement of performance is very significant for the efficient management of an organisation. As said by Deming, without measuring something, it is impossible to improve it. Consequently, to develop organisational performance, one wants to define the degree of TQM implementation and measure its influence on industry performance (Madu *et al.,* 1996; Gadenne and Sharma, 2002).

Several writers have disputed about and empirically verified the positive influence of TQM on a organisation's performance in regard to quality, operating and financial results, customer/employee satisfaction (Choi and Eboch, 1998; Hendricks and Singhal, 1997, 2001; Agus and Hassan, 2000; Terziovski and Samson, 1999, 2000;

Brah *et al*., 2000, 2002; Saizarbitoria, 2005; Karia and Asaari, 2006; Yang, 2006; Fuentes *et al.*, 2006). Nevertheless most of these researchs have emphasis on classifying the TQM practices that have greatest effective and vital from the point of view of performance improvement. Some of those studies stress only on a specific type of performance such as, quality performance, financial performance. The study of Kumar *et al*. (2009) provided sign of the positive influence of TQM on organisation performance. On the subject of the four areas of organisation performance studied, all of them were enhanced, in specific employee relations (developed employee contribution and self-confidence), operating procedures (upgraded products and quality of services, productivity and process, and decreased errors), satisfaction of customer (number of customer objections and complaints havereduced), and financial results (profitability has been increased).

The period of time to feel these benefits was about 33.3 Months on average after TQM implementation. So, concerning the influence of TQM on organisation performance, it was demonstrated in qualitative terms that TQM has a positive influence on the four mentioned practices. Measurement of performance is considered one of the elements of TQM and a critical success factor for TQM adaptation (Bititci *et al*., 1997; Mehra *et al*., 2001; Brah *et al*., 2002; Taylor and Wright, 2006). In their study, Kumar *et al.* (2008) provided useful insights on performance measurement by the most recognised TQM implementers in Canada (Xerox, Northern Telecom, Texas Instrument, Avco Financial Services to name a few).

The research findings of Prajogo and Sohal (2003), in response to RQ1 (*Do TQM practices – that have been successfully proven as significantly and positively related to quality performance – have a similar predictive power against innovation performance?*), provided empirical evidence that TQM significantly and positively contributes to innovation performance, in terms of both product and process. From a practical point of view, organisations that want to pursue innovation performance are recommended to adopt TQM and co-align it with other practices and techniques relating to research and development (R&D) and technology management. There is a comparatively huge body of empirical research's that measures organisation performance by TQM practices (Samson and Terziovski, 1999; Flyyn *et al*., 1995; Wilson and Collier, 2000; Fynes and Voss, 2001; Flynn and Saladin, 2001; Montes *et al*., 2003; Benson *et al.*, 1991; Choi and Eboch, 1998). These studies discover a variability of theoretical and empirical subjects. If the TQM plan is applied correctly, it yields to impact on a extensive range of parts such as understanding customers' needs, improved customer satisfaction, improved internal communication, better problem solving and fewer errors. The main results of a study by Huarng and Chen (2002) showed that TQM philosophy, TQM techniques and their integration are related to performance. Brah and Tee (2002) investigated the relationship between TQM and performance of Singapore companies. They found that their study supported the proposition that the implementation of TQM correlates with quality performance.

The improvement of QMS systems has substantively been influenced by several American and Japanese quality experts: Deming, Juran, Feigenbaum, Crosby and Ishikawa. The main theme of Deming is that by improving quality it is likely to raise productivity, which consequences in the developed competitiveness of a business enterprise (Kruger, 2001). As said by Deming, the quality improvement of the company's work processes, both manufacturing and service, will outcome in a lesser amount of reworking and less waste of manpower, material resources and the number of mistakes will be decreased. One of the main aims of management is to decrease the waste and develop all company's quality activity which contains all company functions, such as customer services, engineering stages, way of distribution and system of transportation. (Kruger, 2001). Terzioviski (2006) concluded that the study showed that managers should be aware that a multiple number of quality management practices need to be implemented in order to achieve productivity improvement and customer satisfaction. Quality management has developed as a management model for improving the competitiveness and effectiveness of the organisation (Dow *et al*., 1999; Grandzol and Greshon, 1997; Sanchez-Rodriguez and Martinez-Lorente, 2004; Sila, 2007).

Numerous empirical research’s propose that companies attain higher stages of productivity and organisational performance throughout effective employment of quality management (Powell, 1995; Easton and Jarrell, 1998; Das *et al*., 2000, Kaynak, 2003; Yeung *et al*., 2006; Santos-Vijande; Alvarez-González, 2009 and Talib *et. al.* 2013). Miyagawa and Yoshida (2010) summarised that quality-oriented management in Japanese-owned manufacturers contributes positively and significantly to organisational performance both in the US and China. Their findings support the earlier literature that studies the relationship between TQM practices and organisational performance in a changing environment. The significance of quality for a firm’s performance in numerous levels and achievement in the market is broadly recognised in business literature and activities (Kumar *et al*., 2009b). When organisation performance measured improperly that will lead to weakness of TQM philosophy and forbid the companies from attaining the benefit from the implementations of TQM (Goodman *et al.*, 1994; Najmi and Kehoe, 2001; Chang, 2005, 2006). Phan *et al.* (2011) concluded that the quality management practices such as leadership, process management and communications and information sharing should be explored to achieve high competitive performance.

Parast *et al*. (2011) presented a inclusive review of literature on how TQM has an effect on performance which is shown in Table (3-7).

Table 3-7: Quality management practices on performance

Study	Operational of TQM	Main findings
Anderson *et al*. (1995)	Multidimensional construct Visionary leadership Internal and external cooperation Learning Process management Continuous improvement Employee fulfilment Customer satisfaction	Employee fulfilment has a significant effect on customer satisfaction. No significant relationship exists between continuous improvement and customer satisfaction
Flynn *et al*. (1995)	Multidimensional construct Process flow management Product design process Statistical control/feedback QM infrastructure practices Customer relationship Supplier relationship Work attitudes Workforce management Top management support	Statistical control/feedback and the product design process have positive effects on perceived quality market outcomes, while the process flow management and statistical control/ feedback are significantly related to the internal measure of the percentage that passed final inspection without requiring rework. Both perceived quality market outcomes and the percentage that passed final inspection with no rework have significant effects on competitive advantage
Powell (1995)	Multidimensional construct Executive commitment Adopting the philosophy Closer to customers Benchmarking Training Employee empowerment Zero-defects mentality Flexible manufacturing Process improvement Measurement	Executive commitment, open organisation, and employee empowerment show significant partial correlations for both total performance and TQM program performance. A zero defects mentality and closeness to suppliers correlate with TQM performance, but with total performance only marginally
Hendricks and Singhal (1996, 1997)	Single construct (winning of a quality award is a proxy for the effective implementation of TQM programs)	Implementing an effective TQM program improves performance of firms
Adam *et al*. (1997)	Multidimensional construct	Employee knowledge about quality
Ahire and O'Shaughnessy (1998)	Multidimensional construct Management commitment Employee training Employee empowerment Employee involvement Internal quality information Supplier quality management Design quality management Statistical process control Customer focus Benchmarking	Firms with high top management commitment produce higher quality products than those with low top management commitment. Customer focus, supplier quality management and empowerment emerge as significant predictors of product quality
Easton and Jarrell (1998)	Single construct (in this study, various dimensions of TQM were examined; however, a single TQM construct is used to analyse the relationship between TQM and performance)	For the firms adopting TQM, financial performance has increased
Rungtusanatham *et al*. (1998)	Multidimensional construct Visionary leadership Internal and external cooperation Learning Process management Continuous improvement Employee fulfilment Customer satisfaction	Continuous improvement has a positive effect on customer satisfaction. Employee fulfilment seems to have no effect on customer satisfaction
Dow *et al*. (1999), Samson and Terziovski (1999)	Multidimensional construct Leadership Workforce commitment Shared vision Customer focus Use of teams Personnel training Cooperative supplier relations Use of benchmarking Use of advanced manufacturing systems Use of just-in-time principles	Employee commitment, shared vision, and customer focus in combination has a positive impact on quality outcomes. Leadership, human resource management and customer focus (soft factors) are significantly and positively related to operating performance
Das *et al.* (2000)	Multidimensional construct	High-involvement practices are

Study	Operational of TQM	Main findings
	Employee involvement Senior executive involvement Employee satisfaction Compensation Customers Design and conformance Knowledge Employee selection and development Inventory reduction	improvement, what quality of product customers receive and perceive, employee compensation and recognition and management involvement are significantly and inversely correlated with the total cost of quality and average percent of items defective. Financial performance is positively correlated with senior management involvement and with employee compensation
Choi and Eboch (1998)	Single construct (in this study, various dimensions of TQM were examined: however, a single TQM construct is used to analyse the relationship between TQM and performance)	TQM practices have a stronger effect on customer satisfaction than they do on plant performance. The plant performance has no significant effect on customer satisfaction
Lee *et al*. (2003)	Multidimensional construct Leadership Quality information and analysis Customer and market focus Strategic quality planning Human resource management Process management Quality results	Quality information and analysis has strong, positive impact on strategic quality planning and process management, and quality results are affected by human resource and process management
Kaynak (2003)	Multidimensional construct Management leadership Training Employee relations Quality data and reporting Supplier quality management Process management Product/service design Inventory management performance Quality performance Financial and market performance	Management leadership is directly related to training, employee relations, supplier quality management, and product design, and indirectly related to quality data and reporting, and process management. Quality data and reporting does not have any direct effect on any of the (financial) performance measures. Supplier quality management emerges as an important component of TQM. It is the only TQM practice that has a direct effect on inventory turnover. Improving operating performance results in increased sales and market share, thereby providing companies with a competitive edge
Lai and Cheng (2003)	Multidimensional construct People and customer management Supplier partnerships Communication of improvement information Customer satisfaction orientation External interface management Strategic quality management Teamwork structures for improvement	Significant contrast exists between public utilities/service industries and manufacturing/construction industries, with the former group having a higher level of quality management implementation and achieving better quality outcomes. The emphases that they placed on their quality management implementation also seem to differ

Study	Operational of TQM	Main findings
	High-involvement work practices Quality practices	positively correlated with quality practices; quality practices are positively correlated with customer satisfaction; customer satisfaction is positively correlated with firm performance
Wilson and Collier (2000)	Multidimensional construct Leadership Information and analysis Strategic planning Human resource management Process management	Process management, and information and analysis have significant and positive direct effects on financial performance
Douglas and Judge (2001)	Single construct (in this study, various dimensions of TQM were examined; however, a single TQM construct is used to analyse the relationship between TQM and performance)	The extent to which TQM practices are implemented is positively and significantly related to both the perceived financial performance and the industry expert-rated performance
De Ceiro (2003)	Multidimensional construct Practices relating to the design and development of new products Production process Links with suppliers Links with customers Human resource management	The results show a significant relationship between the level of implementation of quality management practices and improvement in operational performance in cost, quality and flexibility. Quality management practices related to product design and development, together with human resource practices, are the significant predictors of operational performance
Lai (2003)	People and customer management Supplier partnerships Communication of improvement information Customer satisfaction orientation External interface management Strategic quality management Teamwork structures for	The results suggest that market orientation factors (i.e. market intelligence generation, market intelligence dissemination, responsiveness to market intelligence) are positively correlated with quality management factors and business

Study	Operational of TQM	Main findings	Study	Operational of TQM	Main findings
	Operational quality planning Quality improvement measurement systems Corporate quality culture			improvement Operational quality planning Quality improvement measurement systems Corporate quality culture	performance
Rahman and Bullock (2005)	Multidimensional construct Customer satisfaction Employee morale Productivity Defects as a percentage of production volume Delivery in full on time to customer Warranty claims cost as percentage of total sales Cost of quality as a percentage of total sales	The paper investigates the direct impact of soft TQM on the diffusion of hard TQM, and then assesses the direct impact of hard TQM on performance. Analysis of 261 Australian manufacturing companies revealed significant positive relationships between soft TQM and hard TQM elements. In addition to direct effects, soft TQM also has an indirect effect on performance through its effect on hard TQM practices (indirect effect)	Sila (2007)	Multidimensional construct Leadership Strategic planning Customer focus Information and analysis Human resource management Process management Supplier management	The results show that the implementation of all TQM practices is similar across subgroups of companies within each contextual factor. In addition, the effects of TQM on four performance measures, as well as the relationships among these measures, are generally similar across subgroup companies. Thus, for the five contextual factors analysed, the overall findings do not provide support for the argument that TQM and TQM performance relationships are context dependent

Source: Parast *et al*. (2011)

Reviewing most publications that cover the relationship between the TQM practices and performance in different fields revealed that some had a positive impact or positive correlation with performance, and some showed negative impact or negative correlation. Sadikoglu and Zehir (2010) made comprehensive review of literature to investigate the positive and negative impact of TQM on performance. Below, Table 3.8 shows the positive relationship and Table 3.9 shows the negative relationship

Table 3-8: Previous studies' results of positive relationships or correlations between TQM practices and performance

TQM Practices	Performance						
	Quality	**Operating**	**Market &financial**	**Employee**	**Innovation**	**Project**	**Aggregate Firm**
Leadership	Kannan and Tan (2005), Adam *et al.* (1997), Ahire and O'Shau ghnessy (1998), Nair (2006), Cua *et al*. (2001), Das *et al*. (2000)	Ahire and Dreyfus (2000), Fuentes *et al*. (2006), Phan *et* al. (2011)	Nair (2006), Sanchez-Rodriguez and Mar tinez- Lorente (2004), Adam *et* al. (1997), Kannan and Tan (2005), Fuentes *et al*. (2006)	Flynn *et al*. (1995), Rungtusan atham *et al*. (1998), Fuentes *et al*. (2006)	Prajogo and Sohal (2004), Feng *et al*., (2006), Hung *et al.* (2011), Phan *et* al. (2011)	Shieh and Wu (2002)	Powell (1995), Cua *et al.* (2001)
Training	Ahire and Dreyfus (2000), Quazi *et al*. (1998) and Talib *et al*. (2012)	Kaynak (2003), Anderson *et al*. (1998), Fuentes *et al*. (2006)	Kay nak (200 3), Fuentes *et al*. (2006)	Anderson *et al*. (1995), Fuentes *et al*. (2006)			
Employee management	Ahire and O'Shaughnessy (1998), Ho *et al*. (2001), Rahman and Bullock (2005), Cua *et al*. (2001), Choi and Eboch (1998), Quazi *et al*. (1998)	Flynn *et al*. (1995), Fuentes *et al*. (2006)	Fuentes *et al*. (2004, 2006), Das *et al*. (2000), Sanchez- Rodriguez and Mar tinez- Lorente (2004), Nair (2006)	Flynn *et al*. (1995), Fuentes *et al*. (2004, 2006), Rahman and Bullock (2005), Shmuel and Elizur (2000)	Prajogo and Sohal (2004), Mazzanti *et al*. (2006), Feng *et al*. (2006), Hung *et al*. (2011)		Powell (1995), Nair (2006)
Information & analysis	Choi and Eboch (1998), Prajogo and Sohal (2004), Ho *et al*. (2001), Quazi *et al*. (1998), Prajogo(2005) and Teh *et al*. (2009)	Cua *et al*. (2001)	Wi lson and Collier (2000)		Prajogo and Sohal (2004), Phan *et al*. (2011)		Nair (2006)
Supplier management	Kannan and Tan (2005), Ahire and O'Shau ghnessy (1998), Ho *et al*. (2001), Cua *et al*. (2001), Quazi *et al*. (1998)	Kaynak (2003), Nair (2006), Flynn *et al*. (1995), Fuentes *et al*. (2006)	Fuentes *et al*. (2006)			Shieh and Wu (2002)	Powell (1995), Nair (2006), Cua *et al*. (2001)

Process management	Kay nak (2003), Flynn *et al*. (1995), Prajogo and Sohal (2004), Ahire and Dreyfus (2000), Forza and Flippini (1998), Cua *et al*. (2001), Choi and Eboch (1998), Quazi *et al*. (1998), Feng *et al*. (2006)	Flynn *et al*. (1995), Fuentes *et al*. (2006)	Wi lson and Collier, 2000, Nair (2006), Ahire and Dreyf us (2000)	Anderson *et al*. (1995), Fuentes *et al*. (2006)	Prajogo and Sohal (2004), Phan *et al*. (2011)		Nair (2006), Cua *et al*. (2001)
Customer focus	Prajogo and Sohal (2004), Grandzol and Gershon (1997), Ahire and O'Shaughnessy (1998), Nair (2006), Feng *et al*. (2006)	Fuentes *et al*. (2004, 2006) , Nair (2006) , Cua *et al.* (2001) , Flynn *et al*. (1995)	Fuentes *et al*. (2004, 2006) , Nair (2006)	Fuentes *et al*. (2004, 2006)	Prajogo and Sohal (2004), Hung *et al.*(2011)		Chong and Rundus (2004), Nair (2006)
Overall TQM practices	Prajogo and Sohal (2003, 2004, 2006), Dow *et al*. (1999), Samson and Terziovski (1999), Cua *et al.* (2001)	Cua *et al*. (2001), Dow *et al*. (1999), Samson and Terziovski (1999), Shah and Ward (2003), Anderson and Sohal (1999 , Anderson *et al*. (1998), Tata *et al*. (2000), Carter and Narasimhan (1994)	Hendricks and Singhal (1996), Easton and Jarrell (1998), Dougla sand Judge (2001), Mohrman *et al*. (1995), Sanche z- Rodriguez and Martinez- Lorente (2004)	Sila (2007), Mohrm an *et al*. (1995), McAdam and Bannister (2001), Grandzol (1998), Adam *et al*. (1997), Boselie and Wie l e (2002) and Sadikoglu and Zehir (2010)	Prajogo and Sohal (2003, 2004), Costa and Lorente (2008) and Sadikoglu and Zehir (2010), Hung *et al*. (2011)		Sun (2000), Ismail *et al.* (1998), Rahman and Bullock (2005), Costa and Lorente (2008), Rado vilsky *et al.* (1996) and Sadikoglu and Zehir (2010)

Source: Sadikoglu and Zehir (2010)

Table 3-9: Previous studies' results of negative relationships or correlations between TQM practices and performance

TQM Practices	Performance						
	Quality	**Operating**	**Market &financial**	**Employee**	**Innovation**	**Project**	**Aggregate Firm**
Leadership	Choi and Eboch (1998)		Kannan and Tan (2005)				
Training				Rungtusanatham *et al.* (1998)			
Employee management		Fuentes *et al*. (2004)	Fuentes *et al*. (2004)	Rungtusanatham *et al.* (1998)		Shieh and Wu (2002)	
Information & analysis	Yang *et al*. (2009)						
Supplier management	Yang *et al*. (2009)		Kannan and Tan (2005)				
Process management			Fuentes *et al*. (2006)	Rungtusanatham *et al.* (1998)		Shieh and Wu (2002)	
Customer focus	Rahman and Bullock (2005)			Fuentes *et al*. (2004)			
Overall TQM practices	Prajogo and Sohal (2004)	Sadikoglu (2004)	York and Miree (2004)		Prajogo and Sohal (2004, 2006)		

Source: Sadikoglu and Zehir (2010)

3.5 Project and project management performance.

A project is a temporary endeavour undertaken to create a unique product, service, or result (PMBOK, 2008). A project is a complex effort involving consistent activities, with the purpose of achieving an objective, and a temporary, non-repetitive process (Dinsmore and Cabanis-Brewin, 2006; Khatib, 2003; Lewis, 2000; Nicholas, 2004; PMI, 2008). Project management is a set of processes applied to a project to deliver a product or service (Project Management Institute, 2004). The International Organisation for Standardisation (ISO 2003, QUALITYDIGEST) defines a project as *"a unique process, consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements including constraints of time, cost and resources*". (Gray and Larson, 2005, p. 4) defined project as:" *A project is a complex, non-routine, one-time effort limited by time, budget, resources and performance specifications designed to meet customer needs*". Project management is the application of knowledge, skills, tools and techniques to project activities to meet the project requirements (PMBOK, 2008). Project management (PM) has spread out all over the world covering a large variety of countries with different social, economic and cultural specificities. Managing a project means planning and monitoring its execution, allowing objectives to be achieved.

Project management no longer has a specific focus (managing projects), but rather has become an organisational skill that pervades all levels of the company (business process) (Kerzner, 2010; Kerzner and Saladis, 2009; Lewis, 2000; Nicholas, 2004; PMI, 2008; Westland, 2006). The need for project management is no longer debated, but rather what form it will take (methods, tools, personnel, among others) (IPMA, 2006). The international economic figures attest to the continual increase in the participation of PM activity in the global economy. World Bank (2005) data indicate that 21 percent of the world's gross domestic product (GDP) is gross capital formation, which is almost entirely project based. The growth of professional associations such as the Project Management Institute (PMI) (Majewski, 2004) and International Project Management Association IPMA (2007) along with the development of standards and research, reinforce this deployment. The organisations (all types of organisations) are more and more adopting PM as an integrated part of their structure (Bredillet *et al*., 2008). The methodology of project management has become better understood in the second half of the twentieth century (Lock, 2003). The PM Body of knowledge proposes nine essential knowledge and management areas to describe project management (PMI Standards committee). A complete project management dimension is defined: Integration, Scope, Time, Cost, Quality, Human Resources, Communication, Risks and Procurement.

Performance measurement is one of the vital features of project management. As there are different needs and different goals of any given project, performance measurement should also be tailored to each project. The success of a project is measured by product/project quality, timeliness, budget compliance and degree of customer satisfaction (PMBOK, 2008). How to measure project success? Is a vital and strategic question (Wateridge, 1998). The Project Management Body of Knowledge PMBOK (Project Management Institute (PMI), 2008) frequently mentions to project success, but does not give a certain definition; but the institute make it open to each project by define certain success criteria and aims of the project. Project success means different things to different stakeholders. Stakeholders are the persons or organisations who are actively involved in the project or whose interests may be positively or negatively affected by the performance or completion of the project (PMBOK, 2008). A project that may seem successful to the client may be a completely unsuccessful venture for contractors or end users (Toor and Ogunlana, 2008). Always, stakeholders have different vested benefits in a particular project and consequently the understanding of success might also vary across several stakeholders (Bryde and Brown, 2005). The perception of project success may also vary according to perspectives of the organisation management Cox *et al*. (2003).

There are two likely standpoints: macro-level success, which accumulates all stakeholders and shareholders, and micro-level success which only reflects those directly with the project executions Lim and Mohamed (1999, p. 244). The authors proposed to evaluate project success from both the macro and micro viewpoints. Figure (3-3) shows the two viewpoints of project success. The question of "does the original concept tick?" is worried of macro viewpoints. There are specific people caring about the success from the macro viewpoint are the end users and project recipients. Whereas the construction side such as contractors and consultants are concerns about the micro viewpoint.

Moreover, micro success relates to the traditional iron triangle (i.e. time and cost and quality). Phua (2004) is of the view that multi-firm project success can be defined and measured, at least at the operational level, as the extent to which projects meet a combination of budget, timetable and technical specifications. Two different examples reflect the understanding of the project success, the first one, is Sydney Opera House which exceeds the proposed budget by 16 times and four times longer than planned time, this project, seen as a great success for the Australian people, whereas from management point of view is a failure (Thomsett, 2002). Contrariwise the Millennium Dome in London executed on time, within the budget limit and according to project specifications. But in British people eyes the project has failure due to the fact it did not deliver the amazement and excitement desired and hoped-for the project (Cooke-Davies, 2001).

Baccarini (1999, p. 25), project success involves two separate modules, project management success and project product success, He differentiates between the two modules as follows:

(1) Project management success emphases on the project management process and in specific on the successful achievement of the project within concepts of iron triangle.

(2) Project product success stress on the special effects of the end-deliverable of the projects.

The three dimensions of time, budget and quality feature in many definitions of project management success (Blaney, 1989; Duncan, 1987; Globerson and Zwikael, 2002; Redmill, 1997; Thomsett, 2002). However, time, budget and quality are not sufficient to measure project management success. Dimensions such as the quality of the project management process – leadership performance – and the satisfaction of the project stakeholder's expectations also need to be considered (Baccarini, 1999, p. 28; Schwalbe, 2004, pp. 109-10). Therefore, extending the traditional triangle – time + quality + cost – to include the performance of the management process provides a more complete view of project management success. Belassi and Tukel (1996) came out with a framework where they can be assembled into four interconnected areas: the project; the project manager and team members the organisation; and the external environment.

Atkinson (1999) termed these three measures together as the 'iron triangle'. Dweiri and Kablan (2005) Demonstrate the project management activities using only iron triangle measures could fall over and done with the gaps. Therefore, areas covered by performance management must taking in account other measures in order to have exact measurement of project success.

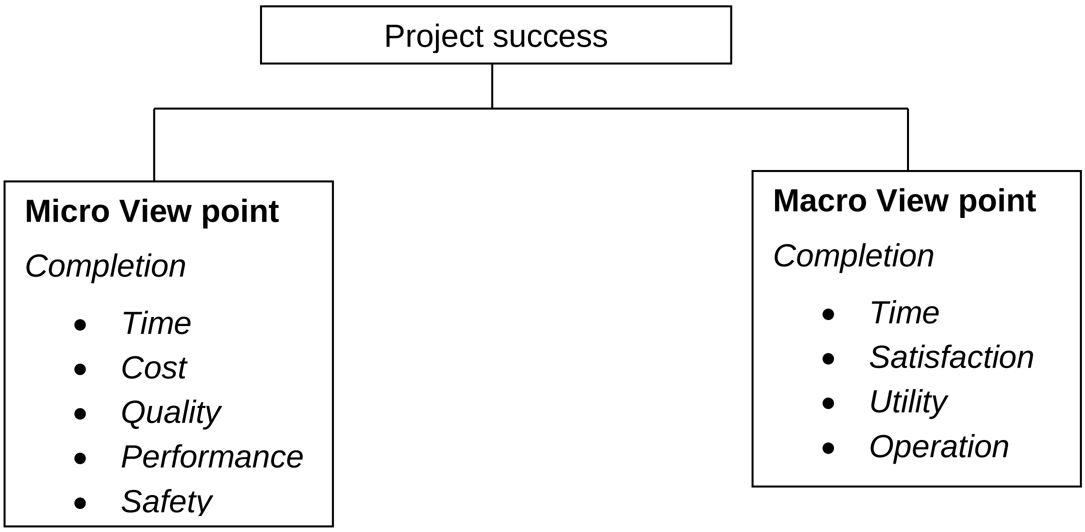

Figure 3-4: Micro and Macro viewpoints of project success

Source: Lim and Mohammed (1999)

Shenhar *et al*. (1997) suggested that project success is classified into four dimensions. As shown in Figure 3.5 below, these four dimensions are time-dependent. The first dimension is the period during project execution and right after project completion. The second dimension can be assessed shortly afterwards, when the project has been delivered to the customer. The third dimension can be assessed after a significant level of sales has been achieved (1-2 years). Finally, the fourth dimension can only be assessed 3-5 years after project completion.

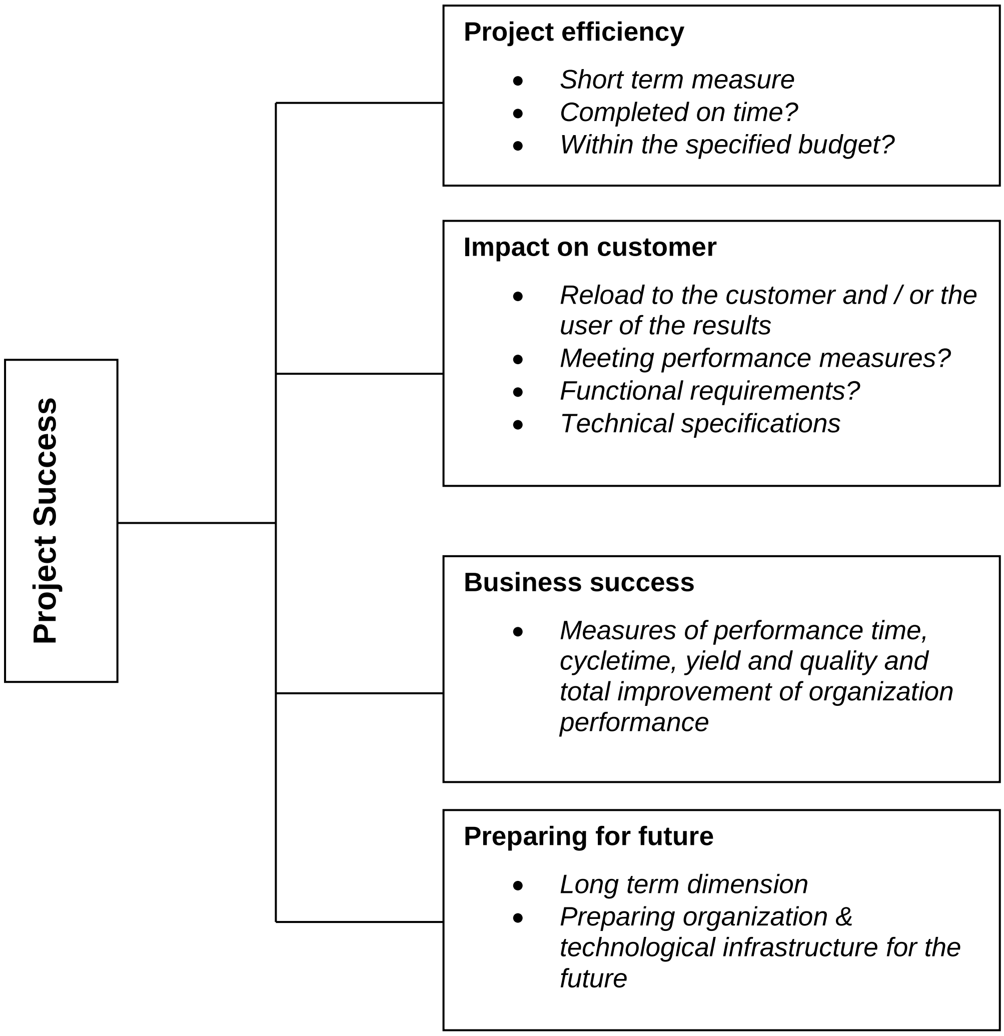

Figure 3-5: The four dimensions of project success

Source: Shenhar *et al.* (1997)

Atkinson (1999) similarly divided project success into three stages: the first stage is "the delivery stage: the process: doing it right"; the second is "post-delivery stage: the system: getting it right" and the last stage is "the post-delivery stage: the benefits: getting them right". Figure 3.6 is used to show Atkinson's model of measuring project success.

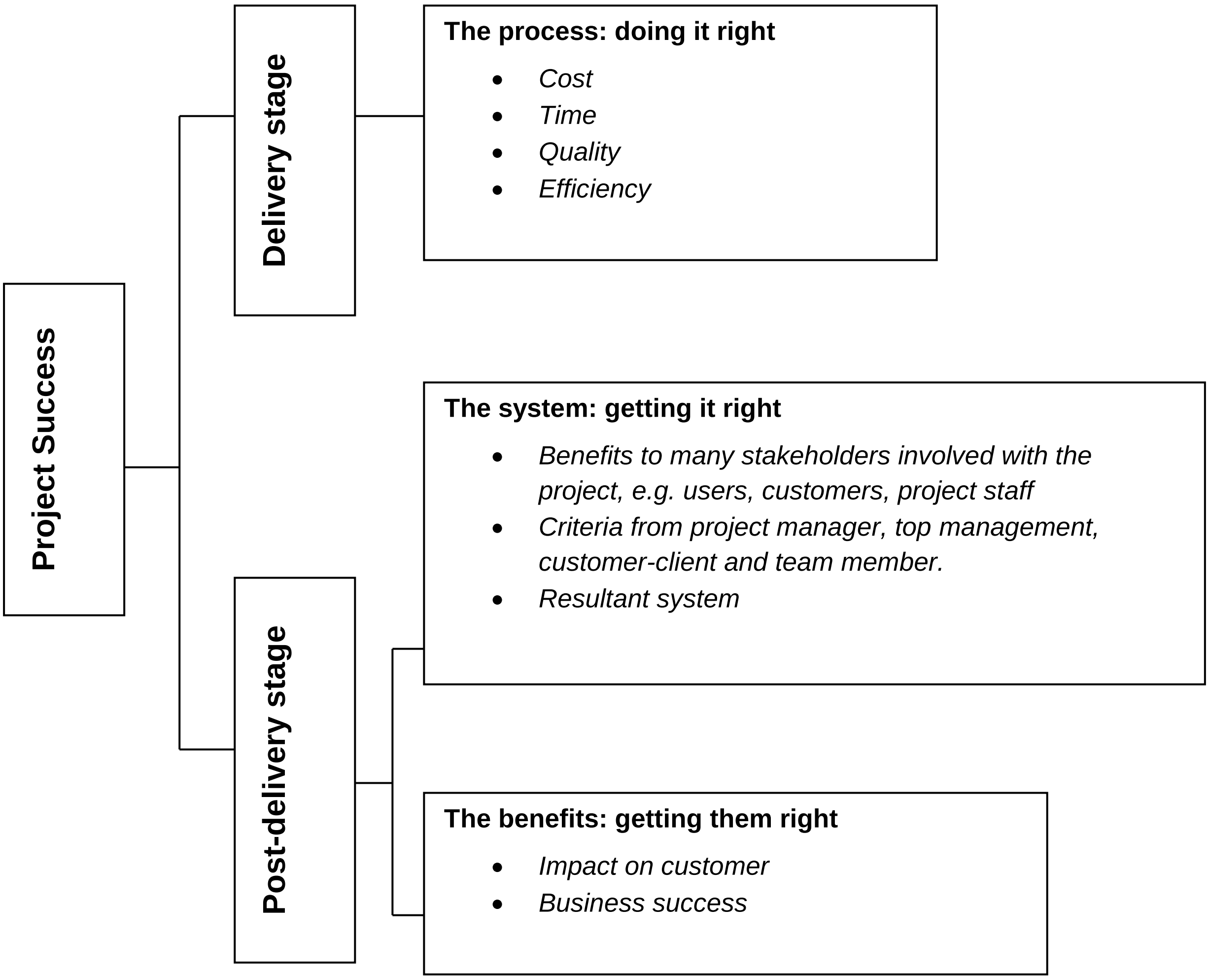

Figure 3-6. Atkinson's model of measuring success.

Source: Atkinson (1999)

Sadeh *et al*. (2000) classified project success into four dimensions. The first dimension is meeting design aims, which relates to a contract that is signed by the customer. The second dimension is the advantage to the end user, which refers to the benefit to the customers from the end products. The third dimension is benefit to the developing organisation, which refers to the benefit it gains as an outcome of executing the project. The last dimension is the advantage to the technological infrastructure of the country and of companies involved in the development process.

All of these four dimensions give the overall assessment of project success (Aoko, 2014). Table (3.10) shows the success dimensions and measures.

Table 3-10: Success dimension and measures

Success dimension	Success measures
Meeting design goals	Functional specification Technical specification Schedule goals Budget goals
Benefit to the end user	Meeting acquisition goals Answering the operational need Product entered service Reached the end user on time Product has a substantial time for use Meaningful improvement of user Operational level User is satisfied with product
Benefit to the developing organisation	Had relatively high profit Opened a new market Created a new product line Developed a new technological capability Increased positive reputation
Benefit to the defence and national infrastructure	Contributed to critical subjects Maintained a flow of updated generation Deceased dependence on outside sources Contributed to other projects
Overall success	A combined measures for project success

Source: Sadeh *et al. (*2000)

Over the last decade, researchers have proposed different criteria for measuring project success. Figure 3.7 presents a consolidated framework for measuring success of construction projects (Chan and Chan, 2004).

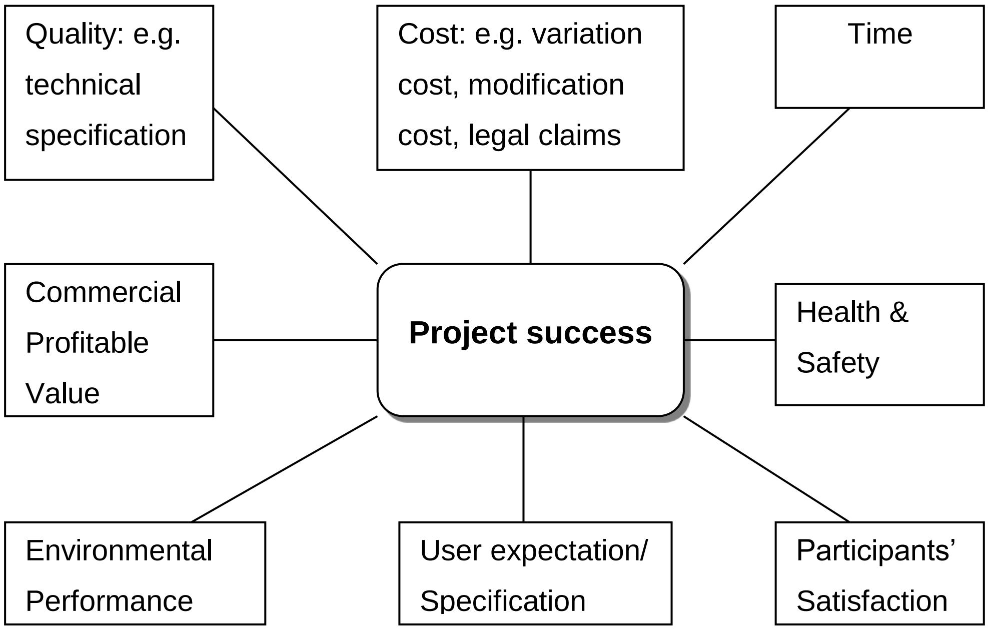

Figure 3-7: Consolidated framework for measuring project success

Source: Chan and Chan (2004)

In spite of the unsophisticated nature of performance measurement through the iron triangle measures, practitioners as well as academies have left from this traditional method of measurement and new direct and indirect measures are being engaged for the measurement of project performance. However, according to the PMBOK Guide published by the Project Management Institute (PMI), project success criteria shall include the golden triangle and key project stakeholders' satisfaction. Low and Chuan (2006), claim that the measurement of project success should not be constrained to the traditional iron triangle. They strongly demand to expand the project success measurement towards project management success or product success or both. Same demand has been claimed by several author and various scholars who rely believe on different project success factors (Bryde, 2003b; bryde and Brown, 2005; Cookie- Davies, 2002 and Shenhar *et al*., 1997).

Toor and Ogunlana (2009) concluded that the iron triangle criterias has been the widely accepted criteria during the last couple of decades. (Toor and Ogunlana, 2009b, p. 8) stated: *"However, with shifting functions of buildings, changing demands of users, and evolving environmental regulations, the same old-fashioned performance criteria can no more be the sole determinant of project success".*

Empirical and empirically based conceptual studies on large projects in project management research acknowledge project autonomy, a dynamic character of projects, and complexity in a project's stakeholder environment (Morris, 1982; Kharbanda and Stallworthy, 1983; Slevin and Pinto, 1987; Morris and Hough, 1987; Milosevic, 1989; Kharbanda and Pinto, 1996; Miller and Lessard, 2001a, b; Williams, 2002; Flyvbjerg *et al.*, 2003; Samset, 2003; Pitsis *et al.*, 2003; Kolltveit *et al*., 2004; Grün, 2004). Success of future projects will be increasingly measured on the criteria of strategy, sustainability, and safety. Future buildings and infrastructure will be evaluated based on their operational flexibility, maintainability, energy efficiency, sustainability, and contribution to the overall well-being of their end users. Therefore, future frameworks of project performance measurement need to be more comprehensive and should include not only the quantitative and objective criteria but also more subjective and qualitative criteria. Dweiri and Kablan (2005) note that disparate measurement systems may result in superfluous and incompatible performance measurement frameworks.

Consequently, there is a need for project managers to quantify performance as a whole and to be able to drill down to different measurements at different levels of detail and time. Accordingly, any project performance evaluation supposes the need to analyse the measurements taken, whatever the dimensions. It is a question of considering the impact of each component of a performance. From the research carried out to date, theoretical justification for developing models of project performance can be provided in two ways. First, models that help organisations provide effective PM performance can lead to beneficial outcomes regardless of the success or otherwise of the project being managed. Second, as elements of PM performance may influence overall satisfaction at the outcome of a project, which is the overriding measure of project success, modelling PM performance may contribute to the successful delivery of desired project outcomes (Bryde, 2003a, p.230). Also in Bryde's paper is the suggestion that developments in the PM discipline suggest that new models of PM performance need to reflect the *"multi-dimensional/multiple-stakeholder/quality of process as well as product"* paradigm for defining success.

Also in measuring project performance effectively, researchers have studied measuring the pre-project process stages in construction. A construction project evolves different stages that represent different processes and involve different parties. In each stage process control is essential. It is aimed at monitoring and controlling process performance to achieve end-project goals. The very early stages in the project development such as the pre-project stage are crucial to its success (Haponava and Al-Jibouri 2008). Many experts believe that planning efforts conducted during early stages of a project are key in the whole project process and have a greater effect on project success than efforts undertaken on the project in later stages (Dumon *et al*., 1997). In their work to develop tools for measuring performance, Feurer and Chaharbaghi (1995) recommended to keep the focus of measurement on processes rather than on the functions of the project. Koskela (2000) highlighted that process performance is an important feature of performance indicators to improve process transparency so that the relevant and invisible attributes of the process become visible. Pillai (2002) also suggested measuring the construction processes rather than their outcomes. Costa *et al*. (2004) highlighted the need to develop objective as well as subjective measures to have a more comprehensive picture of the different aspects that explain process performance.

A specific organisation would have its own model of "project governance". A study conducted by Bekker and Steyn (2008) concludes that it is not possible to generalise a project governance model, since different projects might require different approaches. Yilin *et al*. (2008) state that project governance works indirectly on project management performance. Furthermore, Bekker and Steyn (2008) observe the need for formal project governance to achieve better project performance. A project is considered successful when it is carried out within the desired deadline, budget and quality level, meeting the expectations of the primary stakeholders. Salazar-Aramayo, *et al.* (2013, p. 2) stated that:

> *"At this point, the work of Cooke-Davies (2002) is particularly relevant in distinguishing between 'project management success' and 'project success'. Specifically, project management success is measured against the widespread and traditional measures of performance (cost, time and quality) and project success is measured against the overall objectives of the project. This implies that project success cannot be measured until after the project is completed. By contrast, project performance can be measured during the life of the project."*

The IPMA (2006, p. 40) defines project management success as *"the appreciation of the project management results by the relevant interested parties".* Thus, *"project management success" is synonymous with "project management performance", because the interest is in assessing management performance and not project results.*

PMI has conducted an in-depth study involving 65 case study organisations from 14 countries and extended up to four years to find what importance project management delivers to organisations and companies (Thomas and Mullaly, 2009). The study well-established the significance of project management; though, it showed that the value is reliant on culture, employment 'fit' with organisations' requirements and raised up questions about the sustainability of value generation. This study results that project management creates tangible and intangible benefits (Thomas and Mullaly, 2008). This result is reinforced by several other researchers (Bryde, 2003a; Kwak and Ibbs, 2000; Phillips, 1998); nonetheless, the value is well-defined inversely from one research to another. Based on a wide-ranging literature review of the project success, Muller and Jugdev (2012) claimed that a strong definition to the success of the project does not exist and there is a need to develop expressive and quantifiable concepts of project success.

Moreover, perspectives on the performance also differ through industries (Chan and Chan, 2004). Ngacho and Das (2014) concluded that the empirical findings and subsequent analysis suggested that the performance of development projects does not simply depend on the traditional internal criteria of time, cost and quality. It also depends on another internal measure, *safety*, and two external measures, namely *site disputes and environmental impact*. Study carried out by Muller and Jugdev's (2012), foucsed on the improvement of the project success literature over the last ten years, precisely summarises this issue by declaring that it is a multidimensional and networked concept. Both emphasise that viewpoints of success and the relative significance of success dimensions vary "*by individual personality, nationality, project type, and contract type"* (Muller and Jugdev's 2012, p. 768). Mir and Pinnington's (2014) recommendation, from their study of project-based organisations, is that they must capitalise in a project management performance to increase the possibility of accomplishing success of the project. Mir and Pinnington, (2014), concluded that the relationship between project management performance and success of the project is extremely dependent on the subjective and objective nature of how project success is understood and defined

3.6 TQM and project management performance (P M Performance)

The most important aspect in project management is PM Performance, which is a dynamic issue. Practitioners and academicians have comprehensively studied how various aspects effect the success of the project management. Researchers and practitioners approached another way for using established models from other management fields, such as TQM. The complementary nature of TQM and project management (Broetzmann *et al*., 1995; Choi and Eboch, 1998; Hides *et al*., 2000;

Bryde, 2003a) provides some explanation for implementing TQM-based models such as EFQM (EFQM 2011). Examples of models adapted from EFQM to the project management environment are the PM Performance Assessment Model proposed by Bryde 2003a and the PM Excellence Model proposed by Westerveld (2003).

Tatikonda and Rosenthal (2000) showed how several degrees of flexibility and formality employed during the execution phase of the project effect the final project success. PMI (2004) stated that the main aspects for measuring performance of the project management are cost, schedule, and performance. In brief; it assesses and controls project execution within budget, on time, while meeting performance. Applying and watching nonstop improvement is a significant challenge for evolving project management performance (Meredith and Mantel, 2003). Jung *et al*. (2009) carried out a study which showed positive and important path coefficients between the TQM practices and the project management performance domain designate a solid effect of the TQM practice on project management performance. Mir and Pinnington (2014) concluded that there is an inadequate understanding of the relationship between project management performance and Project Success.

Jung and Wang (2006) concluded that soft TQM elements have stronger influences toward Continuous Improvement of International Project Management (CIIPM), however hard TQM practices also have important parts. Amongst the four TQM practices studied, the comparative strength of each practice in the direction of CIIPM is classified in the order of: employee relations, leadership, product/process management, and customer/supplier relations, from the toughest to the weakened. The results of the study endorse the conclusions of Bullock and Rahman's (2005) which found that the organisational performance (i.e. customer satisfaction, employee morale, productivity performance, delivery performance, etc.) is pointedly influenced by soft TQM practices (i.e. workforce commitment, shared vision, customer focus, etc.), however also influenced by hard TQM practices (i.e. computer based technology, technology utilisation, etc.) to a certain level. The study outcomes propose that companies need both soft and hard TQM practices. Both practices make significant assistances towards developing international project management performance. Nixon *et al.* (2012) concluded that the leadership performance is a crucial factor to a project's success.

The overcoming of obstacles is always the intention of project managers. Hides, *et al*. (2000) concluded that the awareness of major propositions of TQM philosophy can help to overcome the obstacles to effective project management. From the literature it is obvious that TQM and project management are two crucial management approaches employed in organisations and companies for achieving continuous improvement and organisational success (Bryde, 1997). Project management is set up to be an operative tool for achieving the strategic aims and objectives of organisations (Kerzner, 2003), managing the change in the organisations (Bryde, 2003b; Maylor, 2001) and methodical planning, execution and control of events in a methodical manner (Meredith and Mantel, 2003). From the literature, it is very obvious that there is a two-way connection exists between project management and TQM approach (Broetzmann *et al*., 1995; Choi and Eboch, 1998). Project management is known as an operative methodology for employing TQM elements in organisations. Likewise, TQM acts a role in offering an environment which enables organisations and companies to make use of project management (Bryde, 1997, 2003a, 2003b). These outcomes offer a foundation for measuring project management practices using known TQM practices. There is a certain point of agreement among a group of researchers that the EFQM model, based on the TQM philosophy, is a real performance valuation model (Neely *et al*., 2007; Sandbrook, 2001). Subsequently, the researchers can claim that the EFQM model be usefully applied to the assessment of project management performance by adapting it to the project management atmosphere.

Bryde (2003a) connected TQM and project management practices suggesting a model based on the EFQM model called the 'Project Management Performance

Assessment (PMPA)’. In PMPA replace the nine criteria used in the EFQM model by five criteria which are PM leadership, PM staff, PM policy and strategy, PM partnerships and resources and project life cycle management process and Key Performance Indicators (KPIs). The PMPA model is presented in Fig. (3.8). Mir and Pinnington (2014, p204) cited the explaniations of The PMPA model as done by Bryde (2003a) as follows: The PMPA model is presented in Fig. (3.8).

1. *PM Leadership: Focuses on*

- *development and promulgation of awareness of the role of projects as a vehicle for managing all types of change*
- *ensuring that PM system supports the development of open, two-way partnerships with customers and suppliers and a shared, common project language culture.*

2. *PM Staff: Emphasises*

- *the planning and management relating to PM staff to increase its project management capability by maximising the potential of project-related human resources*
- *the extent to which the management of PM staff incorporates methods for rewarding performance relating to project management.*

3. *PM Policy and Strategy: Focuses on how the development of project management, across an organisation, is introduced in a planned and systematic fashion ensuring the linkage between strategic, organisation level and the tactical, project level.*

4. *PM Partnerships and Resources: Emphasises:*

- *The role and importance of win–win partnerships between all stakeholders*
- *Effectiveness of such partnerships on project management strategy*

5. *Project Lifecycle Management Processes: Incorporates processes which are required to manage the whole project life cycle*

6. *PM Key Performance Indicators (KPIs): Focuses on*

- *KPIs to indicate results achieved in relation to meeting the requirements of project stakeholders*
- *The methods used within the project management system to improve performance against the KPIs.*

A number of scholars have studied the relationship between TQM practices and firm performance (e.g. Kaynak, 2003; York and Miree, 2004; Rahman and Bullock, 2005; Fuentes *et al.*, 2004; Sadikoglu, 2004; Prajogo and Sohal, 2006; Chong and Rundus, 2004; Kannan and Tan, 2005; Nair, 2006). Some scholars (Prajogo and Sohal, 2004; cf. Prajogo and Sohal, 2001; Kaynak, 2003) suggest that the effect of each TQM practice on the various types of performance measures is different and only certain TQM elements differentiate high and low performing organisations. Zehir and Sadikoglu (2010) concluded that their study had found a positive relationship between TQM and various performance measures, and literature supports the findings and, despite the negative arguments about the relationship between TQM and innovation in the literature, they have found that TQM practices are significantly and positively related to innovation performance in the firm.

The link between TQM and project management in many circumstances has been seen and analysed from two main standpoints (Bryde 1997); one is the use of the principles of project management as an agency for the unbeaten implementation of a TQM Programme. The other is when individual quality improvement has been seen as smaller projects within the milieu of the total quality improvement programme. Maylor (2001) states that it is necessary now to develop and adopt new models. Empirical studies show that TQM has been abundantly inaugurated in successful PM

(Pelligrinelli and Bowman 1994; Hides *et al*. 2000); this shows that mixing the PM and QM fields gives success to the outcome. Day-by-day introduction of TQM helps us to make better approaches to enhance the PM performance. The concepts of TQM not only help to synchronise the requirements of key project participants but at the same time TQM also contributes in other areas which can contribute to the deployment of successful project management (Qureshi *et al*., 2009).

TQM methodology can provide a guideline where an organisation can improve its performance on future projects by reviewing the performance of past projects (Stamatis, 1994). TQM creates a no-blame culture amongst project leadership (Kotnour]). QM models have been modified to assess project and PM performance. Furthermore, many models have been customised in the PM context. Among them some models which map organisational unfolding with respect to the maturity of QM are customised (Humphery, 1989; Dale *et al*., 2007.; and Crosby, 1984) and other models which use self-assessing technique are customised, e.g., Malcolm Baldridge National Quality Award (MBNQA). It is very obvious that the literature in the field of relationships between TQM practice and project management performance is very limited in comparison with studying the relationship between TQM practices and firm performance or organisation performance. This conclusion encouraged the author to go further with study to investigate the relationship between the TQM practices and project management performance.

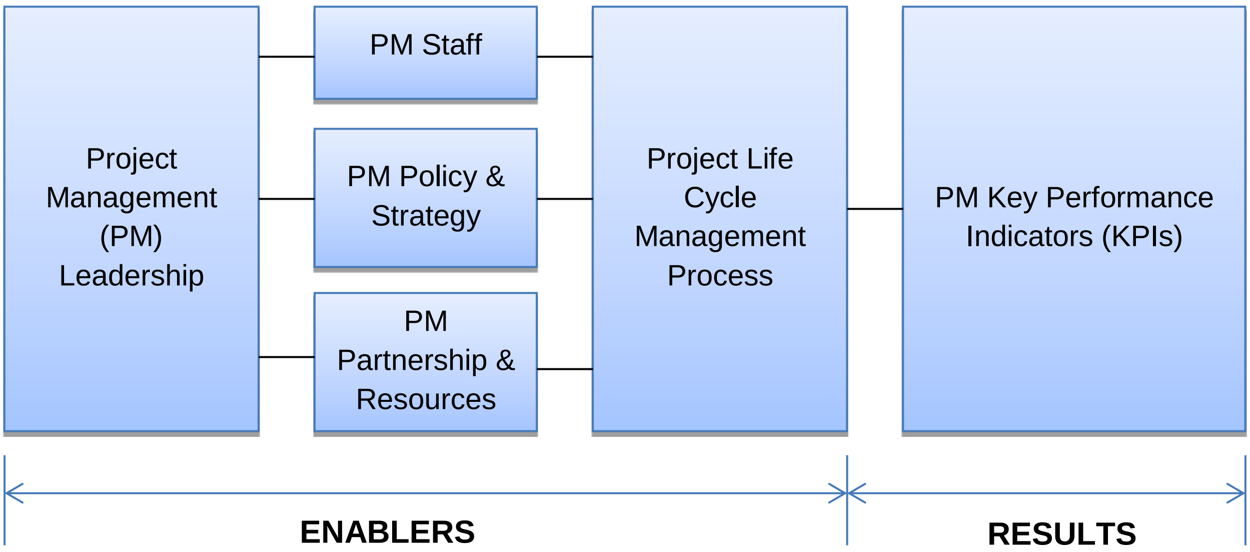

Fig 3-8 The PMPA model

Source: Bryde (2003a, p. 233)

Moreover, Basu (2014), highlighted the significance of quality system in project life and managing quality in projects, and summarised his conclusion in the following points:

Quality management systems and procedures:

- Formal quality management systems and procedures for the project team should be in place before the implementation phase of the project.
- The quality management systems and procedures for suppliers/contractors should also be established supported by a structured training process.
- Quality management systems and procedures should follow the guidelines of PRINCE2 or PMBOK, and also the proven practices of company standards and delivered projects.
- The training programmes have helped to inculcate a quality management system.

Quality audit and compliance

Official quality audit processes must be in place covering the three realms of: 1) design conformance, 2) process conformance and 3) supplier deliverables. It is indispensable that audit processes are clarified and communicated to project teams and suppliers before the initiation of any audit. Audit teams must include members from the areas of quality, safety and the project team, moreover to contractors and users as appropriate (Basu, 2014).

The audit process should be well supported by effectively designed documents, checklists, reports and continuous improvement.

Performance management

A performance management system should be structured around the principles and four aspects of the Balanced Scorecard. The key performance indicators should reflect both enabling and delivered measures. It is vital that a performance management system spans across project groups and key suppliers. It should be aligned with gateway or milestone reviews (MSP, 2007) and also with audit, self-assessment and continuous improvement.

Through the author's experience as a project manager, it was found that it is possible to take advantage of total quality management practices to enhance the performance of projects, for example, Motivations, Top management Involvement, Benchmarking, Supplier Management and Customer Focus. Bryde and Robinson (2007) carried out an exploratory survey study focused on investigating whether there was a link between the focus of project management practices and the existence of TQM practices. The study concluded that a link was established between customer-focused and project management practices and they recommended an in-depth study to understand the relationships and interactions between TQM elements and project management practices.

3.7 Hypotheses formulation

The main goal of the research is to investigate the relationship between TQM practices and PM performance in oil and gas related projects. The literature review designates an important positive relationship between TQM practices and PM performance. This clue to the following hypothesis:

*H1.*There is a significant positive relationship between identified TQM practices and PM performance in oil and gas industry related projects.

To know the relationship of each TQM practice on PM performance in oil and gas companies and organisations, the following hypotheses will be uitilised and tested.

Project Management Process

Project management is one of the serious processes of any project. This is due to the fact that project management is the fundamental process that links all other project activities, actions and processes together. Mir and Pinnington (2014) noted that the organisation's future success is impressively effected by development management process and systems employed in the company and organisation. This concluding statement is a significant lesson for company leadership and project managers as well as they can guide in organizing for the future and maintainable and sustainable long-standing success by participating in process and systems. Bryde (2003a) connected TQM and project management practices suggesting a model based on the EFQM model called the 'Project Management Performance Assessment (PMPA), project management process is playing an essential part of the model.

. In this regard, the project management process becomes an essential practice to achieve maximum project performance.

H1. Project Management Performance for TQM practices is positively associated with PM performance.

Top Management Involvement

Management leadership is an important factor in successful TQM implementation, as documented by quality experts (Deming, 1982; Juran, 1988). Previous studies in TQM practices stress the crucial role of top management involvement in guiding overall TQM employment in the organisation (Talib. *et al*., 2012; Zehir and Sadikoglu, 2010; Zakuan *et al*., 2010; Teh *et al*. 2008). Teh *et al*. (2008) concluded that the high-ranking leaders and management direct the organisation and evaluate the organisational performance. Kanji (2001) declared that top management involvement is the essential driver of business excellence. Tarí *et al*. (2007) concluded that the leaders play a critical role as drivers of TQM towards high performance. In this sense, top management involvement acts as a driving force of TQM implementation by creating values, goals and systems to achieve maximum performance and pursue continuous improvement. Consequently, it is suggested that:

> *H2*. Top Management Involvement for TQM practices is positively associated with PM performance.

Benchmarking

Benchmarking is one of the most common approaches that can be used for performance management. Benchmarking can be defined as the pursuit for and analysis of industry best practices that guide to higher performance (Rao *et al*., 1999). Benchmarking is the practice of correlating performance data within the organisation and outside the organisation as well. Talib *et al*. (2012) concluded in their study that benchmarking is one of the determinant TQM practices that play a critical role in achieving quality performance. Shan *et al*. (2013) reported that the benchmarking practices improve the organisation's operational process that leads to increased organisational performance. Sit *et al*. (2009) noted that the benchmarking measures organisation's operations or processes in contrast to the top class performers from inside the industry and outside as well. Furthermore, Luu *et al*.

(2008) concluded that the findings of their study suggested that the benchmarking approach can help construction companies to compare their performance to competitors, to learn from good practices of others and to carry out challenges for continual development and improvement; also, the results of their study encourage practitioners to benefit from the benchmarking. Additional, Yusuf *et al*. (2007) carried out a study and concluded on emphasised the helpfulness of active benchmarking for increasing the performance of the organisation and to accomplish competitive advantage. Further, studies concluded that benchmarking empowers organisations to develop their internal systems by learning from external sources (Ahire *et al*., 1996; Baidoun, 2003; Dow *et al*., 1999; Molina *et al*., 2007; Powell, 1995). Goncharuk and Monat (2009) concluded that internal benchmarking can be of significant value in maximising enterprise productivity, yielding productivity enhancements of 18-89 percent while reducing waste by 20-49 percent. Consequently, the following hypothesis relates to benchmarking and PM performance.

H3. Benchmarking for TQM practices is positively interrelated with PM performance.

Training and Development

The purpose of training and education is to blowout the knowledge of unceasing development and novelty in the project management process to achieve maximum PM performance. Hua *et al*. (2013) reported that training significantly impacts on the Knowledge creation process that leads to quality improvement and at the end to organisational performance. Talib *et al*. (2012) noted that training and education was among the determinant TQM practices that lead to quality performance. Talib and Rahman (2010) concluded that the training and development of employees plays a critical role in maintaining high quality and performance level within the service industry. Furthermore, several studies on TQM also found a positive correlation between training and development and performance in quality performance (Ahire and Dreyfus (2000), Quazi *et al*. (1998)), in operating performance (Kaynak (2003), Anderson *et al*. (1998), Fuentes *et al*. (2006)), in marketing and financial performance (Kaynak (200 3), Fuentes *et al*. (2006)) and in employee performance (Anderson *et al*. (1995), Fuentes *et al*. (2006)). So, the subsequent hypothesis endeavours to discover connection between training and development and PM performance:

> *H4*. Training and development for TQM practices is positively correlated with PM performance.

Motivation System

Motivation is vital because of its consequence as a determinant of performance and its intangible nature. An employee's performance, which at the end leads to organisation performance typically, is influenced by motivation, ability, and the work environment. In Joy’s (2008) research he described innovation motivation as being “the need to be different” and “innovation expectancy” (Joy, 2008, p. 12). Joy (2008) defined innovation expectancy as a person’s need to employ an original method to create a novel and useful product. Chang and Chen (2013) stated that human capital is a vital asset for every company, particularly for high-tech companies that need to face ever-changing situations to stay competitive in their field. Their paper provides various reasons to support the importance of human capital in new venture creation, performance and enhancement. Empirical evidence proves that entrepreneurial experience, entrepreneurial manpower, pioneering motivation and entrepreneurial creativity directly impact either profitability and/or obvious creation. Rowland (2013) concluded that the study findings obviously indicate that both managers and employees see a potential for motivation of the teamwork enhancing performance.

Consequently, the next hypothesis endeavours to find a relationship between motivation and PM performance:

H5. Training and development for TQM practices is positively correlated with PM performance

Customer Focus

An organisation must acknowledge requirements of their customers, be approachable to customer demands and needs and measure satisfaction of the customers over the implementation of the TQM within it (Zakuan *et al*. 2010; Zhang, 2000). Further, several studies on TQM also concluded that the customer focus correlated positively with performance, in quality performance (Prajogo and Sohal (2004), Grandzol and Gershon (1997), Ahire and O'Shaughnessy (1998), Nair (2006), Feng *et al*. (2006)), in operating performance (Fuentes *et al*. (2004, 2006), Nair (2006), Cua *et al*. (2001), Flynn *et al*. (1995)), and in innovation performance (Prajogo and Sohal (2004), Hung *et al*. (2011)). This practice assesses the level of customer contact, customer orientation and customer responsiveness. Accordingly, the following hypothesis relates to customer focus and PM performance.

H6. Customer focus for TQM practices is positively correlated with PM performance.

Supplier Management

Operative supplier management can be accomplished by cooperation and longstanding relationship with the supplier (Zakuan *et al*. 2010). Zineldin and Fonsson (2000) concluded that developing supplier partnerships and longstanding associations can escalate the organisation's competitiveness and, hence, improve performance. Moreover, several studies on TQM noted that supplier management correlated positively with performance, in quality performance (Kannan and Tan (2005), Ahire and O'Shaughnessy (1998), Ho *et al*. (2001), Cua *et al*. (2001), Quazi *et al*. (1998)), in operating performance (Kaynak (2003), Nair (2006), Flynn *et al*. (1995), Fuentes *et al*. (2006)) and in project performance (Shieh and Wu (2002)).

Consequently, the following hypothesis is suggested:

H7. Customer focus for TQM practices is positively correlated with PM performance.

Process Management

Process management contributes to performance by lessening process variance, which leads to fewer products being scrapped and modified. This argument has been supported by a number of studies (Cua *et al*. 2001; Kaynak 2003 and Yeung *et al*. 2005). Process management is a scientific methodology in which whole of the resources of an organisation are uitilised in the most effectual and effective manner to attain the wanted performance (Sit *et al*. 2009). Motwani (2001) reported that process management emphasises the value added to a process, improving the productivity of every employee and increasing the quality of the performance of the organisation. Moreover, a number of studies methodically examined the relationship between process management and performance, with quality performance (Flynn *et al*. (1995), Prajogo and Sohal (2004), Ahire and Dreyfus (2000), Forza and Flippini (1998), Choi and Eboch (1998), Quazi *et al*. (1998), Feng *et al*. (2006)), with operating performance (Flynn *et al.*, (1995), Fuentes *et al.*, (2006)), market and financial performance (Wilson and Collier, 2000, Nair (2006), Ahire and Dreyfus (2000)) and innovation performance (Prajogo and Sohal (2004)). The results of the studies revealed a positive relationship between them. Consequently, the subsequent hypothesis is suggested:

H8. Process management for TQM practices is positively correlated with PM performance.

Grounded on the above review of the literature, a conceptual framework has been established and a examination model has been suggested to investigate the relationship between TQM practices and PMP in the oil and gas industry related projects. The proposed TQM conceptual framework is shown in Figure 3-9 below.

This research model suggested that the better the extent to which these TQM practices are present, the higher the project performance in the oil and gas industry will be accomplished. In this framework, the independent variables are TQM practices and the dependent variable is project performance.

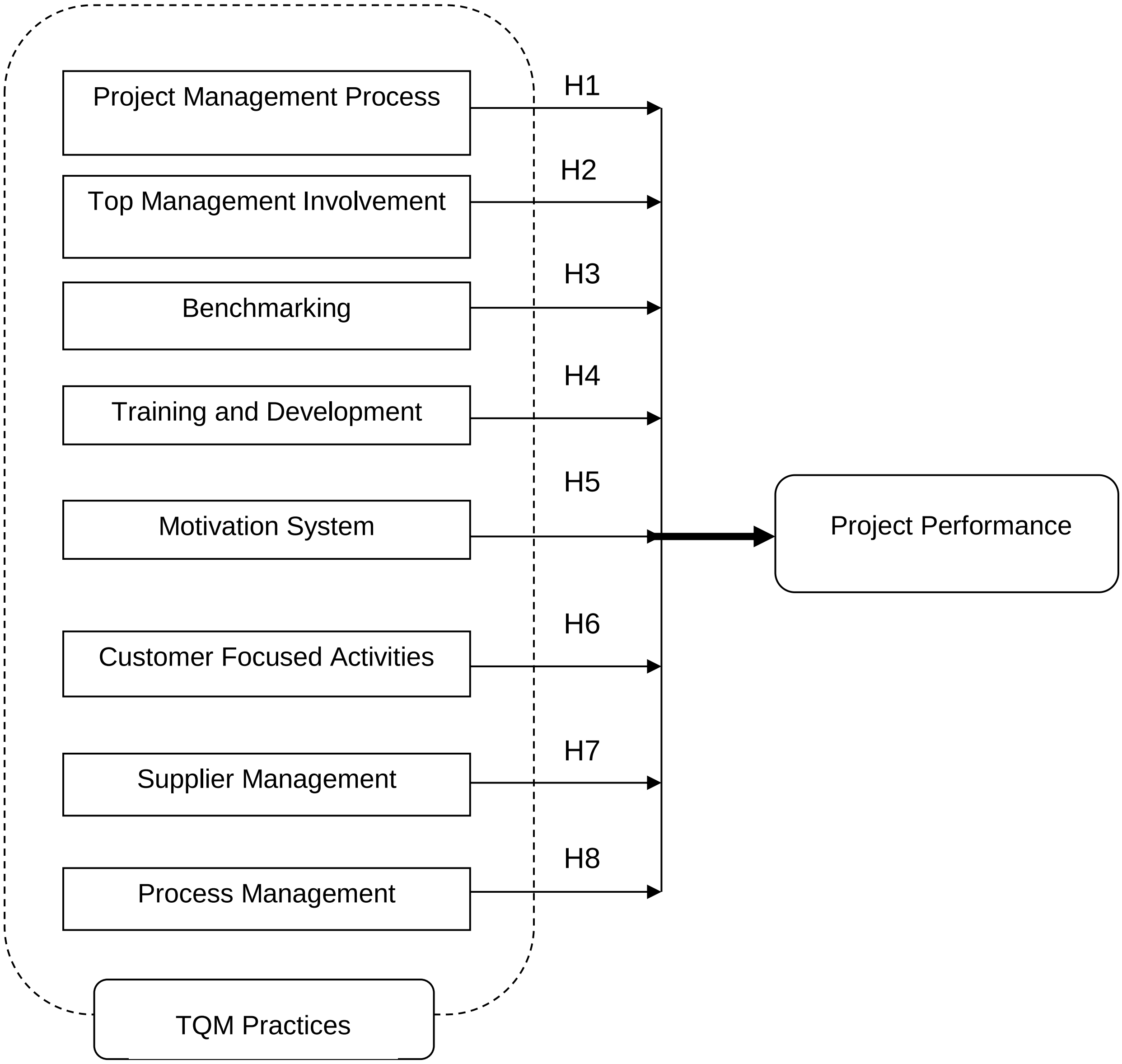

Figure 3-9: A conceptual framework of the relationship between TQM practices and Project performance

3.8 Summary

This chapter began with a review of descriptions and importance provided by professionals and researchers around the world in literature which is available in the public domain for the perception of quality and that of TQM. Section 3.3 covers a historical review about the quality movement began with quality specialists Deming, Juran, Crosby, Feigenbaum, Ishikawa, Taqushi and others, and ended with quality prizes. Also covers quality planning, quality control, quality assurance and quality management system.

In order to arrive at an understanding of the relationship between TQM and performance in general, section 3.4 presented an inclusive review of literature on how quality management has an effect on performance thorough a literature investigation of the definition and understanding of project and Project Management Performance (PMP), which shows the project success models. Finally, although there has not been much research conducted on the relationship between TQM and PM performance, a review of literature was presented in section 3.6 to see the exact effect of TQM practices on PM performance.

Founded on the literature, the TQM and its key practices must not be responsible for any disappointment or failure of project performance; it is more being short of understanding of what TQM practices mean for each unique organisation and how to implement them successfully, to achieve maxim project performance. TQM can be a influential tool by which organisations can accomplish excellence in business performance.

The next chapter, Chapter four, will present the research methodologies and design.

CHAPTER FOUR

4 Research methodology

4.1 Introduction

Research has been portrayed as an investigation into a problem that necessitates a solution based on a systematic and organised effort (Neuman 2006). Leedy and Ormrod (2005) described research as a way of increasing the understanding of a phenomenon through a methodical process of collecting, analysing, and interpreting information (data). On the other hand, they described research methodology as a way to extract meaning from data. Fellows and Liu (2008) defined research methodology as "*the principles and procedures of the logical thought process which are applied to a specific investigation*". Remenyi *et al*. (1998) suggested that the main drivers for selecting a suitable research methodology are: the issue to be researched, the key research questions and the availability of resources. On the other hand, robust research must be meticulous, systematic, integrated and focused whatever the method chosen (Peters and Howard 2001). This chapter presents the fundamental concepts and a principle associated with research methodology and outlines the strategy taken on board for this research in order to achieve its aims and objectives. It also explains the rationalisation for selecting the interviews and launching the interviews as well as designing and piloting the questionnaire. Also, the methods and techniques adopted for data collection, analysis and interpretation are also presented.

4.2 Research definition and purpose

Before the decision is taken on which research methodology will be used, it is vital to obviously describe the research application and its purpose (Creswell and Plano Clark, 2007). Ghauri and Grønhag (2005) designate research as the procedure of developing, accomplishment and examining an inquest about phenomenon or experience to find and suggest solutions or strategies to improve the existing circumstances. This study aims to explore the relationship between PMP and TQM practices in the oil and gas industry.

According to Cameron and Price (2009), the purpose of research is to improve applied methods and applications which are well versed from a range of information sources in organisations that are in force and dependable. Easterby-Smith *et al.* (2012) highlight that business and management research is a methodical process to explore information and knowledge to improve daily performs in these fields. The main role of research in social sciences, as said by Frankfort-Nachmias and Nachmias (2007), is to increase and improve the knowledge of what is already known about the case, which is also mentioned to as the '*body of knowledge'* on a certain subject. Ghauri and Grønhaug (2005) classify that a main feature of the research process is that the methodological and philosophical positioning of the researcher relates to the purpose and inquiry being tested and examined.

4.3 Research philosophy

The meaning of philosophy is *the love of wisdom*; this is derived from the Greeks (Cavalier 1990). Ruona (2000) pointed out that philosophy entails thinking about questions, giving interpretations, trying out ideas and thinking of strong arguments for and against and wondering how concepts indeed work. It also provides a structure for thinking, helps to expand areas of thinking and improves the alignment between what we think and what we do (Paul 1993; Honderich 1995). As Easterby-Smith *et al.* (2003) noted, there are three key crucial factors for understanding the philosophical issues of research: clarification of the research design; identification of the suitable design; and supporting the researcher in identifying the design or the value of other designs, particularly those that might have been disqualified in his/her past experience. The two main philosophical positions of social research and, by extension, most construction management research, are ontological and epistemological considerations (Bryman, 2008), which are discussed in more detail below.

4.3.1 Ontological considerations

Ontology relates to the nature of reality and its qualities (Creswell, 2007). In this case, a researcher uses quotes and themes in the words of the participants and then seeks to give proof of dissimilar perspectives and experiences. Grbich (2007) disputed that ontology is related to accomplishment of knowledge about the nature of being and reality. Bryman (2008) pointed out that ontological considerations are concerned with two positions: objectivism and constructivism. Objectivism emphasises that social phenomena and their meanings depend on an existence free of social actors. Conversely, constructivism confirms that social phenomena and their meanings are constantly being achieved by social actors. Similarly, Fitzgerald and Howcroft (1998) indicated that there are two types of ontological position: the realist and the relativist. The realist position views the external world as comprising hard and tangible structures that pre-exist independently of an individual's ability to acquire knowledge about them; it is considered practical and not concerned with an abstract or idealistic view of life. However, the relativist position observes reality as being directed by socially transmitted terms and diverges according to language and culture. It holds the existence of multiple realities as subjective constructions of the mind. In this view, ideas such as right and wrong, goodness and badness, or truth and falsehood could vary from culture to culture and situation to situation.

4.3.2 Epistemological considerations

To choose the research design and analytical processes, it is important that the researcher is capable of distinguishing which of the epistemological traditions she/he has chosen to work within (Grbich 2007). Epistemological subjects deal with questions of knowledge tolerability within a discipline. They are associated with "how we know" and the methods by which knowledge is achieved (Bryman 2008). Nevertheless, epistemological positions fall into broad categories such as positivist or interpretivist (Love *et al.* 2002). With an epistemological statement, researchers should aim to get as close as possible to the participants being studied and stay longer in the field so as to understand the participants' issues (Creswell 2007).

Constructivism and interpretivism

According to Creswell (2007), the constructivist position is often joined with interpretivism. Thus, meanings are formed through interaction with others through individuals' lives. Similarly, Grbich (2007) indicated that constructivism and interpretivism assume that there is no objective knowledge free of thinking; consequently, knowledge is constructed mutually in interaction by the researcher and the participants, in contrast to objectivism and positivism. Fellows and Liu (2008) argued that reality is constructed and derived by observations and perceptions to classify truth and reality from the participants' collective perspective. According to constructivism and interpretivism, there is not only one reality, but numerous realities, so a collective mentality is constructed and that is likely to develop over the course of time (Guba and Lincoln, 1994). Creswell (2007) argued that, in these positions, individuals search for understanding of the situation in which they live and work, in order to develop subjective meanings of their experiences that lead to certain objects or things. The range and multiplicity of meanings leads the researcher to focus on the complexity of views instead of a few categories or ideas. In such a position, more open-ended questions are better, as the researcher listens attentively to the interviewee and also asks probing questions when necessary. Consequently, interpretation can be made through findings and is also shaped by interviewees' experiences and background.

Grbich (2007) highlighted the major characteristics of constructivism and interpretivism, which are as follows:

- the research focus is on exploration of the way people interpret and make sense of their experiences in targeted situations to know the impact of these situations on constructed understandings;
- the researcher constructs and imposes understandings through interpretation which is limited by the framework derived from his/her experiences in these situations: and

- subjectivity and inter-subjectivity depend on the researcher's constructed views and the reconstruction of views through interaction with others, which are all of interest.

Significantly, these positions are more likely to feature in qualitative studies (Royer and Zarlowski, 2001; Creswell, 2007; Grbich, 2007; Fellows and Liu, 2008; Bryman, 2008).

Positivism and Post-positivism

The main impression of positivism is that the social world exists externally, and that its belongings should be measured through objective methods, rather than being inferred subjectively through sensation, reflection or intuition (Easterby-Smith, *et al*. 2012, p.22). August Comte (1853, p.3) was the first person to encapsulate this view by

Saying: *"All good intellects have repeated, since Bacon's time, that there can be no real knowledge but that which is based on observed facts."*

This statement contains two assumptions: first, an ontological assumption, that the reality is external and objective; and second, an epistemological assumption, that knowledge is only of significance if it is based on observation of external reality. Bryman and Bell (2011, p. 15), stated that positivism is an epistemological position that advocates the application of the methods of the natural science to the study of social reality and beyond. But the term stretches beyond this principle, though the constituent elements vary between authors.

Bryman and Bell (2011, p. 15) mentioned five key concepts of positivism:

1. Only phenomena and hence knowledge confirmed by the sense can genuinely be warranted as knowledge (the principle of phenomenalism).

2. The purpose of theory is to generate hypotheses that can be tested and that will thereby allow explanations of law to be assessed (the principle of deductivism).
3. Knowledge is arrived at through the gathering of facts that provide the basis of laws (the principle of inductivism).
4. Science must (and presumably can) be conducted in a way that is value free (that is, objective).
5. There is a clear distinction between scientific statements and normative statements and a belief that the former are the true domain of the scientist.

The last principle is implied by the first because the truth or otherwise of normative statements cannot be confirmed by the senses.

As a result, positivism shows the role of research as the grouping of empirically verifiable data which can be used to obtain generalizable propositions that can be thoroughly tested in order to arrive at laws or theories. In order to arrive at these laws or theories, positivists tend to take up statistical analysis which entails large sample sizes. This is thought to raise external validity and generalisability of the conclusions (Hair *et al*. 1987).

Table 4-1: Positivist and Interpretivist

	POSITIVIST PARADIGM	INTERPRETIVIST PARADIGM
Basic beliefs:	• The world is external and objective • Observer is independent • Science is value free	• The world is socially constructed and subjective • Observer is part of what is being observed • Science is driven by human interests
Researcher should:	• Focus on facts • Look for causality and fundamental laws • Reduce phenomena to simplest elements • Formulate hypotheses and then test them	• Focus on meanings • Try to understand what is happening • Look at the totality of each situation • Develop ideas through induction from data
Preferred methods include:	• Operationalising concepts so that they can be measured • Taking large samples	• Using multiple methods to establish different views of phenomena • Small samples investigated in-depth over time

Source: **Easterby-Smith *et al*. (1999)**

Postpositivism represents the modified view of modern science. The rationale for postpositivism inquiry is to accommodate the criticism of positivism, without losing some of its key elements. Postpositivism is marked by key works, such as Kuhn (1970) and Propper (2002 [1959]), altering how we should understand the use of science in investigating the world. Kuhn's historical analysis of the nature of scientific progress altered the way that many researchers understand how progression is made in science. Propper's considerable influence is left mainly through the concept of falsification – a key part in discrediting verificationism and positivism in latter part of the 20th century.

According to Creswell and Plano Clark (2007, p. 22), postpositivism is often associated with quantitative approaches. Researchers make claims of knowledge based on:

1. Determinism or cause-and-effect thinking;
2. Reductionism: by narrowing and focusing on select variables to interrelate;
3. Detailed observations and measures of variables; and
4. The testing of theories that are continually refined (Silf and Williams, 1995).

Realism

Easterby-Smith *et al.*, (2012, p. 345), defined realism as an ontological position which assumes that the physical and social worlds exist independently of any observations made about them. According to Bryman and Bell (2011, p. 17), realism segments two features with positivism: a belief that the natural sciences can and must put on the same kind of method to the collection of data and to explanations, and a guarantee to the view that there is an external reality to which scientists direct their attention (in other words, there is a reality that is separate from our descriptions of it). In many respects, realism falls between the two ends of positivism and interpretivism on the band of research approaches (Figure 4.1). Realists share with positivists the belief that a reality exists outside and free of human thoughts and beliefs (Saunders *et al*., 2003). Within the social sciences, this external reality is reflected in the existence of large-scale social forces that impact on people, in spite of whether or not they are alert to the existence of these social forces. On the other hand, realists also realise that human beings are not merely scientific objects that can be studied but that socially constructed beliefs will impact on their behaviours and interpretations of events (Saunders *et al*., 2003). In this regard, realists share some of the same values as interpretivists. Thus, realism makes a less ambitious attempt than positivism to prove true knowledge since some social phenomena are context dependent, making them difficult to measure. Nevertheless, realists try to label and measure these phenomena, taking into account the social forces that may affect any resulting findings (Fisher, 2004).

Within the realism school of thought, critical realism goes further by arguing that there are diverse layers to our understanding of knowledge. Bhaskar (1975), who first developed the theory of critical realism, argues that there are three levels of reality. Experience forms the first, and also the most limited level of reality; this is what is seen on a personal level but does not essentially reflect reality. At the second level, events are things that a person does not have first-hand experience of but interprets through their own experiences. Ultimately, at the innermost level, mechanisms are the reason for the occurrence of events, as events do not happen out of nothing. A quality of this third and most complex level is that, while there is an awareness that mechanisms exist, they cannot be directly experienced and can only be logically inferred (Fisher 2004).

Consequently, the main driver for critical realists is an effort to unearth the deep mechanisms that lie beneath the reality which is seen and observed. Bhaskar (1989, p. 2) argues that *"we will only be able to understand – and so change – the social world if we identify the structures at work that generate those events and discourses".*

It is vital to note at this point that it would be naïve to presume that any researcher within a particular school of thought would concur completely with all the characteristics of that particular school of thought. The central tenets of the above research approaches have been developed over time and have collectively come as one to represent the different philosophies (Easterby-Smith *et al*., 2002). The philosophies in themselves show varying degrees of extremism portraying different characteristics. This continuum is shown in Figure 4-1 below.

Approach to Social Sciences					
Positivist				Interpretivist	
Reality as a concrete structure	Reality as a concrete process	Reality as a contextual field of information	Reality as a realm of symbolic discourse	Reality as a social construction	Reality as a projection of human imagination

Figure 4-1: Objective – Subjective Continuum

Source: **Morgan and Smircich (1980)**

Pragmatism

Originating in the writings of early twentieth-century American philosophers, particularly William James ([1907] 1979) and John Dewey (1916), according to Saunders *et al.* (2007, p. 607), pragmatism is an ontological position that argues that the most important determinant of the research philosophy adopted is the research question, arguing that it is possible to work within both positivist and interpretivist positions. It applies a practical approach, integrating different perspectives to help collect and interpret data. Easterby-Smith stated that pragmatism is often seen as a compromise between internal realism and relativism: it does not accept that there are pre-determined theories or frameworks that shape knowledge and truth; nor can people construct their own truths out of nothing. Pragmatism is a valuable perspective in management research because it focuses on processes that are particularly relevant to studies of knowledge and learning (Easterby-Smith *et al*., 2012, p. 32). Pragmatism is the best paradigm that provides a foundation for mixed methods research (Creswell and Plano-Clark, 2007). Tashakkori and Teddlie (2003) suggested that at least 13 different authors embrace pragmatism as this worldview or paradigm for mixed methods research.

Table 4-2: Common Elements of Worldviews and Implications for Practice

Approach	Ontology *(What is the nature of reality?)*	Epistemology *(What is the relationship between the researcher and that being researched?)*	Methodology *(What is the process of research?)*
Pragmatism	Singular and multiple realities(e.g., researchers test hypothesis and provide multiple perspectives)	Practically (e.g., researchers collect data by “what works” to address research question)	Combining (e.g., researchers collect both quantitative and qualitative data and mix them)

Source: Creswell and Plano Clark (2007, p. 26)

Table (4-3) below lists the recent major studies of quality management practice and performance in different sectors and organisations, the quantitative approach appear to be the dominant in the studies. By adopting a mixed method approach the author preferred to have another way of investigating the phenomena and to have a wider view about it.

Table 4-3: The recent major studies of quality management practice

Study	Year	Country	Sample Size	Nain Findings	Methodology
* Asrilhant *et al.*	2004	Brazil and UK	9	The study revealed the importance of strategic PM for the Oil and Gas sector	Interview
Rahman & Bullock	2004	Australia & New Zealand	962 of 3000	They found considerable variation in the positions when defining cash resources used in cash flow statements	Questionnaire
Asrilhant *et al*.	2005	Brazil & UK	31 Companies	The overall research finding was that, there is a gap between managers' practices and elements of successful strategic PM.	Mixed
Soltani *et al*.	2006	UK & China	150 companies	The survey evidence (from both questionnaire and interviews) showed that only a minority of respondents were satisfied with their TQM programmes	Mixed
Bryde & Robison	2007	UK	176 out of 1200	They showed there is the existence of a link between TQM and PM practices in some practices and no link in others.	Questionnaire
*Kumar *et al*.	2008	Canada	14	The study provides useful insights on performance measurement by the most recognised TQM adopters in Canada	Interview
Jung *et al*.	2009	USA	268 of 650	Analysis of the results revealed of a strong influence of TQM practice on PMP.	Questionnaire
Sadikoglu & Zehir	2010	Turkey	373 out of 500	The results of the study illustrated the importance of continued efforts toward implementing TQM practices in firms by revealing the positive impacts of effective TQM practices on innovation performance, employee performance and firm performance.	Questionnaire
Agus & Hassan	2011	Malaysia	169 was derived from the Federation of Malaysian Manufacturing Directory-FMM	The findings of this study advise that TQM would be able to shore up and put emphasis on production performance as well as to increase the level of customer related performance. TQM would no doubt improve the process of producing value added products.	Questionnaire
Talib *et al*.	2013	India	600 from four Indian service industries	The study found 12 TQM practices (top-management commitment, customer focus, continuous improvement and innovation, supplier management, employee involvement, information and analysis, process management, human resource management, strategic planning, employee encouragement, product and service design, and communication) to be partially influencing the company's quality performance.	Questionnaire

4.3.3 Exploratory research

Sheilds and Rangarjan (2013, chapter 5) defined exploratory research as research conducted for a problem that has been clearly defined. It is often before we know enough to make conceptual distinctions or posit an explanatory relationship. Exploratory research helps to:

- Decide the best research design
- Data collection method and
- Selection of subject.

Saunders *et al*. (2012, p. 670) defined exploratory study as research that aims to seek insights into phenomena in a new light. It is particularly useful if the researcher wishes to clarify understanding of the problem to be researched. There are several ways to conduct an exploratory study. These include a search of the literature, interviewing experts in the subject to be researched, conducting in-depth individual interviews or conducting focus group interviews. Saunders *et al*. (2012, p. 171), stated the advantages of exploratory research: that it is flexible and adaptable to change. Exploratory research becomes useful, if the researcher wants to formulate a more precise problem or to develop a hypothesis. One of the main purposes of it is finding anything new in any subject arena and it always tries to shed some light on the unknown domain of knowledge. This kind of research also helps to generate new discipline in sciences and to identify problems of those particular research areas. Exploratory study may be concerned with a wide focus but this will become narrower as the research progresses.

Oyegoke (2011) stated that the constructive research question can be phenomenon driven or theory driven or a combination of the two. Constructive research is mainly, done by many technological corporations in order to find new/alternative solutions to any particular crisis or problems. For example, renewable energy research or development of the capacity of optical fibres may fall into this category of research as well as computer science. This type of research demands a form of validation that does not need to be quite as empirically based as in other types of research like exploratory research. However, the conclusions have to be objectively argued and defined. This may involve evaluating the "construct" being developed analytically against some predefined criteria or performing benchmarking tests with the prototype.

4.3.4 Constructive research

The constructive research approach suits the future directions of project management in temporary organisations in the area of expectations, action and learning in project settings, as advocated by Packendorff (1995). Winter *et al*. (2006), suggested that the constructive research approach can be used to achieve further directions in project management in the areas of understanding and addressing problems associated with project complexity. Oyegoke (2011) concluded that the constructive approach adds to the existing body of knowledge, shows proof of logic, embodies a mastery of thorough research methodology and contains evidence to support the applicability of suggested solutions in practice. The constructive research approach deals with the art and practice of managing a project and advances the perspective of PM research by enabling a design construct based on the needs of various ranges of stakeholders and providing a means of evaluating and testing the construct in terms of its relevance and usefulness to stated objectives.

4.3.5 Empirical research

Empirical research is a way of gaining knowledge by way of direct and indirect observation or experience. It is also defined as research based on observed and measured phenomena and derives knowledge from actual experience rather than from theory or belief. Empirical evidence can be analysed quantitatively or qualitatively. Through quantifying the evidence or making sense of it in qualitative form, a researcher can answer empirical questions, which should be clearly defined and answerable with the evidence collected. It is an observational type of research, where one observes or tests real-life data or analyses the pattern of some specific events in order to identify the nature or the class of trend that specific phenomenon maintains. Heitink (1999, p. 233) showed an empirical cycle that consisted of five items: Observation, which should include the collection and organisation of empirical facts, forming a hypothesis; Induction, formulation of a hypothesis; Deduction, deducting consequences of the hypothesis as testable predictions; Testing, which tests the hypothesis with new empirical materials; and, finally, the Evaluation, which is to evaluate the outcome of testing. This cycle is illustrated in Figure 4.2 below and it is known as A.D. de Groot's cycle.

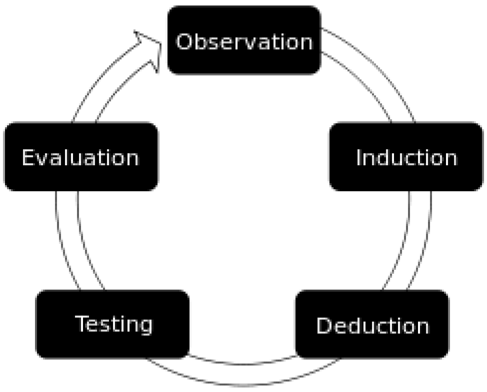

Figure 4-2: Empirical Cycle According to A.D. de Groot

Source: Wikipedia

4.4 Philosophical position of this research

The pragmatic approach allows the researcher to use the most suitable methods to make the study work (Creswell, 2009), adopting constructivist ontological and interpretivist epistemological positions as an appropriate philosophy. This research was handled in the environment of oil and gas industry projects. This context consists of many stakeholders having different experiences, ways of thinking and backgrounds. Those stakeholders are classified as owners, consultants and contractors and have a complexity of views. Therefore, multi-realities are derived through observations and perceptions to identify the truth and reality from the participants in the form of collective perspective. Creswell (2007) argued that, in such situations, more open-ended questions are better to enable the researcher to listen carefully and probe questions when necessary. Based on the aforementioned discussion, this research adopts constructivism as an ontological position and interpretivism as an epistemological position within an overall qualitative and quantitative research philosophy.

Such a philosophy is justified by the existence of different perspectives among the stakeholders in the oil and gas industry projects approach. As mentioned above, constructivist ontology and an interpretivist epistemology achieve the exploration of a situation and construct a full understanding about the situation which enables the researcher to provide an interpretation about the targeted phenomenon. They also provide a varied and multiple knowledge which leads the researcher to look for a complexity of views, rather than narrow the search for knowledge to a few categories or ideas. Additionally, this research adopts qualitative and quantitative approaches, and these positions are more likely to feature in the qualitative and quantitative approaches, which are dominant in the constructivism and interpretivism paradigms.

4.5 Research approach

Bryman (2008) highlights the usefulness of distinguishing between quantitative and qualitative research. However, this distinction is seen to be ambiguous by some writers and is seen by others as no longer useful or even simply false (Layder, 1993). Similarly, Baumard and Ibert (2001) argued that the distinction between the two approaches is both equivocal and ambiguous as it is based on a multiplicity of criteria, none of which allow for absolute distinction. However, Bryman (2008) argued that quantitative and qualitative approaches represent different research strategies and each carries with it striking differences in terms of the role of theory, epistemological issues and ontological concerns. According to Bryman (2008), the connection between theory and research, epistemological considerations and ontological considerations – quantitative and qualitative research – can be taken to form two distinctive groups of research approaches, the differences between which are outlined in Table 4.4.

Table 4-4: Fundamental differences between quantitative and qualitative approach

	Quantitative	Qualitative
Principle orientation to the role of theory in relation to research	Deductive; testing of theory	Inductive; generation of theory
Epistemological orientation	Natural science model, in particular positivism	Interpretivism
Ontological orientation	Objectivism	Constructivism

Source: Bryman (2008)

A research approach can be defined as a description of the way in which a researcher goes about doing the research, the particular style that is used and the different methods adopted. It has been referred to in the literature as the research method (Yin 2008). According to Yin (2008), the selection of an appropriate research approach should be identified on the basis of:

- The nature of the enquiry and the type of questions being posed;
- The extent of the investigators' control over the actual behavioural events; and
- The degree of focus on contemporary events.

Often, data and methodologies are inextricably interdependent. Therefore, the methodologies used for a particular research problem must always take into account the nature of the data that will be collected in the resolution of the problem (Leedy and Ormrod, 2005). Furthermore, the decision taken to adopt any particular approach depends on the purpose of the study and the type and availability of information for the research (Naoum, 2002).

The research approach is concerned with the types of evidence to be collected and the sources of such evidence, besides the process of interpretation used to obtain satisfactory answers to the questions being posed (Easterby-Smith *et al.*, 2002). However, the commonest research approaches used in business and management research are categorised into qualitative and quantitative (Cooper and Emory, 1995; Hussey and Hussey, 1997; Baumard and Ibert, 2001). Although each of these methods differs in many respects, they can complement each other (Neuman, 2006). A mixture of the qualitative and quantitative methods could be used and is referred to as triangulation.

4.5.1 Inductive and deductive

Consideration of the research approach is vital so that the theories lying behind the research design are made explicit. The researcher can then make better decisions, identify what works and embrace a research design that is suitable for coping with constraints. Induction and deduction give two different approaches to the building of theories that help in understanding, explaining and predicting business phenomena (Sekaran and Bougie, 2010). An approach that is inductive contains a process of observing data for the generation of a theory (Ghauri and Gronhaug, 2005). It has been concluded by Rubin and Babbie (2010, p. 39-40) that either deductive or inductive approaches can be used for theories to influence the research process:

> *"An inductive approach is a research process based on inductive logic, in which the researcher begins with observations, seeks patterns in those observations, and generates tentative conclusions from those patterns. A deductive approach is a research process based on deductive logic, in which the research begins with a theory, then derives hypotheses, and ultimately collects observations to test the hypotheses."*

The deductive approach then involves collecting facts for the confirmation or rejection of hypothesised relationships between variables that are deduced from already existing knowledge. So, deductive research begins with existing concepts and theories and hypotheses are formulated and later tested using empirical data; whilst inductive research begins from empirical data from which concepts, models and theories are derived (Thyer, 2010). The main differences between the two main types of research approach are shown in Table 4.5. Inductive theory is also known as building theory and it allows researchers to gain a better understanding of the nature of phenomena under study through the collection and analysis of data.

The link between theory and research is whether theory guides research (deductive theory) or theory is an outcome of research (inductive theory) (Remenyi *et al*., 1998; Bryman and Bell, 2007; Fellows and Liu, 2008; Creswell, 2009; Saunders *et al*., 2009; Gill and Johnson, 2010; Bryman, 2012), which is illustrated in Figure 4.3.

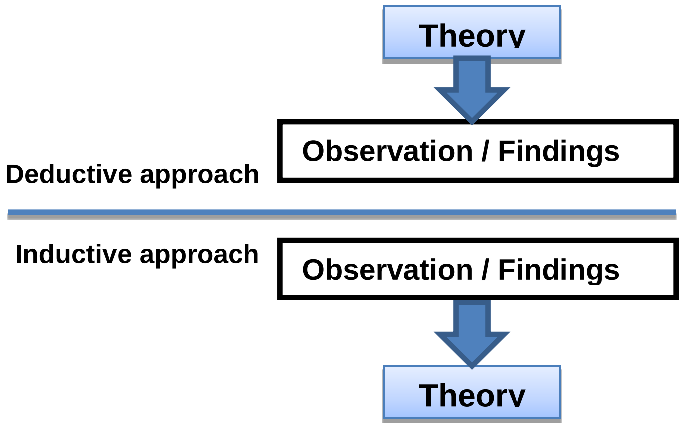

Figure 4-3 Deductive and inductive theory

Bryman (2012, p. 26)

Saunders *et al*. (2009) have proposed that it is advantageous to combine deductive and inductive approaches and so both are adopted for this research: the theoretical framework for the literature being developed using deduction, with the research aims addressed using the application of an inductive approach.

Table 4-5: Major differences between deductive and inductive approaches

Deductive approach	Inductive approach
Scientific principles	Gaining understanding of the meaning humans attach to events
Moving from theory to data	A close understanding of the research context
The need to explain the causal relationship among variables	The collection of qualitative data
The collection of quantitative data	A more flexible structure to permit changes of research emphasis as research progresses
The application of controls to ensure validity of data	A realisation that the researcher is part of the research process
The operationalisation of concepts to ensure clarity of definition	Less concern with the need to generalise
A highly structured approach	
Researcher's independence from what is being researched	
The necessity to select samples of sufficient size in order to generate a conclusion	

Saunders *et al.* (2007, p. 120)

4.5.2 Qualitative research

Qualitative research can be defined as "*an inquiry process of understanding based on distinct methodological traditions of inquiry that explores a social or human problem"* (Creswell, 2007, p.15). Qualitative research approaches follow an inductive approach in relation to theory and were originally evolved in the social sciences to enable researchers to study social and cultural phenomena. They further emphasise words instead of quantification in the collection and analysis of data (Bryman and Bell, 2007). Qualitative research is subjective in nature and is exploratory and attitudinal (Frechtling and Sharp, 1997) with researchers often depending on interpretive or critical social science and following a non-linear research path (Neuman, 2006). They operate under the assumption that reality is not easily divisible into discrete, measurable variables (Creswell, 2007). Qualitative researchers often begin their research by posing general questions rather than specific hypotheses, hence collecting vast amounts of verbal data from a small number of participants and organising it into a coherent form. Therefore they use verbal descriptions to depict the situation subjected to study (Leedy and Ormrod, 2005). With the emphasis on people's lived experience, qualitative data are fundamentally suitable for locating the meanings people place on the events, processes and structure of their lives in terms of perceptions, assumptions, prejudgments and presuppositions (Amaratunga *et al.*, 2002).

It has been realised that the language of the qualitative approach involves cases and contexts, and does not seek to represent data in quantitative form; but rather it seeks to analyse interaction, statements and transcripts with the intention of identifying patterns, links, beliefs and trends (Neuman 2006). According to Kaplan and Maxwell (1994), the purpose of understanding a phenomenon from the point of view of the participants and its particular social and institutional context is largely lost when textual data is placed in a quantified form. Similarly, Leedy and Ormrod (2005, p.133) pointed out that the qualitative approach "*is typically used to answer questions about the complex nature of a phenomenon, often with the purpose of describing and understanding it from the participant's point of view".* Additionally, they indicated that *"The qualitative approach is also referred to as the interpretative, constructivist, or post positivist approach".* A small number of, usually non-representative, cases but with focused samples are used and respondents are selected to fulfil a given requirement (Sherif, 2002). Accordingly, Bryman (2008) argued that a qualitative research approach might be adopted when:

- there is no existing research data on the topic and the most appropriate unit of measurement is not certain; and
- the concepts to be researched are assessed on a nominal scale, with no clear demarcation, and involve exploring behaviour or attitudes.

Perry (1994) indicated that qualitative research is exploratory in nature, and tends to attempt to deduce answers to 'how? and why?' questions. Therefore, he argued that a major issue was the identification of what variables are involved in the question, and advised that a case study methodology tends to be adopted. Furthermore, Creswell (2007) focused on the situations in which the researcher selects the qualitative approach as an appropriate approach, these include:

- When the problem or issue needs to be explored;
- The need for a complex, detailed, understanding of the issue;
- The need to empower individuals to share their stories, hear their voices, and minimise the power relationships that often exist between a researcher and participants in a study;
- To write in a literary, flexible style that conveys stories without the restrictions of the formal, academic, structures of writing;
- To understand the context or settings in which the participants in a study address a problem or issue;
- To follow up quantitative research and help explain the mechanisms or linkages in causal theories or models;
- To develop theories when partial or inadequate theories exist for certain populations and samples or existing theories do not adequately capture the complexity of the problem that is being examined;
- It is used because the quantitative measures and statistical analyses simply do not fit the problem; and
- It is simply a better fit for the research problem.

Bryman (2008) argued that the main steps involved in qualitative research, which are represented in Figure 4.2, are non-linear and the research questions are often driven by theoretical issues, which in turn drive data collection and analysis.

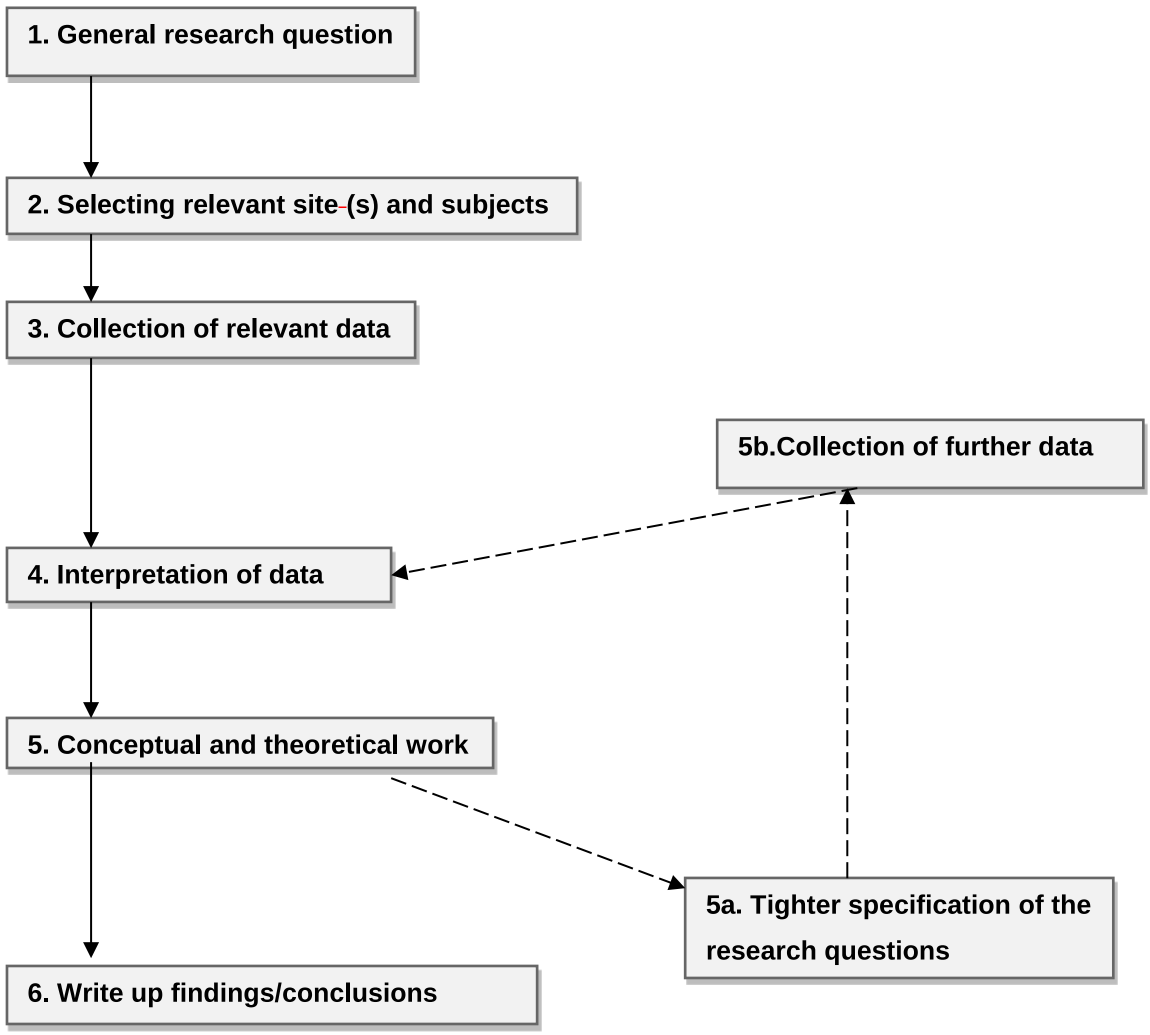

Figure 4-4: Outline of the qualitative process
Source: Bryman (2008)

However, qualitative research has been criticised by some researchers, including Bryman and Bell (2007), who identified the following limitations:

- *Limited generalisation capability*: limited capability to generalise the research findings due to the sample sizes and sampling methods used in qualitative research.

- *Too subjective*: there is a weakness in the strength of the deeper understanding provided by the qualitative approach, which limits confidence in the results.
- Difficult to replicate: limitation in terms of replication by other researchers
- For example, what one researcher might focus on might not be the focus of another researcher.
- *Lack of transparency*: the process of collecting and analysing qualitative data is sometimes difficult to establish and can lack clarity.

The qualitative approach depends on three types of collected data: interviews; direct observations; and written documents. These yield quotations, descriptions and excerpts which are either unstructured or semi-structured (Patton 2002).

4.5.3 Quantitative research

Quantitative research can be defined as "*to gather factual data and to study relationships between facts and how such facts and relationships accord with the theories and findings of previously executed research*" (Fellows and Liu, 1997, p.9). Quantitative research methods originally evolved in the natural sciences to study natural phenomena. Leedy and Ormrod (2005) pointed out that quantitative research is used to answer questions about relationships among measured variables with the purpose of explaining, predicting and controlling phenomena. This approach is sometimes called the traditional, experimental or positivist approach. Quantitative research follows a deductive approach in relation to theory and is concerned with design, measurement and sampling. The approach follows the practices and norms of the natural scientific model. Positivism particularly views social reality as an external, objective reality. It employs the use of mathematical and statistical techniques to identify facts and causal relationships (Naoum, 2002). Moreover, the quantitative approach is objective in nature and based on testing a hypothesis or theory that is composed of variables (Fitzgerald and Howcroft, 1998; Naoum, 2002). According to Naoum (2002), the quantitative research approach is selected for:

- Finding facts about a concept, a question or an attribute; and
- Collecting factual evidence and studying the relationships between the facts in order to test a particular theory or hypothesis.

However, additionally to finding facts, it provides considerable evidence when it is used to evaluate perceptions about a concept or an attribute. As shown in Figure 2.2, Bryman (2008) highlighted the major steps followed in quantitative research and emphasised that these represent an ideal account of how research should progress. He, however, argued that despite research being rarely linear, as depicted in Figure 4.3, it provides a rough indication of the interconnections between the main steps in quantitative research.

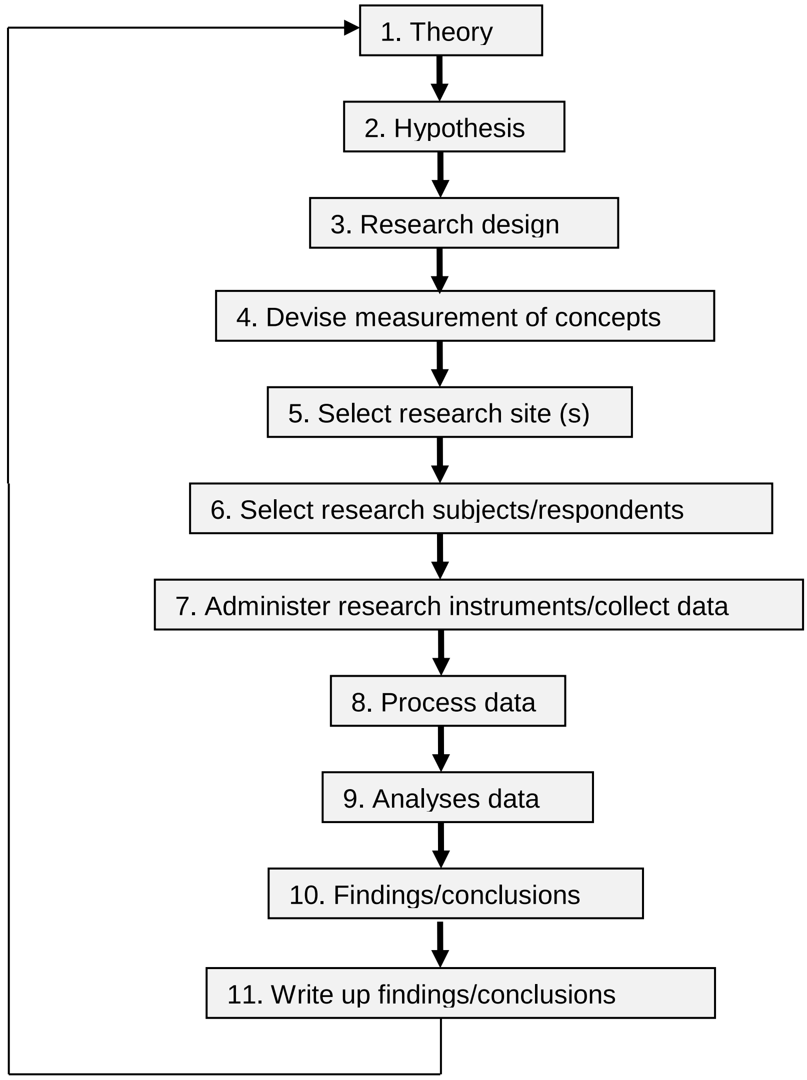

Figure 4-5: Outline of the quantitative process

Source: Bryman (2008)

Although used extensively, quantitative research has been criticised by the research community. These criticisms were outlined by Bryman (2008) as follows:

- Failure to distinguish between people and social institutions from the natural world;
- Involvement of an artificial measurement process and a sense of precision and accuracy not proceeding from a true or claimed source;

- Reliance on instruments and procedures that hinder the connection between research and everyday life; and
- Creation of a static view of social life that is independent of people‘s lives when analysing the relationships between variables.

Additional criticisms in relation to the limitations of quantitative research have been outlined by Bryman and Bell (2007), as follows:

- *Sampling limitation*. A sample by its nature cannot be identical to its population, and thus poses a limitation in terms of generalising results and research outcomes.
- *Non-response limitation*. The rate of non-response can affect how well the sample represents its population, and thus affect the possible generalisation of results.
- *Data collection errors*. Some limitations and errors are associated with how data is collected, for example, ambiguous questions or differences in responses arising from different data collection methods.
- *Data processing errors*. The large amount of data in quantitative analysis can lead to data processing errors.

4.5.4 Justification of the selection of the mixed methods approach

The definition of the mixed methods approach is provided in Johnson and Onwuegbuzie (2004, p. 17) who state that it is: *"the class of research where the researcher mixes or combines quantitative or qualitative research techniques, methods, approaches, concepts or language into a single study"*. When both qualitative and quantitative methods are applied to data collection, it is known as a triangulation method (Easterby-Smith *et al.,* 2008). Denzin (1978, p. 291) defines triangulation as: *"the combination of methodology in the study of the same phenomenon".* It is considered that a mixed methodology helps in giving greater fullness to the research. No single method, however, ought to be regarded as perfect in itself (Thyer, 2010; Morse, 2010). Collis and Hussey (2003, p. 77) also suggest that: *"A questionnaire survey providing quantitative data could be accompanied by a few in-depth interviews to provide qualitative insights and illuminations"*. Research can, more specifically, be conceptualised as a combination of qualitative and quantitative research in a way that is parallel, simultaneous, conversion or sequential (Tashakkori and Teddlie, 2003; Cameron, 2010). Whereas several researchers consider that quantitative and qualitative methods ought not to be mixed as they have vastly different underlying assumptions, Teddlie and Tashakkori (2009) and Creswell (2009) are amongst the researchers who have pointed out that the use of different methods in the same research study may potentially minimise the limitations. The researcher can discover and justify model components within a single study when both quantitative and qualitative methods are used. Moreover, results from one of the methods can be employed in the development and informing of another method, and one of the methods nested within another can provide insights into several unit levels of analysis (Bazeley, 2008; Quinlan, 2011). It has been highlighted that mixed methods seem to be used more frequently for study of international business and strategic management (Cameron and Molina, 2010).

Table 4-6: Quantitative, mixed methods and qualitative research

	Quantitative Research	Mixed Methods	Qualitative Research
Scientific method	Deductive or "top-down". The research tests hypotheses and theory with data	Deductive and inductive	Inductive or "bottom-up". The researcher generates new hypotheses and grounded theory from data collected and during field work
View of human behaviour	Behaviour is regular and predictable	Behaviour is somewhat predictable	Behaviour is fluid, dynamic, situational, social, contextual, and personal
Most common research objective	Description, explanation, and prediction	Multiple objectives	Description, exploration, and discovery
Focus	Narrow-angle lens, testing specific hypotheses	Multi-line focus	Wide-angle and "deep-angle" lens, examining the breadth and depth of phenomena to learn more about them
Nature of observation	Attempt to study behaviour under controlled conditions	Study behaviour in more than one context or condition	Study behaviour in natural environments. Study the context in which behaviour occurs
Nature of reality	Objective (different observers agree on what is observed)	Common sense realism and pragmatic view of world (i.e. what works is what "real" or true	Subjective, personal, and socially constructed
Form of data collected	Collect quantitative data based on precise measurement using structured and validated data collection instruments (e.e. closed-ended items, rating scales, behavioural responses)	Multiple forms	Collect qualitative data (e.g. in-depth interviews, participant observation, field notes, and open-ended questions) The researcher is the primary data collection instrument
Nature of data	Variables	Mixture of variables, words, and images	Words, images, categories
Data analysis	Identify statistical relationships	Quantitative and qualitative	Search of patterns, themes, and holistic feature
Results	Generalisable findings	Corroborated findings may be generalised	Particularistic findings. Representation of insider (i.e. "emic") viewpoint

Source: Creswell (2003)

For the achievement of the objectives of the research, a mixed methods approach was used as separate use of a quantitative or qualitative approach would be insufficient to fully answer the research questions; the mixed methods approach was considered more appropriate for improving an understanding of the particular phenomenon being investigated (Teddlie and Tashakori, 2009). Swanson and Holton (2005, p. 329) argue that *"the mixed methods research methodology is also suitable when the objective of the methodology is to use the results of one method to elaborate on the results of the primary method used for the investigation".*

The quantitative research methodology is the main approach to the collection and analysis of data for this current study, with a qualitative research methodology being used with the intention of elaborating and enhancing an understanding of the quantitative findings and their context. The complementarities between mixed methods increase the validity of findings when utilised in the research (Saunders *et al.,* 2012). In being autonomous, the processes for qualitative and quantitative analysis do not depend upon each other and, as indicated by Flick (2006), the study phases can be kept separate until the final study stage when a comparison of findings from each can be made, giving a more comprehensive understanding. For this study, the results of the qualitative research can provide further information that expands the understanding of the impacts of TQM practices on project performance that has been gained from the findings of the quantitative research. One of the primary features of a positivist approach is the measurement of a number of different variables. As the researcher's background is in oil and gas, the interpretation and analysis of the findings may be affected, and so validity and credibility is given to the research by adopting a positivist approach.

Triangulation or confirmation of the quantitative method findings is provided by the data and findings that were produced by the qualitative research. An interpretivist/qualitative approach is also employed for the clarification and confirmation of findings from the initial research phase by analysing the semi-structured interview findings and by employing the prior knowledge and observations of the researcher. This research has used the suggested approach of Wing *et al.* (1998), Love *et al.* (2002b) and Dainty (2008) as well as Creswell (2009), where they have argued that a questionnaire could be used after the qualitative findings to achieve the following:

- allow a complete understanding of the phenomena in a PM context
- support the interpretation of the qualitative data
- reinforce or even partly generalise the qualitative findings
- cause transferability of the qualitative findings and increase the validity

4.5.5 Triangulation

Since the mixed method has been utilised in this study, it allow the researcher to enable data triangulation. Triangulation defined by Denzin (1978, p291) as "*the combination of methodologies in the study of same phenomenon*". The triangulation way is treated as the most frequently used approach to mixed methods (Creswell, 2009). The concept of triangulation refers to the mixture of approaches in the research of the same phenomenon or case (Amaratunga *et al*. 2002). Creswell and Plano (2007, p18) stated that:

> *"Triangulation research is important today because of the complexity of problems that need to be addressed, the rise of interest in qualitative research, and the practical need to gather multiple forms of data for diverse audiences".*

The triangulation process is an outcome of evidence from different sources to focus on a subject of the study (Cresswell, 2007). Triangulation allow the researcher to benefit from benefit from the multi–advantages of the two approaches, also it employ two or more research method to reduce and eliminate the disadvantages of each method in the same time gaining the advantages of each method (Amaratunga *et al*. 2002; Jick,1979 and Fellows and Liu, 2008). Saunders *et al*. (2007, p139) stated that: *"Triangulation refers to the use of different data collection techniques within one study in order to ensure that the data are telling you what you think they are telling you"*. Amaratunga *et al*. (2002, p.23) stated that:

“Quantitative data can help with the qualitative side of a study during design by finding a representative sample and locating deviant samples, while qualitative data can help the quantitative side of the study during design by aiding with conceptual development and instrumentation.”

For example, qualitative data gathered together using semi-structured interviews may be a profitable way of triangulating quantitative data collected by a questionnaire. The implementation of qualitative and quantitative techniques unitedly to study the theme or phenomenon can be very beneficial to attain rich understanding and results, to support in making interpretations and as a means of drawing conclusions and assumptions, Figure 4.4 shows the process of triangulation of qualitative and quantitative data.

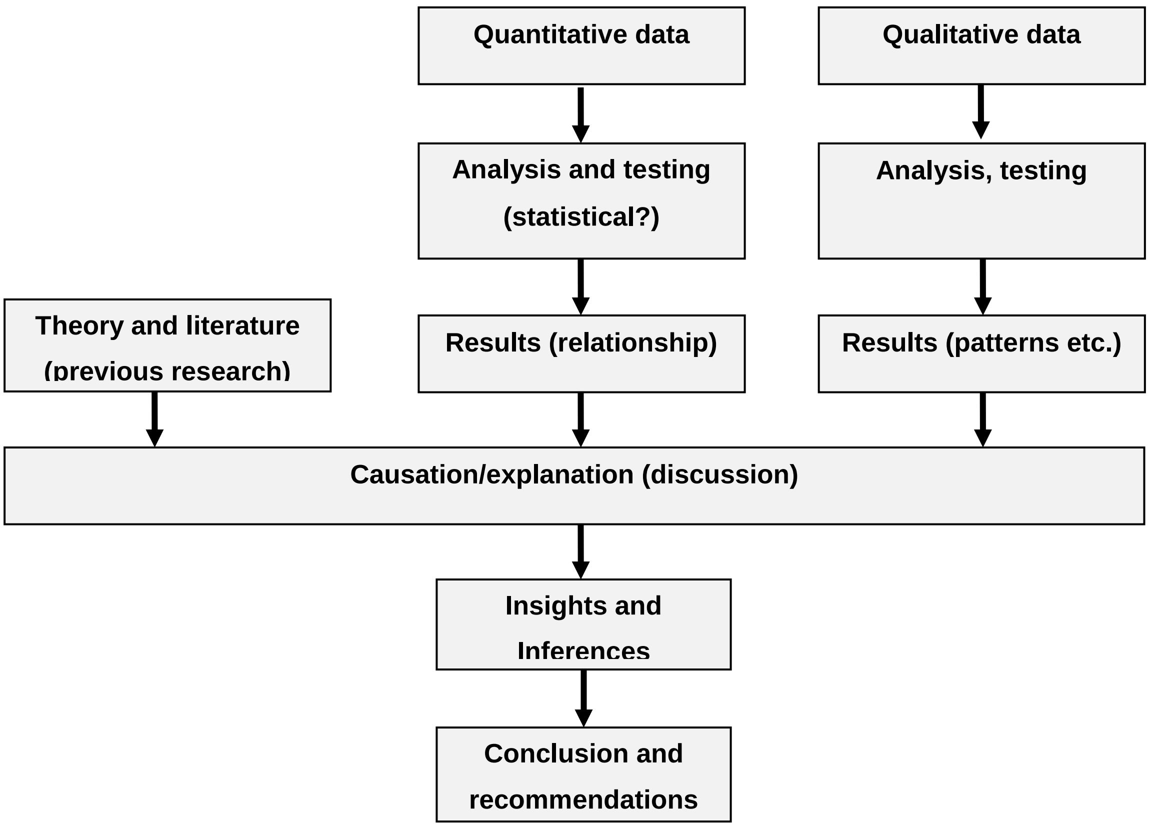

Figure 4-6: Triangulation of qualitative and quantitative data

Source: Amaratunga et al. (2002, p.24)

Furthermore, Love *et al*. (2000) claimed that the mixtures of qualitative and quantitative approaches have two advantages: the capability of contributing the knowledge in a touchable form is enlarged and gathering of findings can give more researcher certainty in the reliability and/or validity of the study results. On the other hand combining methods can result in a better definition and theoretical justification as the researcher tries to place the many pieces of an intricate puzzle together into a comprehensible picture. Moreover, Abdullah (2003) claimed that triangulation might pointer to a better understanding of the phenomena under examination by enlightening extra information that would otherwise remain undiscovered via a single method approach, either qualitative or quantitative. Also, triangulation can identifies which areas in the organization should be examined and investigated.

Conversely, Yin (2009) noted two main problems that could face the researcher when implementing triangulation in any study or research. First, collecting data from a one source will be less expensive compared to collecting data from various sources. Second, the researcher needs to know how to perform the full variety of data collection techniques. This is mainly important, since if the research methods are used inappropriately, the opportunity of addressing a wider array of issues or initiating converging lines of investigation may be lost. So as to clarify the differences between qualitative and quantitative approaches, Table 4.7 shows in summary these differences based on a number of characteristics.

Table 4-7: Differences between quantitative and qualitative research approaches

Characteristics	Qualitative research	Quantitative research
Purpose	• To describe and explain • To explore and interpret • To build theory	• To explain and predict • To confirm and validate • To test theory
Objective	Study issues in depth and detail and seek to gain insight and understand people‘s perceptions.	• Gather factual data and study relationships between facts and relationships in accordance with theory.
Theory	• Theory can be causal or non-causal	• Theory is largely causal and is

Characteristics	Qualitative research	Quantitative research
	and is often inductive – concerned with development of theory from specific instances	Deductive – associated with verification of theory and hypothesis testing
Process	• Holistic • Unknown variables • Flexible guidelines • Emergent design • Context-bound • Personal view.	• Focused • Known variables • Established guidelines • Statistic design • Context free • Detached view.
Research Procedures	• Research procedures are particular, and replication is very rare.	• Procedures are standard, and replication is frequent.
Data Collection	• Informative, small sample •Observations, interviews, documents.	• Representative, large sample • Standardised instruments – questionnaires, laboratory experiments, etc.
Data characteristics	• Soft data, descriptive, less structured, analysed using non-statistical methods.	• Hard data, structured, large sample size, analysed using statistical methods.
Data Analysis	• Analysis proceeds by extracting themes or generalisations from evidence and organising data to present a coherent, consistent picture.	• Analysis proceeds by using statistics, tables, or charts and discussing how what they show relates to the hypothesis.
Reporting Findings	• Words • Narratives, individual quotes • Personal voices, literary style.	• Numbers • Statistics, aggregated data • Formal voice, scientific style
Outcome	• Exploratory and/or investigative and findings are contextual.	• Conclusive findings used to recommend a course of action.
Strengths	• Data gathering methods seen as natural rather than artificial • Ability to look at a change process over time • Ability to understand people‘s meaning • Contribute to theory generation.	• Provide wide coverage of the range of situations • Fast and economical • Where statistics are aggregated from large samples, they may be of considerable relevance to policy decisions.
Weaknesses	• Data collection can be tedious and require more resources • Analysis and interpretation of data may be more difficult • Harder to control the pace, progress and end-points of the research process.	• Tend to be rather inflexible and artificial • Not very effective in understanding a process • Not very helpful in generating theories.

Sources: Leedy and Ormrod (2001), Amaratunga *et al*. (2002), Abdullah (2003) and Neuman (2006)

4.5.6 The adopted research approach

As the pragmatic approach permits the researcher to use the most appropriate methods to make the study work (Creswell, 2009), this study will exploit a mixed methods approach to data collection as it gives a variety of sources and a deepness of information to support the study approach (Price 2009; Ghauri and GrØnhaug, 2005). The trend of utilising the quality management practices in project management daily activities to reach maximum performance becomes more apparent to researchers and practitioners. Quality management is a multifaceted phenomenon and measuring the influence of such practices on company and organisation performance has been a test for researchers (Parast *et al*. 2011). Due to the nature and complexity of the oil and gas industries and the sizes of the projects being constructed with huge budgets, it necessitates that practitioners and researchers know and research more about the practices that produce maximum performance of the project. Research on quality management and project performance brings about two most important questions:

1. Do quality management practices impact on project performance? If so,
2. How does quality management affect project performance?

To find answers to these questions and the research question, the approach of the researcher utilising mixed methods becomes essential, in order to know more from practitioners and their daily management of the project by conducting in-depth semi-structured interviews, which is the qualitative method. The outcomes of interviews will develop the questionnaires which have been prepared from the literature review of previous studies

The above review of qualitative and quantitative research approaches identifies the characteristics of each approach and their limitations. As mentioned before, this research adopted the constructivism ontological and interpretivism epistemological positions as an appropriate philosophy. There were three major reasons for this decision.

Firstly, this study focused on exploration of how quality management practices affect project performance. Only a qualitative approach permits the investigation of multiple realities that lead to subjective knowledge. Secondly, the nature of oil and gas projects is complex; since utilising quality management practices in a project context is a new phenomenon, very few studies have been carried out to investigate this phenomenon and how they affect the project performance. Therefore, the study aimed to cover issues in depth and involved detailed rather than superficial descriptions. The qualitative approach was necessary in order to gain real insights and so fully appreciate and understand the attitudes and behaviours of the project managers involved in the oil and gas project environment. Thirdly, the research focused on understanding the issues affecting the performance of oil and gas industry projects from the point of view of those stakeholders, in the form of words rather than in quantified form.

Accordingly, this research is subjective in nature and is exploratory and attitudinal, resulting in understanding and interpretation coming from the researcher's own frame of reference. As a result and in the light of the aforementioned literature and within the domain of oil and gas projects, the mixed approach of qualitative and quantitative is the appropriate choice for this research.

4.5.7 Combining quantitative and qualitative Methods

As earlier mentioned, the approach of this research has been to select throughout the use of pragmatic philosophy, thus allowing a number of methods to be used in order to collect the research data and reach answers to the raised study question. Two methods of data collection were used in this study: the semi-structured interviews (qualitative) were conducted to collect information about the practices of TQM from managers, project managers, and section heads of the three oil and gas companies which participated in the research; and a questionnaire survey (quantitative): after the analysis of the qualitative data, the primary questionnaire was developed and piloted to the same companies to get more information about the practices of TQM in the context of oil and gas industry related projects.

4.5.8 Research design

Once the appropriate approach to be adopted was identified, which was in this case the mixed approach qualitative and quantitative, the next stage was the research design. There are a number of research designs that could be used by researchers in addressing questions posed in both social science and construction management research (Blismas, 2001). These include: experiment; survey; action research and case study. Similarly, Fellows and Liu (2008) and Naoum (2002) discussed five styles: action research; ethnographic research; surveys; case study and experiment. However, there are five most common research strategies: experiment, survey, archival analysis, history and case study, as shown in Table 4.8.

Table 4-8: Research Strategies versus Characteristics

Strategy	Form of Research	Requires Control of Behavioural Events	Focuses on Contemporary Question?
Experiment	How, Why?	Yes	Yes
Survey	Who, What, Where How Many, How Much?	No	Yes/No
Archival Analysis	Who, What, Where How Many, How Much	No	Yes/No
History	How, Why	No	No
Case Study	How, Why	No	Yes

Source: Yin (2009)

According to Bryman (2008), research design is used to provide a framework for collecting and analysing data. Fellows and Liu (2008) indicated that, to ensure that the research maximises the chance of realising its objectives, it must take into consideration the research questions, determine the required data, and identify an appropriate analysis method. Similarly, Royer and Zarlowski (2001) argued that the design stage represents the approach the researcher will follow and the essential methodological choices made by the researcher including the data collection and analysis methods and the observational field. They argued that the design stage guides the course of research and helps avoid at least some of the barriers that emerge in the latter stages of research. Sekaran (2003) detailed that research design should involve a series of rational decision-making choices, relating to decisions regarding the purpose for the study (exploratory, descriptive, hypothesis testing), its location (i.e., the study setting), the type of investigation, extent of researcher interference, unit of analysis, and the time horizon.

As identified above, the adopted approach in this research is the mixed approach qualitative and quantitative. Nevertheless, the choice of research design should reflect decisions about the dimensions of the research process, as importantly identified by Bryman (2008), who emphasised the importance of addressing the following points:

- Expressing causal conclusions between variables;
- generalising to larger groups of individuals than those actually forming part of the investigation;
- Understanding behaviours and their meanings in a specific social context; and
- Having a temporal (i.e. over time) appreciation of social phenomena and their interconnections.

According to Yin (2008), the research strategy should be chosen as a function of the research situation. As clarified in Table 4.6, there are different types of research strategy, each having its own specific approach to collect and analyse empirical data, and therefore, each strategy has its own advantages and disadvantages. Yin (2008) stated three conditions for adopting each strategy, these are: the type of research question posed; the level of control an investigator has over actual behavioural events; and the degree of focus on contemporary as opposed to historical phenomena. Fellows and Liu (2008) argued that the choice of research strategy is affected by the scope and depth required for study, with the researcher choosing to adopt either a broad but shallow study using questionnaires or a deep but narrow study using a case study and interviews.

Creswell and Plano Clark state five grounds of adopting mixed method, and they are:

- Mixed methods research provides strengths that offset the weaknesses of both quantitative and qualitative research.
- Mixed methods research provides more comprehensive evidence for studying a research problem than either quantitative or qualitative research alone.
- Mixed methods encourage researchers to collaborate across the sometimes adversarial relationship between quantitative and qualitative researchers.

- Mixed methods research encourages the use of multiple worldviews or paradigms rather than the typical association of certain paradigm for quantitative researchers and others for qualitative researchers.
- Mixed methods research is "practical" in the sense that the researcher is free to use all methods possible to address a research problem.

4.6 Actual research process

Research is considered a dynamic process; therefore, it has to be flexible – implying, though not requiring, that a contingency approach will be helpful. *"The way in which you will collect and analyse your data"* (Hussey and Hussey, 1997, p.10).The questions in this research were derived from exploratory interviews and an in-depth literature review. Accordingly, a relevant theoretical background was formed to undertake the research. The research was conducted in three stages, shown in Figure 4.5 and explained in the following sections.

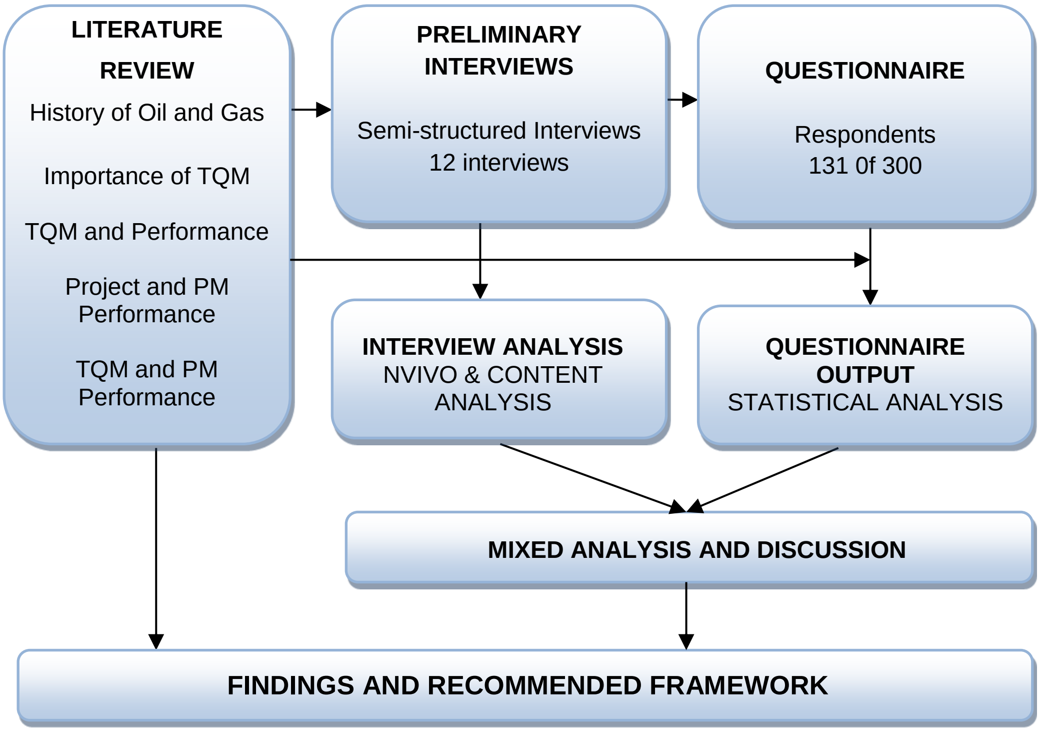

Figure 4-7: The Actual Research Process

4.6.1 Literature review

Literature review is a task that should review established theories, findings from other research and particular applications of theory (Fellows and Liu 2008). The literature review is a clear and logical presentation of the relevant research work done thus far in the area or topic of research. The literature review aims to identify and highlight crucial variables and to document the significant findings from previous research in order to build a theoretical formulation in which contemporary issues and gaps in knowledge could be identified in project performance improvement (Sekaran 2003). Leedy and Ormrod (2005) identified that literature describes theoretical perspectives and previous research findings regarding the problem at hand; it also looks at what others have done in relevant areas. The literature review in this research (as discussed through Chapters two and three) covered these topics: History of the oil and gas industry; nature and types of oil and gas companies; importance of TQM; project and project management performance; TQM and project management performance. The review essentially served three main roles:

- it provided a solid foundation for this research by throwing light on all relevant issues;
- it made the contemporary issues clearer while highlighting the gaps in knowledge and practice; and
- it acted as a basis for the formulation of the proposed improvement framework.

4.6.2 Mixed methods and data collection

As formerly mentioned, this study approach has been selected through the use of the pragmatic philosophy, therefore allowing a number of methods to be used in order to gather the research data. In this study, it is proposed by the researcher to collect the data through semi-structured interviews in the first phase of the research and through questionnaire in the second phase and both of these approaches is explained in detail below.

4.6.3 Interviews

Interviews have been defined as "*methods of collecting data through face-to-face or voice to-voice interactive dialogue in order to discover the opinions or feelings of people on a certain subject"* (Hussey and Hussey, 1997, pp.167-168). In general, there are three forms of interview commonly used in business research: structured, semi-structured, and unstructured (Fellows and Liu, 2008; Hussey and Hussey, 1997). Structured interviews are by definition very specific and include defined questions and limited probing. In unstructured interviews, questions can differ between interviewees and the interviewer might not have questions prepared and can probe freely. In the middle of the above two extremes are semi-structured interviews, in which the interviewer has prepared some questions or a framework for the dialogue but is also free to probe when necessary.

Semi-structured interviews were selected as one of the data collection techniques in this research.

4.6.3.1 Justification of the Selection of the Semi-structured Interviews

For the collection of complex data, the interview technique is considered highly effective for generating rapport, boosting response rates and dealing with quality, complex data (Saunders *et al.,* 2012). The focus of the researcher was on open questions for participants to describe their opinions and so comprehensive and complex answers were received from them. As one of the more frequently used methods of qualitative research, semi-structured interviews are often an easy way to collect qualitative data from respondents (Greeff, 2011). The qualitative, semi-structured interview is viewed as non-standardised with a list of questions or themes to be covered by the interviewer and sufficiently flexible for the exploration of areas as they arise (Easterby-Smith *et al.,* 2008; Saunders *et al.,* 2009).

Bryman (2008) declares that the semi-structured interview is appropriate in a broad choice of situations and engages the researcher generating the questions they wish to inquire in a given order, but at the same time permits for repeating as an interview develops. The purpose with semi-structured interviews is to inspire the interviewee to talk unreservedly, and this can often be accomplished by getting rid of some of the inflexibility forced by asking questions serially. Semi-structured interviews are favourable when undertaking investigative discussions as a means to exposing '*what'*, '*how'*, and '*why'* (Saunders *et al*. 2009).

This type of interview has the potential to reveal new things about subjects that have been investigated before, and it also allows difference from type to type of interview in respect of how the questions are asked and covered. This does need ability and skill on the part of the interviewer, who should be able to act in response to the flow and adjust questions to outfit, however if the researcher is able to do this tactic, much appreciated input from interviewees can be obtained (Saunders *et al.*, 2009). More benefits of this type of interview are the interviewer's ability to ask for explanation of any answer throughout the sequence of the interview, and the capability to record the minutes, subject to the interviewee's approval (May, 2001).

Saunders *et al*. (2009, p. 318) describe an interview as "[…] *a purposeful discussion between two or more people"*. Three different types of interviews can be distinguished, which are structured, semi-structured and unstructured (Naoum, 2007; Bryman and Bell, 2007; Saunders *et al*., 2009; Oyegoke, 2011; Bryman, 2012; Easterby-Smith *et al*., 2012). According to Naoum (2007) is the structure of the interview defined through the type, the wording and the sequencing of the questions.

The structured interview uses for all interviewees the same order and exactly the same wording of the questions (Naoum, 2007; Saunders *et al.*, 2009; Oyegoke, 2011; Bryman, 2012). The questions are usually closed-ended (pre-coded), where the interviewee can select from a range of predefined specific answers (Bryman, 2012). The aim of this method is to create reliable answers through identical keywords and through quantifiable data (Saunders *et al*., 2009). Hence, structured interviews are classed within the methodology of quantitative methods (Saunders, *et al.*, 2009; Bryman, 2012).

In contrast, the unstructured interview uses no predefined questions and no detailed interview guideline (schedule where the questions have been sequenced), which results in that the interviewee is guiding this interview and not the interviewer (Naoum, 2007; Bryman and Bell, 2007; Saunders *et al*., 2009; Oyegoke, 2011; Bryman, 2012). It is informal (Naoum, 2007; Bryman, 2012) and has the characteristic of a conversation (Bryman and Bell, 2007; Bryman, 2012). The unstructured interview will get always, from interview to interview, a different phrasing and sequencing of the questions and consequently also different outcomes (Naoum, 2007; Bryman and Bell, 2007; Saunders *et al*., 2009; Oyegoke, 2011; Bryman, 2012). The aim is to explore in depth the interested area of research (Saunders *et al.*, 2009). Therefore, unstructured interviews can be categorised within the qualitative methods (Saunders, *et al*., 2009; Bryman, 2012).

This research project preferred to use semi-structured interviews, which are another type of qualitative interview. Semi-structured interviews are more formal than the unstructured interviews, but are also less structured than the structured interviews. The interviewer works here with a guideline where the questions have been predefined and phrased (Naoum, 2007; Saunders *et al*., 2009; Oyegoke, 2011), but the questions are more general in their nature; the sequence of the questions can vary and new questions might develop during the interview (Bryman, 2012). The aim of semi-structured interviews is to explore specific issues within the research project (Naoum, 2007).

The flexibility of the semi-structured approach, according to Tashakkori and Teddlie (2003), can boomerang on the researcher as their personal influence may bias the process. In general, this research wants to benefit from the flexible nature of qualitative interviews (Naoum, 2007; Bryman and Bell, 2007; Saunders *et al*., 2009; Oyegoke, 2011; Bryman, 2012), because the interest is in attainment insights into how practitioners from the industry view and perform project management and its relation with TQM practices.

The researcher had begun the investigation with a fairly clear focus on issues, rather than a very general view on a topic. According to Bryman (2012), research projects with such a characteristic tend to use semi-structured interviews, because more specific issues can be addressed. Furthermore, the chaotic orientation of unstructured interviews might not be seen as a suitable method to persuade very well-organised project managers and other experts from the industry to participate. Therefore, it has been decided to benefit from this “structured flexibility” of the semi-structured interviews. This method is the most suitable for this research because: it helped understand why things happen as they do in practice; after each interview the researcher also received feedback about his research; the interviews lead to new areas which have been previously not considered; and it gives the ability to collect a rich set of data.

Furthermore, when using semi-structured interviews, the researcher has more control about who is taking part (Bryman, 2012), which results in quality assurance. A personal benefit gained from the one-to-one basis characteristic of the interviews was that the researcher also made highly interesting contacts within the industry. The use of a semi-structured interview helps the research due to the level of probing that is allowed without losing control of the issues that have to be discussed. Nevertheless, the method for gathering and analysing the interviews has several components. Creswell (2009, p. 183) thinks of this “[…] *like peeling back the layers of an onion* […]”, where one is making a condensed interpretation out of the large meaning and amount of qualitative data. The following sections will go through each performed single step.

4.6.3.2 Qualitative study sample selection criteria

Criteria for the inclusion of contributors in this study were based on their length of experience and position in the organisation. The participants were limited to those who had had experience of ten years or more in the industry. The types of employee and the reasons for including them were as follows.

- Senior general managers and department directors, to establish their views and perceptions on the relationship between project management activities and TQM practices that influence the project performance.
- Line managers (the project handlers), to establish their views on the significance of TQM practices.
- Middle and junior managers to establish their perceptions about impact of TQM practices on project performance.
- Supervisors and senior engineers, to obtain their feedback on involvement and motivations.

In order to collect the data for the study, it is essential to have a certain strategy for that, which will be applied for both the semi-structured interview and the questionnaires. The research study sampling strategy was developed based into two levels:

A- Case study selection

1- Industry significance, i.e. oil and gas.

As the nature of the study was to appraise the project performance and TQM in the Libyan oil and gas industry, the industry should be oil and gas.

2- Project management history.

The selected companies should have a history of project management practices.

3- Proximity to Libyan context.

Due to the situation in Libya after the Arab Spring, it became difficult to conduct interviews and carry on with the study. Consequently, it was necessary to find companies that simulated the Libyan condition. The owner company was selected in Oman, which has a similarity and commonalty to Libya in many aspects, such as culture, being a developing country, the oil and gas industry supporting the economy, and the same geographical area.

B- Interviewees' selection criteria

1- Experience involved in project management practice.

To gain a wide view about the practising of project management, and to know the TQM practices that are involved in project management, the level of experience must be appropriate to the phenomena that will be researched in the study.

2- Job role, executive level.

The job role of the interviewees will help in exploring the practices of project management. Also, the seniority level gives the project manager more practical experience, which will enrich the discussion, leading to valuable findings.

3- Theoretical relevance.

The project management knowledge of the candidates to be interviewed is vital.

4.6.3.3 Semi-structured interview sampling

The interview was one of the two main sources for data collection, since it aims to clarify and provide more details on the phenomenon being studied. Slack and Rowley (2000) concluded that cognitive information, such as beliefs, motivation and perception, can be gained by interviewing those observed. The advantage of semi-structured interviews is to allow the researcher to decide who should be involved in this research project and who should not (Bryman, 2012).

Twelve interviewees from three oil and gas companies (four in each company) were selected and each interview lasted between 40 and 50 minutes. For each company, qualitative semi-structured interviews were held with the client representative, consultant and contractor; resulting in a total of 12 interviews. The semi-structured interview technique enabled the researcher to allow the interviewees to elaborate on any topic, but required all predetermined topics to be covered (Love *et al*. 2002).

The interviews have been conducted with the candidates who met the researcher's criteria. The profiles of the interviewees can be seen in the following tables.

Table 4-9: Company A Interviewee Profiles

Name	Company	Position	Background	Experience	Time
PM1	Owner A	Senior project manager	Mechanical Engineering	10	40
PM2	Owner A	Department Head	Process engineering	20	47
PM3	Owner A	Engineering Head	Electrical engineering	25	50
DM	Owner A	Manager	Quality	30	50

Table 4-10 Company B Interviewee Profiles

Name	Company	Position	Background	Experience	Time
SPM	Engineering B	Senior project manager	Mechanical Engineering	17	42
BM	Engineering B	Business Manager	Mechanical Engineering	30	50
PPM	Engineering B	Pipeline project manager	Process engineering	15	48
SPM	Engineering B	Senior project engineer	Process engineering	20	50

Table 4-11: Company C Interviewee Profiles

Name	Company	Position	Background	Experience	Time
PM	Construction Contractor (C)	Project Manager	Mechanical Engineering	10	40
PM	Construction Contractor (C)	Project Manager	Civil Engineering	13	45
PM	Construction Contractor (C)	Project Manager	Electrical Engineering	12	46
PM	Construction Contractor (C)	Department Head	Process engineering	20	50

Significantly, prior to conducting each interview, an appointment was made with the selected person involved in managing projects in each company. A telephone call was made to ascertain who would be best able to provide key information on the organisations and the specific project. Once access was agreed, an interview was arranged and a tape recorder used to record the conversation. A consent form, along with a detailed letter explaining the nature of research, from the university which gave ethical approval was presented to each interviewee, for them to sign. Through this approach, the interviewee was allowed to talk freely without interruption or intervention within the time frame allocated. The template of the interviews is presented in Appendix 4.

Quantitative survey: Population and sample frame

4.6.4.1 Population

The population is the collection of units within which the survey will be conducted. Saunders *et al.* (2012) defined population as the complete set of cases or group members. Ghauri and Gronhaug (2010) defined the population as the universe of 'units' from which the sample is to be selected. According to Särndal *et al.* (1992), there are two different populations with which a survey is concerned:

- **The target population:** consists of the group of units about which information is ideally wanted.
- **The survey population:** the units that we are able to survey.

The target population of this research consists of publicly-owned organisations primarily engaged in the Oil and Gas sector. The survey population size is open to enterprises established in the sector; this includes medium-size organisations (over 250 employees) and large-size organisations (over 1000 employees).

4.6.4.2 Sampling

Sampling is the process of selecting units (e.g., employees, managers, organisations) from a population of interest. A sample size must be large enough to give a good representation of the population, but small enough to be manageable. According to Saunders *et al.* (2012), the two main types of sampling techniques available can be divided as illustrated in Figure 4.8 below.

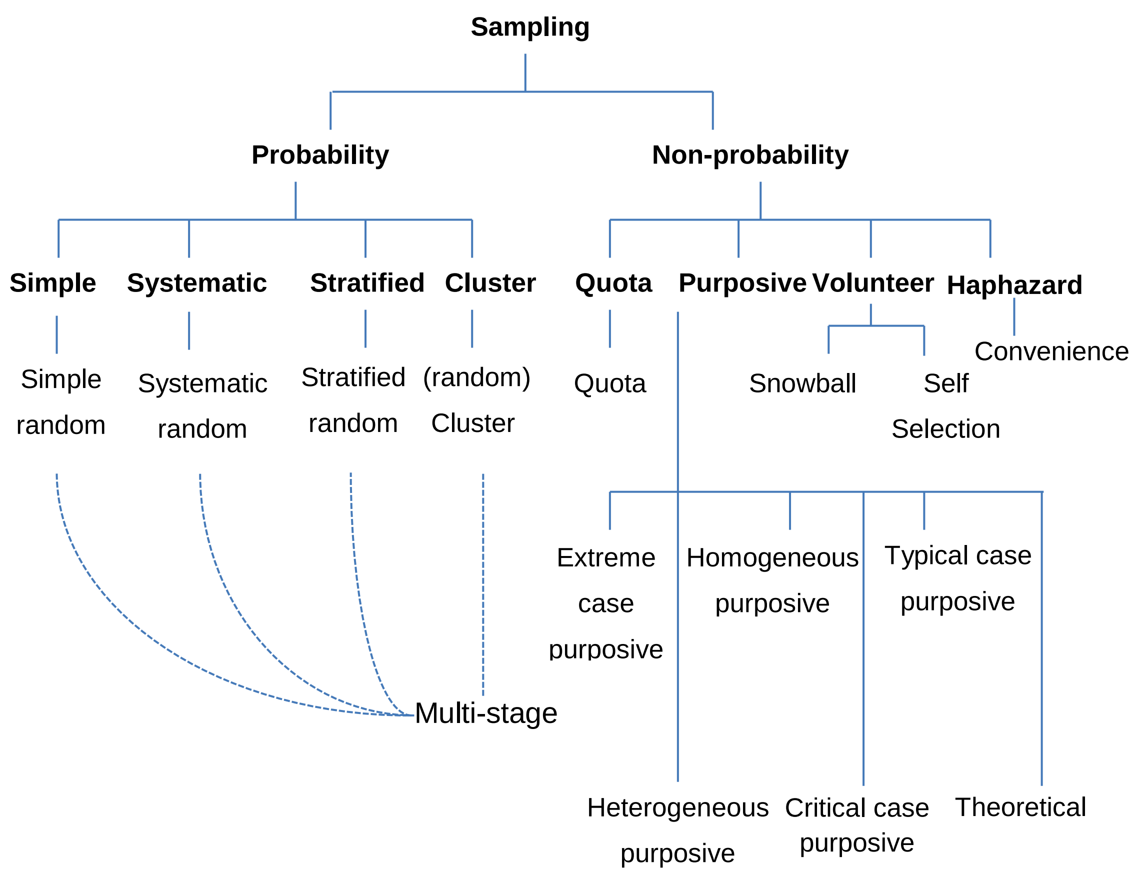

Figure 4-8: Sampling techniques

Source: Saunders *et al*. (2012)

4.6.4.3 Unit

A unit is the base level at which information is sought. There are two types of units:

- Selection units: a *selection unit* is a unit drawn from the population of all units that belong to the population of interest. Using random sampling (also known as 'probability sampling') provides a guarantee that the selection of units will not be biased.
- Reporting units: a *reporting unit* is a unit that reports the information required.

The reporting unit may not be the same as the selection unit. In this study, the selection and reporting unit was the Libyan manufacturing organisation.

4.6.4.4 Selecting a sample

Selecting the study sampling is one of the important steps in the study. According to Saunders *et. al*. (2007), the most appropriate sampling technique are simple random, systematic, stratified random, cluster and multi-stage. Table 4.11 shows them with explanations of each one.

Table 4-12: Types of sampling procedure

Term	Definition
Simple random sampling	Sampling by selecting units at random from the entire population.
Systematic random sampling	Selects the first unit at random, and all additional units are selected at a predetermined interval from the first unit.
Stratified random sampling	Divides the population units into homogenous groups (strata) and draws a simple random sample from each group.
Clustered (multistage) random sampling	First stage units (e.g. firms) are randomly selected from a listing of all such units. Second stage units (e.g. employees) are then randomly sampled from all within the first-stage units selected. This gives a random clustered sample of employees.
Convenience sampling	Selects the sample group in the easiest possible manner. If 20 units need to be sampled, the analyst would sample the first 20 available units in a population.
Purposive sampling	Selects population units according to their attributes in a way judged to reflect the population distribution and/or to suit the study aims.
Quota sampling	Specifies a distribution of the sample (e.g. by size and industry type) that matches known population distributions, but allows units to be selected by convenience, thus differing from stratified random sampling.

Source: (Youssef, 2006)

4.6.4.4.1 Random sampling

Each member of the population to be studied has an equal and independent chance of being chosen to participate in the sample. If random selection is accurately carried out, there will be no chance of the systematic bias which can arise from subjective judgments in sample selection. Small samples may by chance be unrepresentative of the population, but this risk can be reduced by stratified selection.

4.6.4.4.2 Determining the sample size

An important consideration in sample design is the choice of sample size. Larger samples provide greater precision but are more costly to undertake. A common approach to choosing the sample size is to specify the precision desired and then determine the optimal sample size providing that precision.

4.6.5 Quantitative samples used in the study

Initially the researcher intended to conduct the research on the Libyan oil and gas sector. However, due to the political and civil unrest of the country, research could not be fully attained. The oil and gas sector is of paramount importance to the country's economy, but, because the country is experiencing political unrest, the oil and gas sector has not been fully functioning. Due to the unrest in Libya, the researcher decided to select companies from various other international places to mirror the Libyan oil and gas sector. Within the chosen sector, the researcher proceeded by drawing samples of enterprises. This probability sampling was necessary because of limits of time and resources available to the researcher.

The samples of enterprises were drawn purposively and randomly at the same time: purposively to meet the Libyan case, and randomly to avoid introducing any bias on the part of the researcher.

The three selected enterprises were:

- **Owner company**

The targeted owner company in Libya is NOC; however, due to the mentioned circumstances, studying that was not possible so the closest owner company in the Middle East that was most accessible to the researcher was Petroleum Development of Oman (PDO). The justification of this choice is that PDO has a close similarity and commonalty to Libya; the similarities found are in many aspects such as the culture and the fact that Oman is also a developing country. The geographical nature of the country also played a role in this decision.

- **Engineering company**

The NOC recommended to the Libyan oil companies to allow overseas companies to carry out the engineering work of oil and gas facilities, so the sampling of these companies was chosen from the UK due to the fact these companies also left Libya do to the unrest.

- **Construction**

Due to the complications and specificity of the nature of the oil and gas facilities in Libya, most of the major construction companies are also overseas. The sampling was also taken from local companies in the UK.

Within the selected enterprises, the researcher drew stratified samples of staff from various levels to act as survey respondents. The eligible respondents were selected randomly for the study, and the sample included in this study was 131 eligible employees, see Figure 4.9. The survey results are based mainly on standardised measures of the perceptions of staff of the ways in which their enterprises operate, which are relevant to industrial efficiency and output quality.

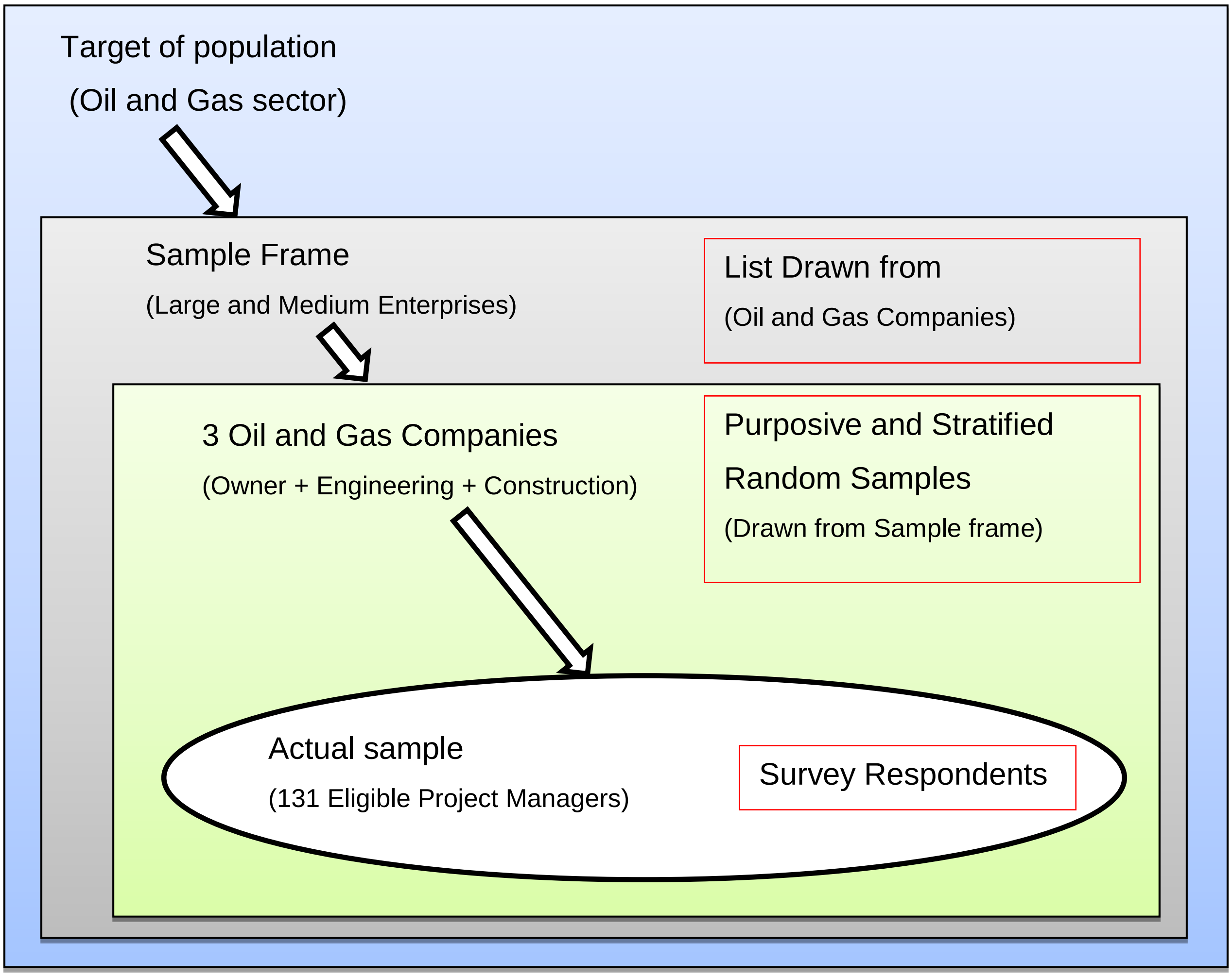

Figure 4-9: Population and sample

As summary of samples used in the study are illustrated in the following table.

Table 4-13 Summary of samples used

Participant	Organisation Type	Projects	Country of origin
A1	Owner company	Oil and gas projects	Oman
A2			
A3			
A4			
B1	Engineering company	Oil and gas projects	UK
B2			
B3			
B4			
C1	Construction company	Oil and gas projects	UK
C2			
C3			
C4			

4.6.6 The questionnaire survey

As this study utilized a mixed method, the empirical work will be essential part of it. Also the empirical work is not costly compared to interviews, and it enables the researcher to get a wide range of participants. Saunders *et. al.* (2007, p.608) defined the questionnaire as "*General term including all data collection techniques in which each person is asked to respond to the same set of questions in a predetermined order.*". Sekaran (2003) explains the questionnaire as the greatest effective and important tool of data collection when the researcher distinguishes precisely what type of information is wanted and how to measure and quantify the study variables.

4.6.6.1 Postal questionnaires

There are two types of questionnaires, self-administrated and interviewer-administrated. The first one classified into three types which are internet-mediated questionnaire, postal questionnaire and delivery and collection questionnaire. While the second type classified into two types which are telephone questionnaire and structured interview. Figure 4.10 shows the two types and its classifications. In this study the researcher will use the postal questionnaire. According to Saunders *et al*. (2007), the postal questionnaire makes the researcher self-governing when the researcher operating the study. Saunders *et al*. (2007, p606-607), defined the postal questionnaire as:

> "*Data collection technique in which the questionnaire is delivered by post to each respondent. She or he then reads and answers the same set of questions in a predetermined order without an interviewer being present before returning it by post.*"

The use of postal questionnaire allows the researcher to cover as much as he want from samples, from cost point of view is affordable to the researcher Sekaran (2003) also it gives the respondents time to answer the questions comfortably to think and answer honestly due to absence of the researcher. In contrast in using the postal questionnaire, in case one of the participants needs clarifications about the questions that becomes hard and then will reflect on her/his answers and accuracy as well (Saunders *et al*. 2007 and Nachmias 2007). The utilising of a postal questionnaire gives indecision to the contributors (Cameron and Price, 2009).

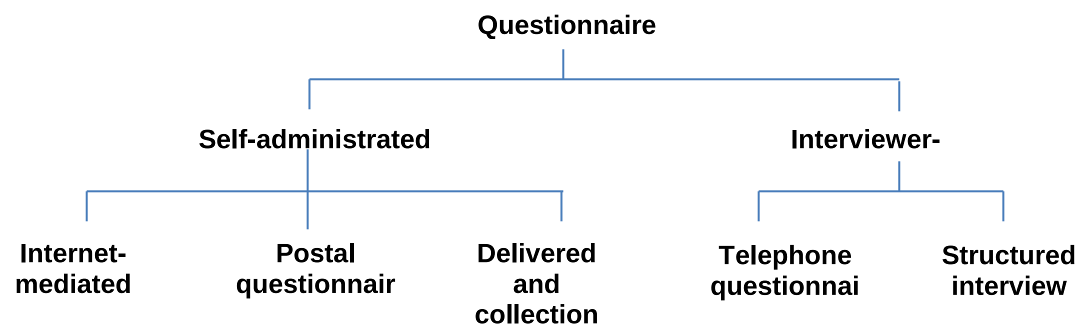

Figure 4-10: Type of questionnaire, source: Saunders *et. al.*(2007, p357)

4.6.6.2 The questionnaire design

To ensure the development of a suitable questionnaire focused upon the research questions, a number of formerly utilised questionnaires were explored. These were taken mainly from related literature about earlier researches and from this list the researcher recognised the questions which could be functional to this research.

Quite few questions in the questionnaire were resulted from recommendations made by a focus group of Arab Business Management PhD students at Cranfield University, who had enough knowledge and experience of PM and TQM in the oil and gas industry. Others were derived from prior studies. The questionnaire was divided into 12 sections to cover the PM and TQM of study variables, as follows:

Part one: Overall project performance, this part includes questions exploring most of the issues that have a relation to project performance and the project being handled.

Part Two: Project management process, this section focuses generally on regarding the process management and controlling of the project.

Part Three: Top management commitment, this part of the questionnaire covers and explores how the top management follow the projects to ensure a good performance and control of the project life.

Part Four: Benchmarking, this section focuses on how benchmarking is being used internally and externally to extract information that helps in project performance.

Part Five: Determining and Developing of Key performance Indicators KPIs, this section of the questionnaire is concerned with the determination and development of KPIs and who is involved in setting them.

Part Six: Training and development, this part covers the issues related to developing and training of the employees for better performance.

Part Seven: Motivation System, this section focuses on motivation and how the organisation utilises it to increase the project performance and whether it has a motivation system or not.

Part Eight: Customer Focus, this section concentrates on relations with customers and their effect on performance as well as the customers' satisfaction in terms of quality.

Part Nine: Supplier management, this part of the questionnaire focuses on ensuring the quality of supplies and auditing to guarantee the quality of goods that are supplied to the project.

Part Ten: Process management, this part focuses on the process in the organisation and its effect on performance.

Part Eleven: Information management process, this section focuses on the management of information, organisation standards and performance measurements.

Part Twelve: Information management performance, this part of the questionnaire focuses on the quality of the information and its clarity to ensure the performance of the projects.

4.6.7.3 Measurement scale

A Likert-type scale has been utilised in this study. This scale is the most broadly used approach in survey studies. The scale using five points, and has been designed to measure the level of perceptions from each respondent for each statement individually (Saunders *et al*., 2007). In order to analyse the respondent's answers the researcher should be familiar in using computer statistical package called SPSS. The format of Likert-type scale is simple and straight forward. It is easy for the participant to use and for the researcher to analyse as well. It allows the perceptions of the contributors into researcher to be recognised easily by giving the participants a list of statements which state feeling and asking them to rate in terms of agree or disagree as well as neutral middle choice is also available (Sekaran, 2003). The configuration and format of typical Likert-type scale is illustrated in table 4.13 below

Table 4-14: Configuration and Format of Likert-type Scale

1	2	3	4	5
Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**

The Questions wording

When formulating the questionnaire, the questions asked should be selected carefully to enable the respondents, first to understand them and then grasp the meaning of the question, and finally answering them. These preparations of the questionnaire make the analyzing of the respondents easy to the researcher. In this regard, Sekaran (2003), suggested that the questions raised must take into account, the way the question, its language and words chosen to meet with the perceptions and attitudes of the respondents.

- The questions must be direct and in simple language to be understood by the respondents in order to enable them to answer the questions.
- The chosen scale of questioning should be straightforward to enable the respondents speed to realize the meaning of the question and then answer it.
- In order to avoid the respondents from confusing in answering the questionnaire, the biased questions should be avoided.

- To encourage the respondents to answer the questionnaire, ambiguity in wording the questions should be avoided in order to make the respondents answering in the same style and context.
- Negative questions should be avoided in order to do not confuse the participants in choice of agree or disagree.

In this study the researcher carefully followed these guidelines to the questionnaire to produce the wright instrument for this research.

4.6.6.4 The type of questions

There are two types of questions used in the instrument of survey, either open questions or closed questions, and both have advantages and disadvantages as mentioned by (Sekaran 2003). The only one advantage of the open questions is to give the respondents chance to provide more data and information about the question being asked and using own words to give their points of view about the case. The disadvantages of the open questions are; took more time from respondents to answer and that may led them to refuse or give short answers, it may affect in overall response due to incomplete questionnaire and the analysis of responses is more difficult than the closed questions (Sekaran, 2003 and Collis and Hussey, 2003).

In contrast, the closed questions give the respondent's choice to select for the answers, which is in terms of time is good for the respondent to encourage participating in the questionnaire. The two disadvantages of closed questionnaire are; difficult to design and took long time and restrict the respondents by several choices. In order to avoid the bias the neutral selection should be available as one of the options, in case the respondents cannot find the exact answer will go for neutral Vaus (2001). To tackle these disadvantages a pilot study should be carried out by the researcher in order to ensure questionnaire clarity for the participants, also to test the questionnaire in terms of, the quality of data collected is suitable and appropriate for use, the length of time it takes and finally the questions are not confusing and straightforward (Saunders *et al.*, 2009).

Accordingly, the closed type questions has been selected to this study with fixed Likert-type scales to make sure that the process of the survey will be reasonably fast.

4.7 Pilot testing

Plot testing is a good means of gaining comments on the content, clarity as well as style of the survey. As mentioned by Saunders *et al*. (2009), the pilot study should be carried out by the researcher before launching the survey to ensure response rate, legibility , reliability and validity for accomplishing the objectives of the research.

The main purposes of the pilot test were to:

- Determine whether the questionnaire instructions were easily understood.
- Identify questions that could be misunderstood or were poorly worded.
- Determine whether rating scales were understood.
- Determine how long it would take participants to complete the survey.
- Determine the participants' reactions to the survey in general.
- Make an initial reliability assessment of the measurement scales.

In this regard, the questionnaire went through a number of iterations of pilot testing.

At the start, the questionnaire was pilot tested among the supervisory team. The team were tasked with fully completing the questionnaire and making comments on clarity, layout, and alignment to research objectives. The second step in pilot testing was sending the proposed questionnaire by e-mail to professionals in the field of quality management as well as project management for their comments on the structure of the questionnaire, and to test the validity of the content. The final step of pilot testing was conducted among a sample of the target population. Convenience sampling was used to identify 12 respondents as this number is considered satisfactory for pilot testing purposes (Fink, 1998). Preceding the pilot exercise, the researcher spoke to each of the respondents individually and briefed them with regard to the purpose of the exercise and asked them to provide honest and critical feedback on a number of features including clarity, layout, presentation, timing, ease of completion as well as any other comments they may have.

The result of the pilot test and the feedback received from the debriefing session after the completion of the pilot test, expert opinion and reliability check are summarised in Table 4.14 below.

Table 4-15: Results of Pilot Testing Exercise

Language	All language clear and easy to understand
Layout	Easy to follow
Clarity	Clear instructions and terminology
Presentations	Professionally presented
Ease of completion	Tick boxes and shading welcomed Requested to add scale at the top of every section
Sequencing	Logical order of sections
Length	• Generally viewed as being long but removal of any questions could not be justified methodologically • Advised to break up into other questions, such as in part eleven.
Time taken to complete	Most completed within 15-20 minutes. Covering letter changed to reflect this timing
Other	No other comments

4.8 Data management

To be able to turn raw data into functioning information which yields useful results, consideration needs to be given to data management (Zikmund, 2003). Data management involves a number of steps including data capture, input, editing, screening and coding. These steps are equally applicable to both qualitative and quantitative data.

Data analysis is conditional upon each of these steps being conducted comprehensively in order to have confidence in the ensuing results. The next sections discuss each of these steps and their application in this research.

4.8.1 Data capture

The primary method of data capture for the exploratory interview stage was tape recording. This was the most efficient method of capturing all the information from interviewees. However, immediately following the interviews taking place, they were transcribed and summary documents created which highlighted the main outcomes of the interview and removed excess information (pleasantries, comments, etc.)

Self-administered questionnaires were the main tool of data capture for the survey stage of the research. The design and implementation of the survey was discussed in section 4.6. Once the completed questionnaires were returned, they were numbered and dated. This allowed for analysis to be conducted establishing any differences between early and late responses.

4.8.2 Data input and coding

With receipt of the first ten completed questionnaires, the data input stage of the research was started. Given the large number of items on the questionnaire, SPSS Version16 was used in order to facilitate managing the data and analysis of findings.

Prior to actual input of the data, variables were created. Each variable was given a label corresponding to the question on the questionnaire. Also, each variable's possible responses were coded. The majority of items in the questionnaire utilised a 5-point Likert scale ranging from strongly agree to strongly disagree, which were coded on a 1 to 5 range. The option of don't know was coded as 6 and any missing values were coded as 99 to ensure that they lay outside the range of legitimate answers and minimised confusion (Diamantopoulos and Schlegelmilch, 1997). There were a small number of reverse-worded items in the questionnaire and the coding for these items was reversed in order to reflect the statements.

Once the variables had been set up, manual input of responses began. This was an ongoing process until all questionnaires were received.

4.8.3 Data editing

One of the most important stages of the data management process, data editing, includes identifying omissions and errors in responses (Diamantopoulos and Schlegelmilch, 1997). This ensures more rigorous and reliable results.

Data was edited for consistency and completeness. Editing for consistency involved ensuring that all responses were logical and consistent with the question asked (e.g. age and years of experience). The nature of the majority of questions (no filtered or ordered questions) and response format (Likert scale) did not lend itself to this type of error. The only sections which could have encountered errors of consistency were the age and experience questions. No such errors were found.

Editing for completeness, on the other hand, was concerned primarily with missing responses. All 131 questionnaires were fully completed and there were no missing questions that had not been ticked.

4.9 Questionnaires versus semi-structured interviews

As the methodology approached in this study is mixed method, it became necessary to use semi-structured interviews and questionnaire, this decision has been taken based on the assumption that these tools will lead the researcher to discover and evaluate the relationship between TQM practices and PM performance in the oil and gas industry. In this regard, number of project managers and professionals in the three oil and gas companies who were selected for participating in the interviewees were anticipated to give data and information in a confidential meeting and illustrate extra matters connected to the importance of information contained in the existing context and perception of PM performance by practising TQM principles in oil and gas industry related projects.

However, whereas the semi-structured interviews are considered as very useful tool in collecting enormous amount of data about the subject, some restrictions were come across by the researcher when operating the study interviews. These obstacles are, the interviews was planned to be carried out with the Libyans companies, and unfortunately it has stalled due to lack of cooperation from the Libyan oil companies with the researcher. Interviews consuming a lot of time and that make it costly; also it is not easy to find the participants as they busy with their daily duties in their organisation/company and finally transcription of the respondents will consume plenty of the researcher time. In this respect, the researcher found that:

- Some of the interviewees found it hard to allocate time for the interview in general, and, more specifically, before they started the interview process, they asked for it to take a limited time, so that limited the amount of information provided about the subject.
- Some of the interviewees – especially new staff who have only spent 2-4 years with the company – have less experience in managing projects than the senior ones.

Due to these two obstacles, the researcher coordinated with the contacts in that company to rearrange the interviews with interviewees. The other problem was solved by talking with section heads in the company to coordinate with two highly experienced and two new project managers.

Selection of participants

In any study, the participant should represent all the sections and sections of the population in the field of the study, so sampling frame was established (Saunders *et al*., 2009). Different types of sampling discussed thoroughly in section 4.6.5.2 explained each one in table 4.12.

Data analysis of the questionnaires

Data collected through questionnaire should be analysed statically. There is different software packages used in this regard such as SPSS and Excel from Microsoft office package. The most familiar statistical package used in social and management studies is SPSS. So, **SPSS version 16 was** chosen to analyse the study questionnaire responses. There are two methods used in dealing with the statistical data which are, parametric and non-parametric Field (2009).

Parametric and non-parametric data:

The data to be parametric should be suited with the following conditions: 1) must be interval, 2) must be normal distributed and 3) the participant must be randomly selected (Pallant, 2007). In contrast, when the data is ordinal and not normally distributed and the sample is not randomly selected, in this case according to (Field, 2009), the data will considered as non-parametric.

4.10 Data analysis procedures

In fact, qualitative data analysis is considered a difficult task due to having large data that come in the form of ‘raw’ data. Ritchie and Lewis (2009) argued that the form of qualitative ‘row’ data is various and most commonly comprises verbatim transcripts of interviews or discussions (or audio tapes if they have not been transcribed), observational notes or written documents of other kinds. Creswell (2007) and Yin (2008) indicated that data analysis consists of a number of stages, i.e. examining, categorising and tabulating or otherwise recombining the evidence, in order to address the initial goal of a study. In this regard, Krueger and Casey (2000) recommended that the reason should drive the analysis; they think that data analysis should start by going back to the purpose of the study and its survival requires a clear fix on the intention of the study. In the qualitative analysis, the focus is to bring meaning to a situation rather than the search for truth focused on by quantitative research (Rabiee, 2004). Strauss and Corbin (1998) illustrated the analysis procedure as an interaction between researchers and data although acknowledging that there is a level of subjectivity in the selection and explanation of the generated data. Data analysis and findings including interviews are presented and detailed in Chapter five.

Interview analysis

There are a number of approaches to the analysis of qualitative data. In practice, as Green and Thorogood (2004) acknowledged, most researchers use a combination of approaches. One of these approaches is the framework analysis method, which was proposed during the 1980s at the National Centre for Social Research (Ritchie and Spencer, 1994). The five key stages involved in the framework are outlined as follows: familiarisation; identifying a thematic framework; indexing; charting; mapping and interpretation. The "Framework" refers originally to the "thematic framework", which is the central component of the method. The use of a thematic framework is to classify and organise data according to key themes, concepts and emergent categories. The advantage of this method is to provide a clear series of steps, which could help first-time researchers to manage the large amount and complex nature of qualitative data much more easily. Extensively, this method allows the researcher to synthesise the identified themes across all cases. Rabiee (2004) argued that framework analysis provides some practical steps for the analysis of individual data. He pointed out that "Framework analysis" is used for individual interviews and it is now widely used by qualitative researchers. Krueger (1994) recommended that a helpful way of thinking about this role is to consider a continuum of analysis ranging from the mere accumulation of raw data to the interpretation of data: the analysis continuum: raw data; descriptive statements; interpretation. The other distinctive feature of framework analysis is that, although it uses a thematic approach, it allows themes to develop both from the research questions and from the narratives of research participants. Consequently, the above mentioned discussion exposed that this method has an important role in analysing the interviews due to having a systematic process. This is exceedingly helpful for managing the data, making logic of what is going on, eliminating extra and irrelevant information and navigating safely through the confusion of large and complex paths of information, and hence addressing the aim of the study. Accordingly, this research adopted the framework analysis as its analysis technique through conducting familiarisation; identifying a thematic framework; indexing; charting; mapping and interpretation.

4.10.1 Reliability

The first step in the analysis of most research projects is the descriptive analysis of the data. This is useful as it provides an initial investigation of the data and provides an insight into the findings (Diamantopoulos and Schlegelmilch, 1997).

For the purposes of this research project, descriptive analysis was undertaken to provide respondent profiles at a number of different levels. The results of the descriptive analyses are presented in Chapter six.

Data analysis procedures also included an investigation of the reliability and validity of the data. This ensured the rigor of the ensuing results. Once reliability and validity had been explored, the next step was to proceed with actual analysis of data.

Reliability is the consistency of measurements in a composite variable formed by combining scores on a set of items; it can be measured by Cronbach's alpha coefficient (Easterby-Smith *et al.,* 2012). Given that the survey instrument is based on a total of 12 constructs, the reliability of these constructs is a key in ensuring the exactness of the study.

Cronbach's alpha is the most common method of measuring reliability (Field, 2005) in social sciences. A score of 0.6 or 0.7 is deemed to be the minimum level of acceptability (Hair *et al*., 1987), yet it is argued that even lower levels are acceptable in exploratory research. Table 4.8 below provides details of the alpha scores for the 12 constructs.

On the whole, the internal scores for all the constructs were strong, signifying that the constructs are a valid measure, and varied from 0.76 to 0.90, and that the constructs in fact measure what they were intended to measure. Details of measuring the reliability as well as the results are illustrated in Chapter six.

4.10.2 Validity

Validity is the level to which an instrument is measuring what it was planned to measure (Coolican, 1994a; Jordan, 1988), e.g. culture. It has been argued that validity is one of the most essential considerations as it symbolises the credibility of research (Bailey, 1991). In the theoretical development of broad thoughts such as culture, validity is vital because these constructs are not observable. Relationships among these unobservable constructs are therefore tested indirectly via observed variables (Coolican, 1994b). Consequently, validity reflects how well a measure, or set of measures, reflects the unobservable construct.

Content validity refers to the extent to which measures represent all facets of a given concept (Hair *et al.*, 1987). The main method of ensuring content validity for the purposes of this research was the use of well-established, pre-validated questionnaires. These broad multidimensional surveys (such as OCQ) limited the threats to validity and ensured that the instrument was actually measuring all elements of the construct.

Construct validity, on the other hand, refers to whether a scale measures the unobservable social construct under review (Nunnally, 1978), e.g. culture or climate. Again, the use of pre-validated questionnaires minimised the risks of lack of construct validity. Also, the mixed-methods approach used in this research ensured construct validity as key participants in the area informed the choice of constructs under investigation.

Having established the reliability and validity of the constructs, the next step was to develop correlation and regression analysis procedures which will give way to the bulk of the quantitative results for this study. These are discussed below.

4.10.3 Correlation analysis

One of the aims of this study is to analyse the relationship between TQM practices and PM practices for oil and gas industry related projects. Correlation analysis was deemed the most suitable method to achieve this aim as it tests whether a relationship exists between two variables (Field, 2005).

There is support in the literature for the use of correlation analysis in establishing the association between variables (e.g. Talib *et al*., 2013; Sadikoglu and Zehir, 2010; Wang and Jung, 2006) and, therefore, this research is not diverging from norms set in the measuring performance field.

Correlation analysis involves initially setting up compound variables in SPSS in order to enable the testing of the association between two variables. Appropriately labelled compound variables were set up in SPSS for the 12 constructs and these were then tested against the project management performance items, as well as between all other constructs. The resulting correlation coefficients (r values) indicate the strength of association between each individual construct and project management performance for each of the three companies' respondents. The results for these tests are presented in section 6.7.

4.10.4 Regression analysis

The final step in the analysis procedures was to use the data to model the predictive value of TQM principles to PM performance in oil and gas industry related projects. This would allow the prediction of which variables have the most impact on perceptions of project performance in oil and gas related projects. The most suitable method of establishing this relationship is through using regression analysis.

A number of regression analysis methods are available but the choice of which method to use is governed by the type of research being conducted and the outcomes sought. Hierarchical regression, for example, is best used when the choice of predictors can be based on previous theory and therefore the predictors are entered on the basis of their importance. The forced entry method, on the other hand, allows all the predictors to be entered onto the model simultaneously but again, this needs to be based on previous theoretical research which indicates that all predictors are of equal importance (Field, 2005). Stepwise regression is different in that the variables are chosen purely based on their mathematical impact on the outcome variable. Therefore, all variables are entered into the model and the variable that has the highest simple correlation with the outcome variable is chosen first. This process is repeated until the variables entered into the model no longer make a significant impact on the model's ability to predict the outcome (Field, 2005).

For the purposes of this research, and given the lack of previous empirical research which assigns priority and importance to the identified constructs, stepwise regression was judged the most appropriate method of launching a forceful model of predictors of project management performance, and this method was used by previous studies for the same purpose as this study (e.g. Talib *et al*., 2013; Sadikoglu and Zehir, 2010; Wang and Jung, 2006). The results of regression analysis are presented in Chapter six. However, before the actual regression analysis can be carried out, a number of assumptions for regression need to be addressed. These assumptions, together with their application in this particular research are detailed below.

- ***Linearity***

One of the basic assumptions of regression is that of linearity. The scatterplots below (Figure 4.11) indicate that the mean values of the dependent variable for each increment of the independent variables lie along a relatively straight line. Therefore, the assumption of linearity has been met.

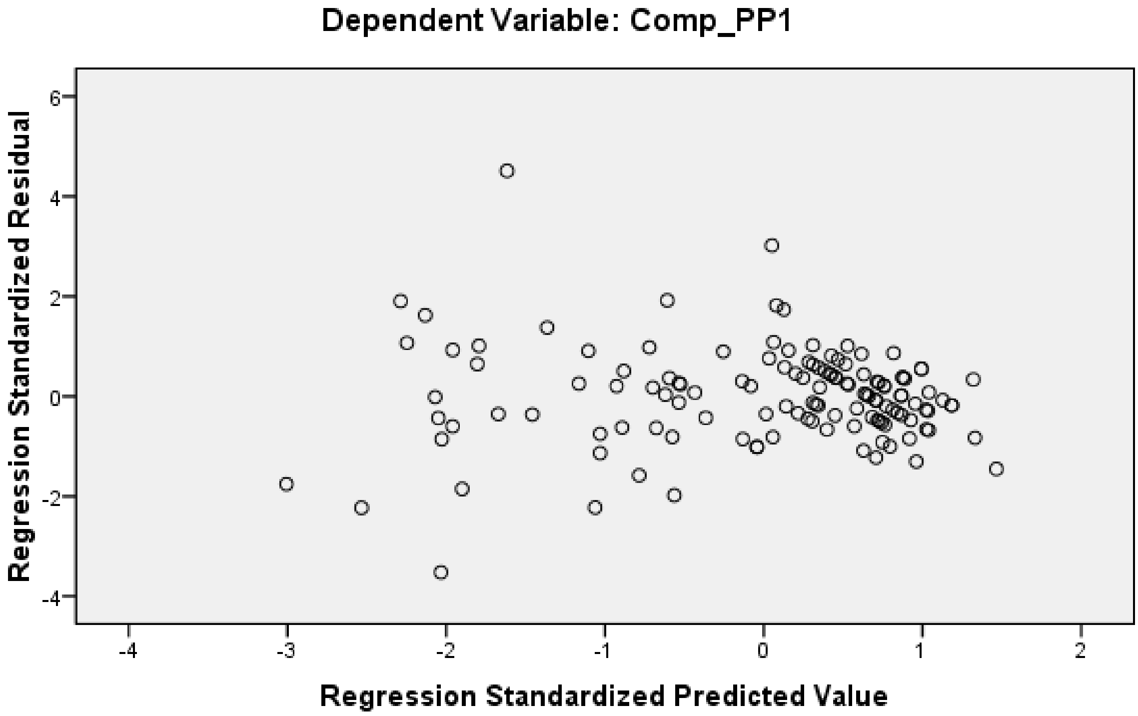

Figure 4-11: Scatterplot

- ***Normality***

In order to ensure the normality of the samples, histograms and probability plots are utilised. Histograms confirm a relatively normal distribution. Furthermore, the normal probability plots show that observed residuals (points on the graph) lie either on the line or very close to the line.

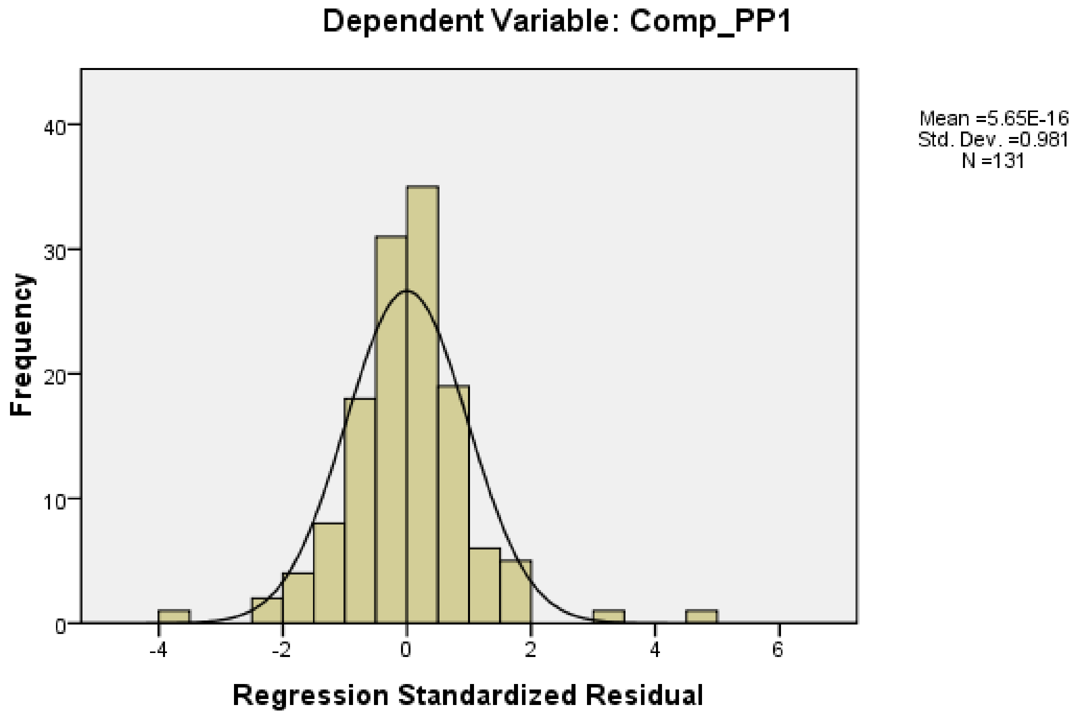

Figure 4-12: Histogram

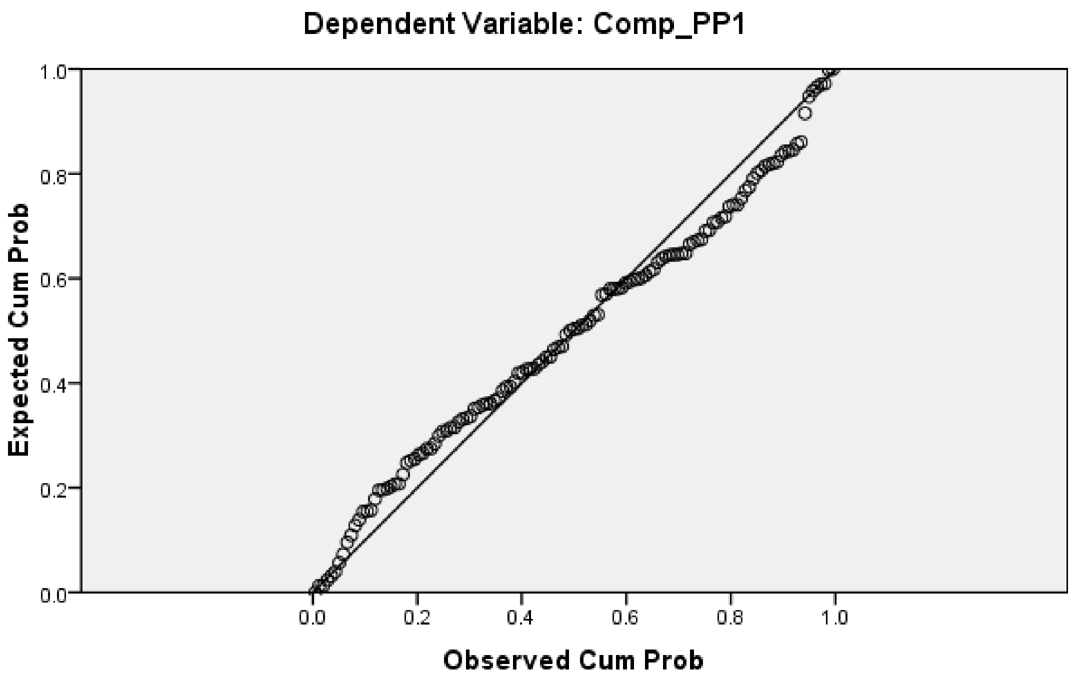

Figure 4-13: Normal P-P Plot of Regression Standardised Residual

4.11 Ethical considerations

The nature of social and management researches required the participant of human in any form of data collection, so the ethical consideration should be taken in the consideration of the researcher. School of Built Environment is under regulations of LJMU who has certain ethical guideline to be followed by the researcher while she/he carrying out the study, in this study the regulations was followed accordingly. Points from the LJMU ethical guidelines are as follows:

- The choice to the participant to contribute or not contribute in the research.
- Withdrawing from the research at any time is the right for the participant.
- Written or verbal consent should be achieved before the involvement in the study.
- Briefing the participants in the study on the implications of participating in this study.
- Informing the participants about the nature of the study and how the gathered data will be handled and published.

The study ethics approval (both interview and questionnaire) has been granted. All materials for this approval such as ethical briefing document, interview structure, questionnaire, research contributing briefing and finally the consent form are attached in Appendices 1 through to 7.

4.12 Summary

In this chapter the adopted methodology has been described thoroughly to reach the aims and objectives of the study. It explained the rational used in selecting the philosophic approach as well as the decision for choosing the method of the study. Semi-Structured interviews carried out in this study, and the questionnaire and what it is related to it are described comprehensively in this chapter. Also, the pilot study of the questionnaire is explained. All the statistical analysis which was carried out in this study is explained and stowed in this chapter. Finally the ethical considerations are described and all materials related to it are also explained in the end of this chapter.

The next chapter, five, will present the results of the qualitative data collected

CHAPTER FIVE

5 Chapter Five: Interview results and qualitative analysis

5.1 Introduction

As indicated in Chapter four, which details the methodology adopted for the study, the questionnaire was formulated in order to gather the opinions of the project managers within the three companies from different categories in the oil and gas industry which are mentioned in Chapter two. This was informed jointly by the literature surveyed in Chapters two and three, and the findings from a set of interviews undertaken with 12 project managers and section heads within these three companies. Qualitative data consist of detailed descriptions of situations, events, interactions, direct quotations from individuals about their experiences, attitudes, beliefs, thoughts and excerpts or entire passages from documents, correspondence, records and case histories. Qualitative data are collected as open-ended narrative without predetermined or standardised categories. Qualitative analysis examines multiple groups to identify common themes that, having cross-confirmation, take on a greater significance. Qualitative data for this study came from semi-structured interviews with 12 project managers within the three oil and gas companies from different categories in the oil and gas industry. The process for systematically analysing the qualitative data collected as part of this study is summarised in the steps below.

This chapter gives details of the participants in the initial qualitative study and subsequently presents the findings which indicate the perception of the concept of Project Management Performance (PMP) and its relation to Total Quality Management (TQM) practices.

5.2 Objectives of interviews

The major purpose of conducting qualitative interviews (as detailed in Chapter four) is to understand and gain insight into a particular phenomenon being investigated (Collis and Jussey, 2003; Saunders *et al*., 2009). Therefore, in this study interviews were conducted in order to gain opinions on issues that could not be properly elicited purely through a quantitative strategy. Hence, interviews were held with a small population of personnel representing three different oil and gas companies, in the belief that a range of opinions would be forthcoming and would encompass the feeling towards the impact of TQM practices on PMP throughout the entire sector. The opportunity for personnel to discuss issues relating to TQM practices on PMP in a private one-to-one encounter with the researcher was thought to be conducive to the objective of obtaining honest responses and to highlighting aspects of TQM practices on PMP that might not otherwise surface.

Of the 12 persons involved in the interview process from the three companies, two of them are department managers, one is a business manager, two are senior project managers and seven are project managers. In all, 12 personnel participated in the interview exercise. Table 5.1 illustrates the interviewees' details with respect to their position. From each company, the selection of participated personnel was to have different levels of seniority, responsibility and experience in order to gain more information and a wide view about the impact of TQM practices on PMP. Also, they were expected to be able to provide a breadth and depth of information related to : 1) PMP definition and measuring, and 2) TQM practices in the project, such as top management activities, benchmarking, defining and measuring of Key Performance Indicators (KPIs), training, motivations, customer satisfaction and quality of goods and services. The interviews were all conducted as individual sessions and each lasted an average of 40-50 minutes. The interview template (see Appendix 4) covered the key issues related to TQM practices on PMP. Hence, the overall objective of this initial qualitative exercise was to acquire data that would offer guidance regarding the construction of the questionnaire, a method which, as noted by Saunders *et al*. (2009), thereby allows for more fruitful interpretations of the eventual quantitative study, and an extension of the research findings.

Table 5-1: Interviewees' Details

Company	Category	Interviewee	Title/Role	Length in Organisation	I.V. Duration
A	Owner	A1	PM	10	40 min.
		A2	PM & SH	15	45 min
		A3	PM & SH	15	45 min
		A4	DM	17	50 min
B	Engineering	B1	SPM	10	40 min
		B2	BM	15	45 min
		B3	PPM	12	40 min
		B4	SPM	10	40 min
C	Contractor		PM	4	40 min
			PM	6	47 min
			PM	5	40 min
			PM & SH	10	50 min

BM: Business Manager **DM**: Department Manager **PM:** Project Manager **SH**: Section Head **SPM:** Senior Project Manager

5.3 Qualitative data analysis

Miles and Huberman, (1994) stated that there are number of procedures to analyse the qualitative data. The main purpose of these procedures is to convert the raw narrative information and data which normally audiotapes and notes into handled and processed data, which after that coded in different analysis themes (i.e. main theme analysis) in order to explore the subject of the study (Yin, 2009). Content analysis is adopted along with NVIVO V10 in order to have a thorough analysis of the interview feedback. Technique of the content analysis is very powerful in compressing many words of text into content groups based on themes and coding (Gao 1996). In order to identify all main topics related to the subject of the study, the analysis is compulsory to be aware of and familiar with collected data, main issues, themes that the examined with and concepts. All of this are referenced and prepared in a way that let the researcher to arrange them according to thematic framework to which they associated. The findings of the process will be compared at the end with findings of quantitative analysis in order to combine them together to attain the final conclusion as well as deep information and wider view of how TQM practices impact on PMP.

5.4 Interview findings

This section explores the perceptions of the interviewees concerning the five major areas which are:

- How is PMP being measured?
- What are the definitions of KPIs and how are they measuring them?
- How the TQM practices impact on PMP?

Table 5.2 in Appendix 6 summarises the answers of each participant which are resulted from content analysis; also, Figure 5.1 and Appendix 7 show how the qualitative data was analysed by NVIVO.

5.4.1 PM Performance

5.4.1.1 Time, Cost, Quality and Health Safety and Environment (HSE).

From the interview results it can be seen that seven out of 12 interviewees emphasise that PM performance is defined and measured as time, cost, quality and HSE. For example, Interviewee A2 reported that:

> *"in terms of HSE, we have 'zero lost time injury' policy but will tolerate a small number of incidents. We monitor these to make sure that there is not a systemic failure. We study the causes of any incident to learn from them and prevent recurrence".*

In Company B, the consultancy and engineering company which is offering and providing engineering and consultancy services to the Owner stress the issues of HSE as stated by Interviewee B2 reported that:

> *"Project performance is about the bottom line and completing on time on budget and the quality criteria required by the client.*
> ***Is there any taking care of stake holders measures by Project Managers****?*

B2 also said that:

> *"those are part of it to look at the stakeholder with those three criteria I mentioned before, and also need to look to our Health and Safety and Environment (HSE), to make sure we achieved the HSE in our commitments, we need to ensure, whatever we doing is according to HSE."*

The interviewees emphasised the HSE issue, and linked it with the project performance. This was due to their positions within the company. Figure 5.2 shows the result of the NVIVO analysis of questions related to project performance in which the time, cost, quality and HSE are among measurement factors of project performance. This finding met with the previous study of Chan and Chan (2004).

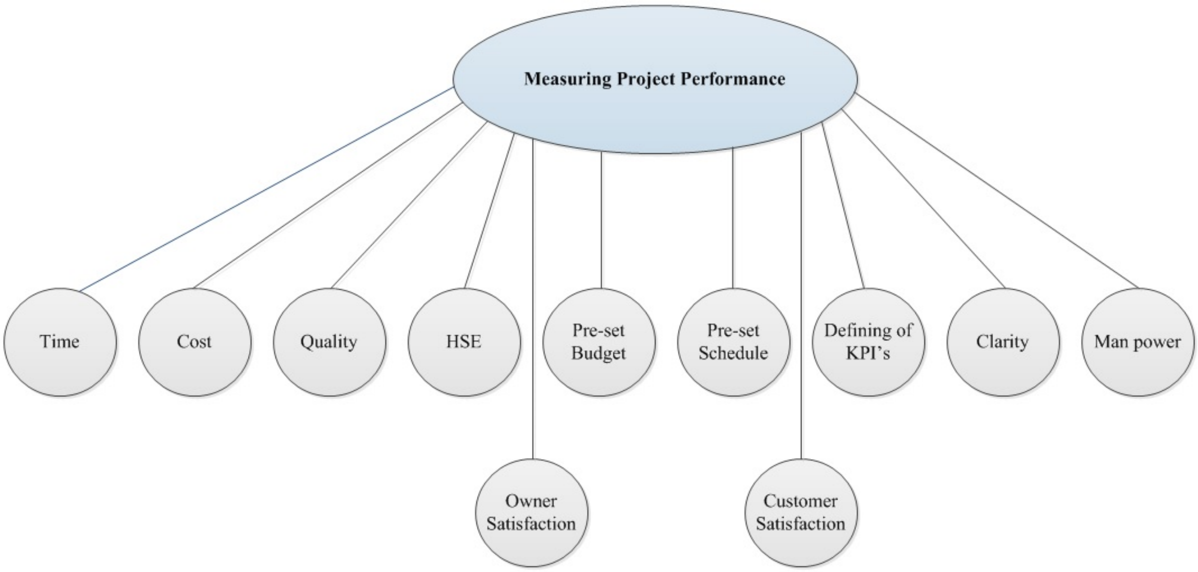

Figure 5-1: NVIVO result of measuring project performance

5.4.1.2 Other criteria

Generally, the interviewees stated time, cost, quality and HSE as a definition of PMP. But some mentioned the manpower involved in the project and their unity in working towards a best performance. Also, clarity and client happiness were stated and they mean by that to keep your client up to date with the project activities in order to make them happy with the performance. For example, in Company C, Interviewee C1 reported that:

> *"by ensuring the contractor is working closely with the fabricator and they work with them to ensure there is clarity in any documentation and discussions, and that all specifications are met. They believe that clarity, tracking of costs and tracking of timescales will achieve the required delivery date and make the client happy".*

Interviewee B4 mentioned ROI, which means the Return on Investment, and stated that:

> *"Defining project performance is usually by telling the investment, so good project performance is good ROI".*

Also, some of the interviewees emphasise predefining KPIs from the quality department as a condition for project performance, see Figure 5.2, which assures the link between quality management practices and project life to end up with a high performance for any project. This meets with the conclusion of Chan and Chan (2004) and Lim and Mohammed (1999).

5.4.2 TQM practices in projects

5.4.2.1 Top management activities

All the interviewees emphasised the importance of top management involvement and following up of project activities to achieve maximum PMP. Top management of Company A had a systematic procedure of following the activities of the project, which was explained by the interviewee as top management stated that they demonstrate their commitment and support in project environments by following what they called the Opportunity Realisation Process (ORP), in which there are a number of stages: identify, select, define, execute and operate. They are kept informed at all stages of the project and they can make sure that it is going to plan in terms of resources and getting approval from the shareholders. They hold regular meetings with project managers and other company managers, and securitise weekly, monthly and quarterly reports, and other steps to ensure that the commitment is there from the top management to support the project. This includes regular visits to projects at all stages by top management.

Interviewee A1 explained how their top management following and monitoring the projects, and that was stated clearly in response to my question regarding the top management involvement; and he reported that:

"How does top management demonstrate its commitment and support in project environments? In our company, we are following something called Opportunity Realisation Process (ORP), and in that process there is a sort of about five stages, that we going from the project, we are going from identify, select, define, execute and operate, and of course with the identify, we also assist the project itself; during all these stages, our management get informed, they are gates, assurance gates to make sure that project is going according to the requirement, in terms of resources, in terms of getting the approval from the shareholders, so all of these gates basically it help the project to start efficiently when it is coming to the execution phase. Talking also about the management support, we also having, apart from the assurance of use which we are having, we have a sort of meetings, which we conducted with the project managers, who are managing the project and the management of the company, and we go through the weekly, monthly as well as quarter yearly report. There are also many steps which we are going through in order to assume that the commitment from the management is there for our project. It is also our management committed to conduct regular visit to projects, either if it is in the design phase or in the execution phase during the construction activities, so that sort of commitment which we getting, it is all the way through basically from beginning of the project all the way to the operation of the facilities after the completion and commission of the project."

However, in Company C, the top management involvement is through the technical team, who evaluate the project and make suggestions that could potentially benefit the project outcome. Interviewee C1 stated that:

“our technical team would evaluate and then give them a few opinions that could potentially benefit the project or whatever it meets the requirements”

Whereas Interviewee B1 reported that in this company the top management involvement is through the quality management system. They have implemented a total quality management system and have ISO 9001 accreditation. They also have a national quality award scheme for their employees and their employment procedures. Their quality procedures are regularly audited by BSI (British Standard Institute), and all this shows how top management demonstrates its commitment and support in the project environment.

Interviewee B1 explained how their top management is following and monitoring the projects, and that was stated clearly in response to my question regarding the top management involvement; and he reported that:

> *"Well the top management here have a basic set up already and implemented total quality management system, ISO 9001 series and also National Quality Award scheme for its employees and its employment procedure, and basically we work everything to our quality procedures and they renew it on a constant basis and we have audits from BSI, which I think is UQAS (Quality Auditing System). We are under sever monitoring of the quality management people, like check on our procedure, and I think this shows how top management demonstrate its commitment and support in project environment. "*

Also, the results of NVIVO show the importance of involvement of top management to achieve maximum project performance. As shown in Figure 5.2, some of the interviewees emphasised the top management commitment through their daily routine check, and some through participating in putting KPIs in place and others assure it through reporting, inspection and auditing.

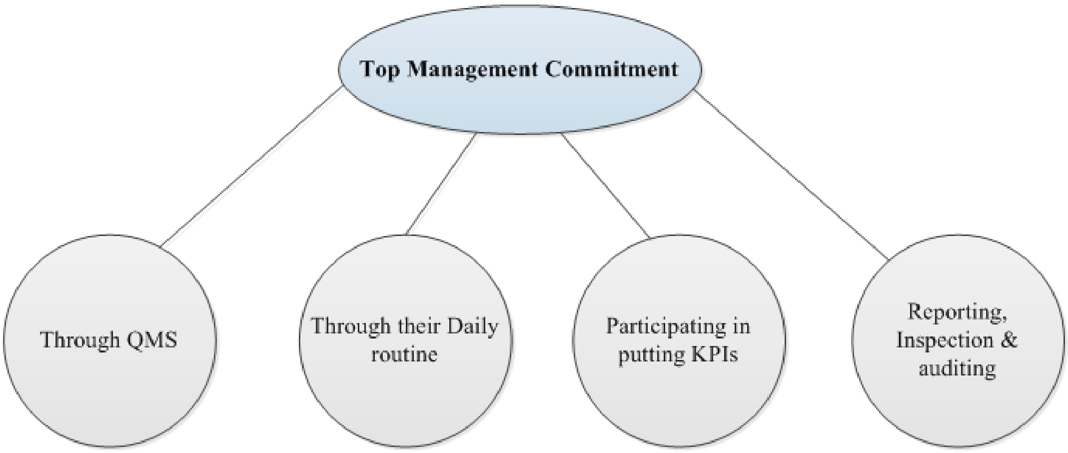

Figure 5.2: NVIVO result of Top Management Commitment

Previous studies in TQM practices put emphasis on the vital role of top-management commitment in driving overall TQM implementation in the organisations (Zakuan *et al*., 2010; Flynn *et al*., 1994; Teh *et al*., 2008). Teh *et al*. (2008) concluded that senior leaders and management lead the organisation and weigh up the organisational performance. Kanji (2001) stated that top-management commitment is the crucial driver of business excellence. In addition, studies demonstrated that top-management commitment extensively influences the quality performance (Arumugam *et al*., 2008; Prajogo and Brown, 2004; Talib *et al*., 2013; Kannan and Tan 2005; Adam *et al*., 1997; Ahire and O'Shaughnessy, 1998; Nair 2006; Cua *et al*., 2001; Das *et al*., 2000), operating performance (Ahire and Dreyfus, 2000; and Fuents *et al.,* 2006), market and financial performance (Nair 2006; Sanchez-Rodriguez and Martinez-Lorente, 2004; Adam *et al*., 1997; Kannan and Tan, 2005; Fuents *et al*., 2006; and Kaynak, 2003), employee performance (Flynn *et al*., 1995; Rungthusanatham *et al.*, 1998; and Fuents *et al*., 2006), innovation performance (Prajogo and Sohal, 2004; Feng *et al*., 2006; Phan *et al*., 2011), project performance (Shieh and Wu, 2002) and aggregate firm performance (Powel 1995 and Cua *et al*., 2001).

5.4.2.2 Benchmarking

Due to the importance and benefit of benchmarking activities for projects, especially for PMP, all three companies emphasised benchmarking activities. Company A carried out benchmarking internally within the company and externally with other companies from other states that was due to the nature of the company itself and the size and number of projects it carried out. Whereas, companies B and C conceded that benchmarking activities were only carried out internally. This met with the conclusion of a previous study, which showed that benchmarking had a direct effect on performance, (Talib. *et al*., 2013).

5.4.2.3 Defining and measuring of KPIs

Defining and measuring KPIs is one of the important activities in a project's life, because the setting of them should result in a high PMP. Because of that, company A insisted that their Quality Department defined them carefully considering the lessons learnt from previous projects and related to the project itself, as stated by Interviewee A4, who said that they view project performance and quality management like any other critical business activity. Their quality department defines the KPIs (taking into account lessons learnt from previous projects) in the way to achieve the success of the projecst . They identify through their project quality plans what the requirements are and how they are going to deliver. They monitor progress against these plans achieving efficiency, which identifies resources against risks; for example, have they done a similar project in the past, or is new technology involved. They have created a culture in which all levels of the company take responsibility for the quality commitments.

Interviewee A4 explained how the company's top management defining the KPIs to the projects, and that was stated clearly by his response to my question regarding the definition of KPIs by top management; and he reported that:

> "*we define project performance, it's ensuring that QM manage same as any other critical business activity, so we do not see any difference to any other critical business activity. We ensure the activities and projects are delivered to promise and facilities performance specified, so we identify through our project quality plans what the requirements are, and how we going to deliver, and we monitor it again what we state, [and] achieve the efficient use of the resources around us. We also do it against our manpower requirements; we use a risk-based approach. I have put a document together which records a practice which I identify resources against risk – now that could be, have we done a similar project in the past, is this new technology, have we applied it in the past, so, there is a different risk process that we identify that, also we create a culture in PDO and contracts and employees to encourage [them] to share the commitments. So, it is make sure that everybody is aware; it is a top-down and bottom-up, top-down; it is the management identifying via the policy, bottom-up, identifying to each individual and they're responsible for the quality award and they deliver.*"

Also, Company B had a series of KPIs defined by the company from top management and their quality department and covered all areas of the project life, and that was stated in the response of Interviewee B2, who said that the KPIs are defined by top management. These are communicated to all levels in the company and everyone is expected to know what the KPIs are and which ones apply to them, so that if something goes wrong it is clear who is responsible. Conversely, people are rewarded accordingly when they perform to the requirements.

Interviewee B2 explained how the company's top management defined the KPIs to the projects, and that was stated clearly by his response to my question regarding the definition of KPIs by top management; and he reported that:

> *"Well, there is a hall punch of KPIs, wright from financial, HS through to behaviour, and every individual gets know what the KPIs [are], and everyone knows what performance criteria are and links to prefix criteria, and it is all about understanding every level in management and organisation, understanding what the criteria are and worked for it, what the worst is, when the people do not know what KPIs are, and there is no doubt where the thing go wrong. They need to understand what have been measured against what is expected of them, if they performed to those requirements, then they are rewarded accordingly that and if they do not meet those requirements, they are punished, we need to help people by training and coaching, so that they can be better and we can support them, so that they can make those requirements clearly understood."*

Company C approached it slightly differently; they broke the project into a number of packages to manage KPIs on a time basis and deliverable basis, as stated by Interviewee C4, who said that their approach was slightly different in that they define KPIs in two separate criteria: firstly on a time and schedule basis to facilitate following up performance of the project, and secondly on a deliverables basis:

Interviewee C4 explained how their top management defined the KPIs to the projects, and that was stated clearly by his response to my question regarding the definition of KPIs by top management; and he reported that:

> "*In our company we define the KPIs in two criteria, the first one in time and schedule basis in order to ease following up the performance of the project; the other criteria is deliverable basis, which we expect deliverables and we monitor the performance associated with these deliverables."*

Results from the NVIVO analysis, see Figure 5.2 above, showed that the issues of defining and measuring of KPIs are not restricted to certain procedures and they vary from one company to another and from one project to another, taking account of the iron triangle plus HSE or HSEQ. The reasons behind that are:

1) the size of the project, 2) the location of the project, 3) the nature of the project and 4) budget of the project.

Consequently, the statements of the interviewees emphasise KPIs as an important practice that would enhance achieving project performance. These met with the conclusion of previous studies (Bryde, 2003a; Mir *et al*., 2014). In this regard, KPIs become an essential practice to achieve maximum project performance.

H9. KPIs for TQM practices are positively associated with PM performance.

5.4.2.4 Training

Due to the importance of training the project managers to catch up and be familiar with up-to-date issues related to project management and gaining new skills, all companies stressed it. Company A had a different training scheme which developed and built the skills of their employees, and Interviewee A2 stated that they have three schemes to help staff perform effectively in project environments. Firstly, there is training in health, safety and environment (HSE) issues, which ensures that employees have the right training to equip them for their particular role. Secondly, there is technical competence assessment and training for all the 12 critical technical disciplines, to ensure that people have the right technical authority, for example to sign off drawings, and if there are any gaps in technical competence how they can be remedied to fulfil the project requirements. Thirdly, there is a scheme to reward performance. They recognise that competent people may not be motivated and this can lead to under-performance and them being under-utilised. They have a scheme to reward people for going beyond the call of duty. They are recognised and there are monthly awards which are publicised throughout the company. The award is made to the best employee in the company, and the reason why they got it is announced to the whole company and there is also a monetary award.

Interviewee A2 explained how staff are trained and developed to be able to perform effectively in project environments, and that was stated clearly by his response to my question:

> ***"How are staff trained and developed to be able to perform effectively in project environments?"***
> *Yeah, we have three schemes: we have training scheme in HSE that we define every individual what is his role or her role, and what kind of HSE competence that they need to have, so for example, like they are working in a H2S environment, they need to have the right training to make sure that they are suited to it. So at different working levels the different HSE competence requirements have been defined and training is provided, and we are monitoring it everybody get the right training and choose any if [we] have new guides we go through HSE enrolment or in the action as well as ensure that, you know, the right clauses have being proposed and adjusted to. In terms of technical competency, we have competence assessment on all the critical positions because they need to have the right technical authority to sign, such as certain drawings and so on, so as an engineering manager with the support of the function we have assisted all the 12 critical positions technically, meaning all the discipline and ensure that the competence is there, and if there are any gaps, how those gaps can be filled without affecting the project. The third scheme is about recognising in terms of performance if a guy is competent but he is not motivated it can lead to under-performance, or he is under-utilised, it could also be problem, so what we do is that, you know, we look at the competence and capacity and there is a scheme if you go beyond your called duty, you get recognised through SA and it goes public: every month, when we have monthly meeting, we announce the best employee of the month and why and what he has achieved and gift that about Ryal50 or it can be talking of appreciation."*

Company B is an engineering and consultancy company which was required to invest in people and train them very well. Interviewee B4 told about another way of training which is being used by his company, and he said that his company, being an engineering and consultancy company, has to invest in people and train them to a high level. The training schedule is developed by the top management and learning seminars are held to train staff on new or modified software. They also hold monthly lunchtime sessions which cover HSE issues, any incidents which have occurred, any good project management developments or any technical developments. These are presented by different managers with time for open discussion to follow, and lunch is provided by the company.

Interviewee B4 explained how staff are trained and developed to be able to perform effectively in project environments, and that was stated clearly by his response to my question:

> *“We have a planning and schedule coming from the highest management called learning seminars or any new software and any developed software; the team who is looking after this work send us for training to perform on it. Also we have lunch learn session every month in HSE or in any event that has happened or any good project management issues or any technical things or any project manager who has developed any good techniques for any project to present it in open discussion, which the company pays for the lunch and people come to attend the presentation"*

Company C stressed the importance of training through the response of their Process Manager C4, who said:

> *“I would argue the other way: if you have effectively trained people and graduates, then I think your overall performance will be a lot better”*.

Also, it is obvious from Figure 5.4, which was developed from NVIVO results, that the three companies stressed it and they use different tools and mechanisms to train their staff to get high project performance. In addition, the training practices were found to be very significant with regard to performance in previous studies, in quality performance (Ahire and Drefus, 2000; Quazi *et al*., 2000; Talib *et al*., 2013) in operating performance (Fuentes *et al*., 2006; Kaynak, 2003; and Anderson *et al*., 1998), in Market and financial performance (Fuentes *et al.*, 2006; and Kaynak, 2003), and in employee performance (Fuentes *et al*., 2006; and Anderson *et al*., 1995).

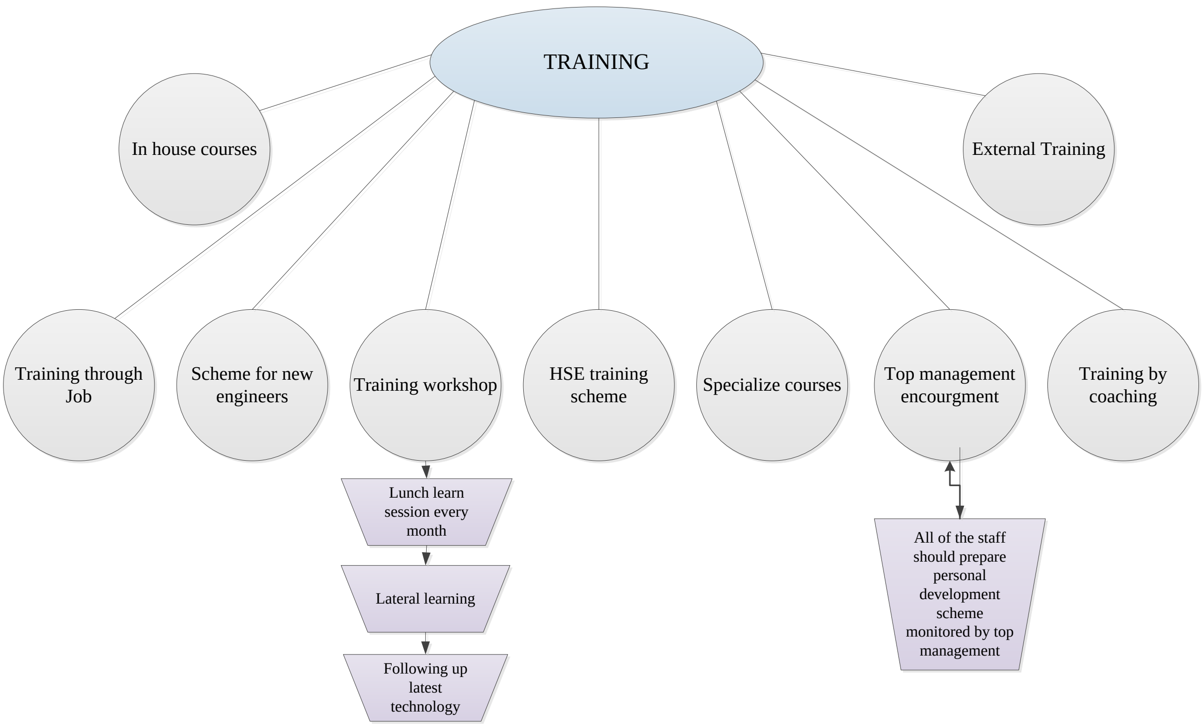

Figure 5-3: NVIVO result of Training

5.4.2.5 Motivation

They all stressed the importance of motivation, but they have different levels of formality. Company A had a formal system called "Shukkren Award"; Interviewee A4 described his company's motivation and award scheme. This provides for award payments to people who have done something out of the ordinary or have made useful suggestions regarding safety issues, or come up with ideas which can potentially save the company money, or put forward new ideas which could improve quality. The rewards are both financial and through recognition in front of the full project team, where it is acknowledged that what this person suggested actually helped the company to deliver the project.

Interviewee A4 explained how staff was motivated to be able to perform effectively in project environments, and that was stated clearly by his response to my question:

> *"The PDO has a system which is called the "ShukKren" awards system; it's basically a capability awards financed payments to people who have done something out of what we would class as normal day-to-day business, so if somebody has done something that could actually be with regards to safety et cetera, or they have done something out of what we class as day to day, we have a "Shukkren" awards system. Also, we have quality performers identifying punctual meetings on a regular basis and improvement areas where we would acknowledge any new items or anything that has been put, so when we have our functional meetings we identify what is being raised and obviously the person that's raised it, if something's being raised at site, we have a card system where people can identify and quality impacts and any safety impacts; we acknowledge that to them, by either financial awards through the "Shukkren" awards or through a verbal award in front of the full project team, where [we] acknowledge what this person actually gave us to help us to deliver the project"*

The other two companies used different award systems and ways of appreciating project managers who achieve an outstanding performance, which is assuring the importance of the motivation.

5.4.2.6 Customer satisfaction

Company A established a system to deal with their customers' demands and complaints called "Change order". A1 reported on how his company deals with customer demands and complaints. They have a procedure and specification for meeting customer requirements. Any changes to this have to be authorised at the appropriate authority level and then carried out with a "Change Control". This means that if there is any change to the project in terms of budget, schedule, or meeting specifications which have been set up for the project, then somebody with the right technical or commercial authority has to authorise and carry out that change.

Interviewee A1 in answering a question related to customer complainants said:

> ***"How does your organisation deal with customer demands and complaints?***
> *Basically, in PDO, we have to ensure that the customers' demands was met; and how we do that, we have a certain procedure and specification within the company and any change to that specification has to be dealt with [by] a change control, so we have a change control, and that change control, basically it goes with accordance [to] the authority level, so if there is any change to the project itself in terms of scope, in terms of budget, in terms of budget, in terms of schedule, in terms of meeting specifications that you have set up for the project, then somebody with the right technical authority or commercial authority has to authorise [it]. So, by doing that, having change control, we really get into meeting customer demands and complaints, so any changes to that one, we have a standard, as I said, we have specifications and any change to that one, it has to be dealt with [by] the change control."*

A2 added that they also have a change control log between the company and the contractor, which records any changes to the original scope of the work that may need to be made. This needs to be clearly defined so that the company is not subjected to claims from the contractor, which will guard against additional costs and protect the bottom line. Both parties are then clear as to their contractual obligations and cost and time estimates are agreed and the change can then be implemented successfully.

Also, interviewee A2 said:

> *"Well, between the company and the contractor, we have change control log or system in place for the various changes that may occur from original scope of work, because if that is not clearly defined and logged of course, we PDO get affected with claims from the contractor who is there to gain, also save cost and maximum profit, so the area of disputes and compliments is always come in clarity, apart from the contractual obligations, so we make sure that every change gets logged and gets discussed, estimated in terms of cost and in terms of implementation, and agreed by both parties and gets implemented."*

Company A, by applying this system from the beginning of contracting with the client in early stages of bidding and writing it clearly in the scope of work, guarantees that the customer will be satisfied with any change that could happen during construction as well as in the engineering stage.

Company B is an engineering company and its nature is to deal with its customers in a way to make them happy and follow the work and solve the problem or complaints from the beginning, and that was stated by their Business Manager, B2, who said that this company is entirely customer focused. They work with customers, offering them offices in his company's premises, working with the same team. His company does not view customers as enemies, and they solve the problems together. His customers have direct access to him and he is authorised to solve their problems, sometimes in direct contact with the highest level in the client company

Interviewee B2, in answering "***How does your organisation deal with customer demands and complaints?***", said:

> "*We do that by ensuring that we are customer focused, that is all we do. We are customer focused, we work with the customers, offering them offices here, working with the same team; our customers are not enemies, and sometimes, customers, especially from international companies tend not to understand that, but we solve the problems, and if we solve the problems and sort the problems out, and understand what they want, do what they need to do, and if there is a complaint we try to sponsor them, we consider right of our customers in top level. I generally act as the project sponsor, and if there is any complaint in the project, they come directly to me; I talk with them to solve the problem out and resolve it. There are no rules or fault; sometimes it's the client fault and we understand the client, the client also to be blamed, and often it is done in a much higher level and sort the problems out straightforward."*

Whereas company C is customer focused and had its own mechanism for dealing with customer complaints. This respondent's starting point is that he accepts what the customer is saying, listens to them even if the complaint seems quite trivial, and then proceeds to solve the problem. Where there are extra demands, then he reviews what the original scope was and if it involves extra cost then he would have to negotiate with the customer and agree to a variation.

The Interviewee C4, in answering **"How does your organisation deal with customer demands and complaints?"** said:

> *"Yes they do, and what you do is first of all is you accept what they say. From my experience you listen to them first of all, no matter how insignificant it is, and invariably and most of their complaints are very minimal and not that*

> *important and sometimes can be explained away; so you deal with them, you to talk with them, go up to them right, and if they have legitimate complaints then you look at them if you have complaints. In terms of demands, if they have extra demands on the project, you review as to what the original scope was, and if it is extra to what was originally agreed, then, actually, you have to agree to a variation on a new order."*

From the perspectives of the interviewees from the three companies, it became very oblivious that making the customers satisfied and happy was significant for the beneficial outcome of the project and accomplishing the highest performance possible. The customer-focused practices were found to be very important with regard to performance in previous studies in quality performance (Prajogo and Sohal, 2004; Feng *et al.*, 2006), in operating performance (Fuentes *et al*., 2004 and 2006; Nair, 2006), in market and financial performance (Fuentes *et al*., 2004 and 2006; Nair, 2006), in employee performance (Fuentes *et al.*, 2004 and 2006), in innovation performance (Prajogo and Sohal, 2004), production performance (Agus and Hassan, 2011) and in aggregate firm performance (Chong and Rundus, 2004; Nair, 2006).

5.4.2.7 Quality of goods and services

In order to get a good project performance, the companies are eager to have a good quality of goods and services as well; due to that, Company A established a system called Approved Vendor List (AVL) to guarantee quality of services and goods.

A2 spoke about ensuring the quality of goods and services from project suppliers. Firstly, they have a requisition procedure in which they define the technical requirements of the goods that need to be procured, and this is then communicated to the vendor, which is already on a pre-proved list – the “Approved Vendor List” (AVL). These companies have been vetted for performance and quality. There are also procedures for approving goods from new suppliers which are not yet on the

AVL. In this case, there must be a clear record that the quality has been demonstrated to meet the company's requirements. There will then follow an audit of the supplier and a review of the quality plan for the product, to ensure that the original specification is being adhered to. There will then be pre-manufacture meetings and then audits during construction. They use third-party inspectors to inspect for quality and functional acceptance, and then to carry out a final pre-delivery inspection. Finally, there is a further inspection when the finished product arrives at the site to check for any damage during shipment and transportation.

Interviewee A2, in answering "***How do you ensure the quality of goods / services from your project suppliers?*"**, answered:

> *"Well, it started in engineering, where we have a RQ requisition [in] which we define the technical requirements of the goods that need to be procured, so that we review it and make sure that the quality requirements are clearly defined into the vendor scope, the technical scope is clearly defined, and once that is sorted send it to the vendor. Also, we have an approved vendor list, and this list in PDO means that has been classified in terms of performance, quality and then they get registered as appropriately suited to deliver goods, that it [is clearly] recorded in demonstration in terms of quality [that it] will meet PDO requirements and that follows through an audit to see the suitability of that specific vendor in line with PDO requirements and then we have a review in approval of the quality plan for product in terms of inspection. In terms of test plan, we ensure all the applicable specifications are being adhered to and we also have a witness which is monitoring, as you know, control points and then we have pre-manufacturing meetings. After that, audit is being placed and then we have vendor audit during construction; we have third-party inspectors that lined with PDO side to look out [for] the quality; we have functional acceptance test, which we have both quality guys as well as technical to participate; and then we have final inspection in release*

> *that the goods have been inspected as suitable for what is asked for, and finally we have at site goods inspection when we received it, if there is any damage and things during shipment and transportation and so on."*

For Company B investing in people and its engineering is all about the quality of people they hire to do engineering and consultancy jobs, so they should be very careful of how to hire them. The way of choosing the people in this company was stated by their business manager: Interviewee B2 said they do not really have suppliers, but they have a set of specifications for the provision of services, which are provided by sub-contractors. They hire the best people and do not look for the cheapest, preferring to look for quality and value, as they have seen other companies, who try to do things too cheaply, going out of business.

Interviewee B2, in answering, ***"How do you ensure the quality of goods/services from your project suppliers?",*** said:

> "*We do not really have suppliers; we have a set of specifications for provisional services to us, and we manage those subcontractors and we ensure those subcontractor services meet our requirements, we hire people with the same mentality to us; we hire them because of that and not because they are cheap. People like us tend to be expensive, a lot tend to hire at low price; that is a disaster, so we hire the best people, the most proper people to do the job. Organisations that look for the cheapest companies go bust eventually and that's what we have seen around. We also have a cheap mentality and they have just gone bust and the whole economy will collapse within 20 years' time and we are seeing another place where quality and value, there is an understanding of, when there is a disconnection of achievements and value and price, we understand what value is, if you understand what price is – and all our customers do not understand the*

> *difference between value and value in price, but those [that] do get also out of it; those that do not go bust."*

However, Company C relies on quality agreement with the supplier and on an inspection and auditing system which they practise, and that was confirmed by Interviewee C2, who stated that his company relies on quality agreements with suppliers and on inspection and auditing system. Their Quality Assurance/Quality Control policies are rigorously enforced on suppliers, which are regularly audited to make sure that their quality policies are in line with his company's own policies.

The interviewee C2, in answering, ***"How do you ensure the quality of goods/services from your project suppliers?",*** answered:

> *"We have quality, I mean policies in our quality QA/QC plans; we enforce those religiously on the suppliers, we actually put our suppliers only once we have ordered them; we check them, audit them and we keep on auditing them, their quality policies, make sure their quality policies are in line with our quality policies."*

The answers came from the three companies about ***"How do you ensure the quality of goods/services from your project suppliers?"*** They showed the importance of the issues of the quality of goods and services, and reflected the way they ensure the accurate choice of materials or services which will end up with a high project performance.

Therefore, the communications and information management process as well as information management performance are crucial for achieving high project performance. This met with the conclusions of previous studies (Choi and Eboch, 1998; Ho *et al*., 2001; Prajogo, 2005; Prajogo and Sohal, 2004; Quazi *et al*., 1998; Rezaei *et al.*, 2011; Teh *et al*., 2009). In this regard, information management process and information management performance become vital practices to achieve maximum project performance.

H10. Information management process for TQM practices is positively associated with PM performance.

H11. Information management performance for TQM practices is positively associated with PM performance.

5.5 Modified conceptual framework and hypotheses

Grounded on the above interview results and literature review from Chapter three, a conceptual framework and hypotheses modified into 11 TQM practices instead of eight, which resulted from the literature review, is the examination of the relationship between TQM practices and PMP in the oil and gas industry. The proposed TQM conceptual framework is shown in Figure 5.4 below. This research model suggested that, the greater the extent to which these TQM practices are present, the higher the project performance in the oil and gas will be. In this framework, the independent variables are TQM practices and the dependent variable is project performance, respectively.

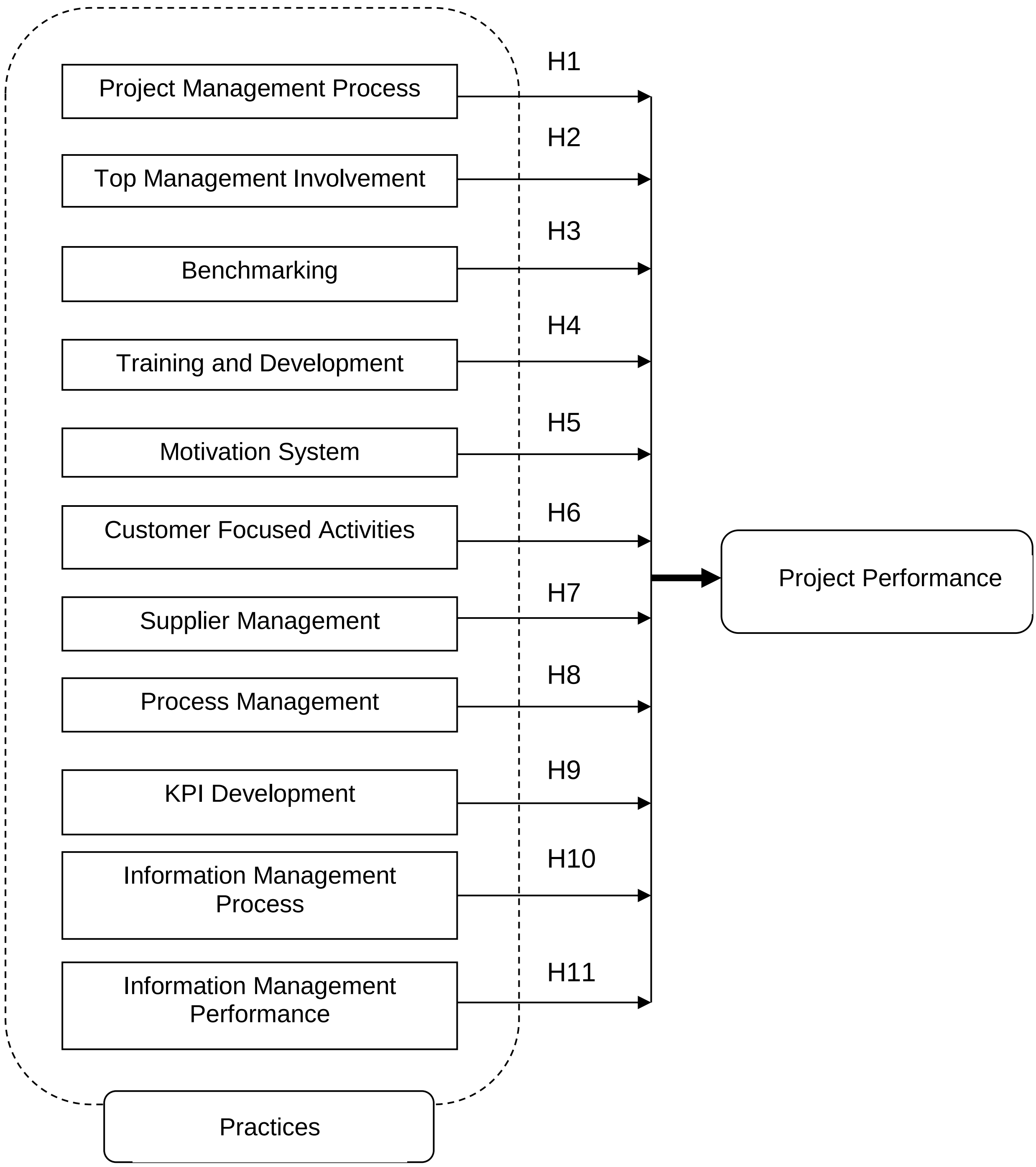

Figure 5.4: The modified conceptual framework of the relationships of TQM elements and PMP

TQM elements are factored into 11 constructs of project management process, top management involvement, benchmarking, KPI development, training and development, motivation system, customer focused activities, supplier management, process management, information management process and information management performance.

5.6 Summary of interviews

The main aim of this research is to explore the relationship between PM performance and TQM techniques in the Oil and Gas industry. The interview results showed that the concepts perceived of TQM, regardless of any specific quality system, were apparent to all of the interviewees, who agreed that the more you apply a quality system and procedures the more project performance you get. Due to the sophisticated nature of the Oil and Gas projects and the importance of its product to our daily life, all of the interviewees insisted on the QMS being applied and followed within the project life, in order to reach the ultimate performance and good quality product with as little damage as possible. One of the interviewees strongly emphasised the QMS and the need to develop their quality department in order to get the maximum benefit from any recognised QMS, aiming to reach the definitive PM performance. The results of the interviews showed three more important TQM practices that have a relationship with PMP, and, based on that, a modified conceptual framework and hypotheses have been formed and shown above in Figure 5.4.

The qualitative analysis was carried out by using both content analysis and NVIVO 10 to analyse the answers and extract the data that would help in developing the survey questionnaire. The aim of analysis and survey results, which will be discussed in the next chapter (six), is to design a framework or model for project managers to utilise the QM practices in order to improve the project performance and organisation competitiveness in the future.

The next chapter six will present the survey results.

CHAPTER SIX

6 Survey results and quantitative data analysis

6.1 Introduction

In this chapter the researcher will mainly focus on the analysis of of findings and results have obtained from the questionnaire, which were returned by 131 participants from various departments and sections from the three different oil and gas companies. The analysis has started with descriptive analysis, which describes and explains all the results obtained. The other step carried out was purification and computation process. The indicator of reliability was Cronbach's alpha.

The two final analysis steps are concerned with the relationship between TQM practices and PM practices for oil and gas industry related projects, and to model the predictive value of TQM principles to PM performance in oil and gas industry related projects. The conclusions and recommendations of these results along with qualitative results will be discussed in chapter seven.

6.2 Analysis process

In Figure 6.1 a general view of hoe process of analysis was achieved. The key objectives of these procedures are to:

1. To analyse the interrelationship between TQM principles and PM Practices for oil and gas industry related projects.
2. To model the predictive value of TQM principles to PM performance in oil and gas industry related projects.

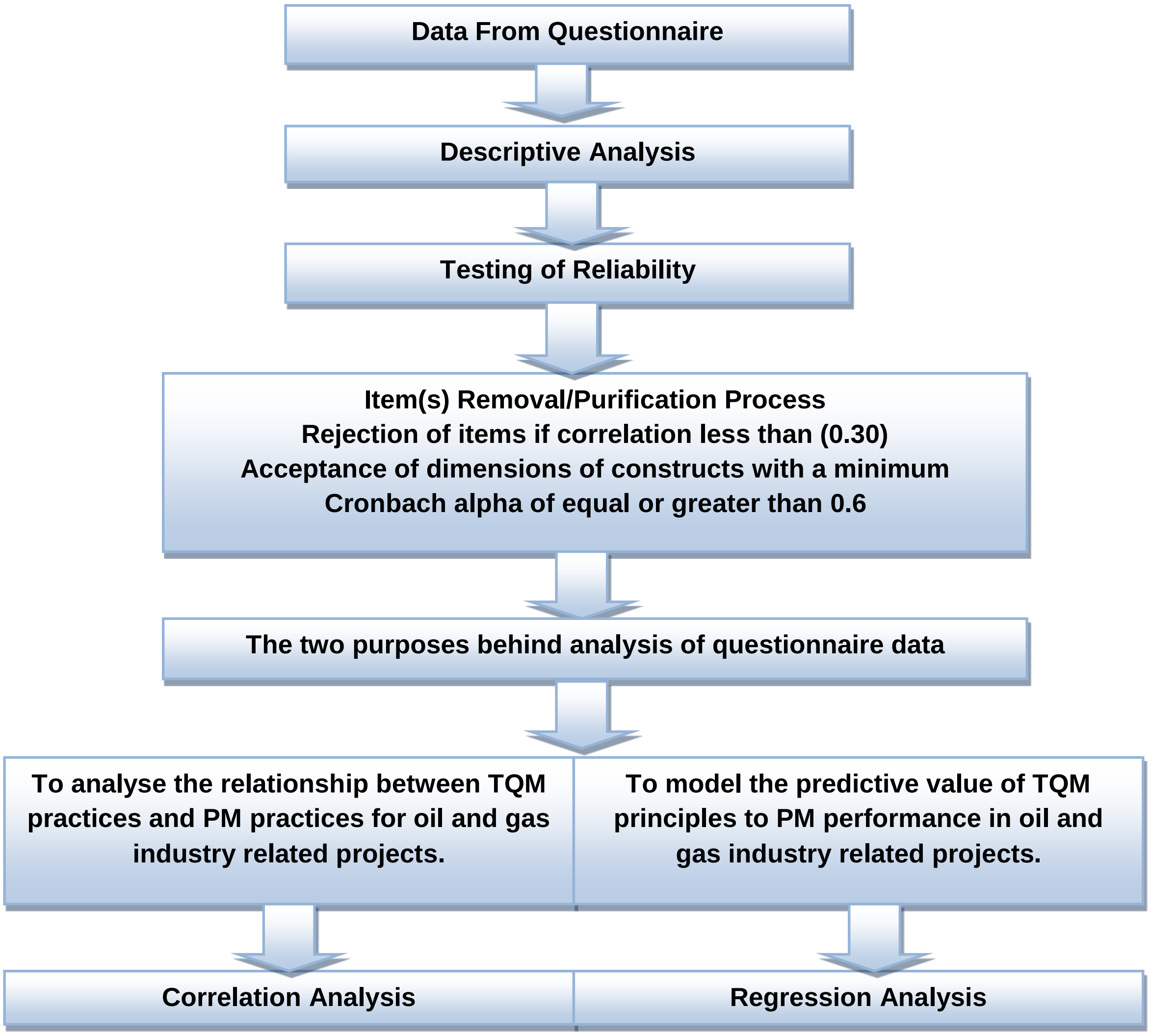

Figure 6-1: Chart of Data Analysis Process

6.3 Steps of data analysis

Quantitative data of this research initiated from a cross-sectional survey. The steps for analysing the quantitative data gathered are summarised in Table 6.1.

Table 6-1: Steps of Quantitative Analysis

Step one	Data integrity test	Checking collected data for quality, validity and reliability
Step two	Descriptive analysis	Measures of central tendency for survey items; frequency tables, figures, means, descriptive cross-tabulations.
Step three	Relationship/prediction	Determination of the associations between variables and the strength of relationship.
Step four	Data comparison and integration with qualitative data	Mixed methods analysis can address many more comprehensive research purposes than quantitative research alone.

6.4 Preparation of data and purification of measures

The gathered empirical data from quantitative approach (i.e. questionnaire) should be subject to a process of purification steps in order to gain significant outcomes from the analysis phase (Nachmias and Nachmias 1996).

6.4.1 Preparation of data

At the begging of the analysis, data should be prepared well for the analysis in order to start with first step which is data editing and coding and then entering them into SPSS.

First step, in order to detect and errors and omissions in data, the data should be edited carefully, this step also contain the correction of data in order to confirming the minimum standard were accomplished. Completed questionnaires were reviewed for completeness and accuracy; they underwent a number of pre-analyses, such as error checks and data editing. The most regular errors were non-response, inconsistent response, and wrong entry. Non-responses were followed up and it was found that the non-respondents were similar to other respondents. Inconsistent response was corrected based on the researcher’s best judgment when comparing it with other related responses.

Second step is to study and have a thorough idea about the variables were coded into formats of SPSS V20 which will be used as tool of analysis.

Final step was to enter the data in SPSS V20 of each questionnaire after purifications from errors and then make them ready for analysis.

6.4.2 Purification of measures

After the completion of recording and entering all the data, the process of purification will began to measure the reliability and validity of data. Benefits from this process and measuring reliability and validity are summarised below:

- Measuring of reliability and validity improve the methodological harshness of the study.
- It permits a coordinating study effort and gives support for triangulation of results.
- It offers an extra meaningful explanation of the phenomena that are being discovered.

The item-to-total correlation method was used to measure the validity and reliability in this study, in order to remove the items that have low correlation. This Method (i.e. multi-item scale) is the most common method used for this purposes by the researchers (Churchill, 1979). The reason behind using multi-item scale is to find the relationship of specific item to the rest of items in the construct. These process assistances to guarantee the items forming up that dimension share a corporate core (Churchill, 1979). Item-to-total correlation should score 0.3 and more to be engaged for more analysis (Edgett, 1991).

Furthermore, (Nunnally, (1978), stated that the approximation of reliability is also depended on the average correlation amongst items within a specific construct, which is concerned with 'internal consistency'. The simple statistic for finding the reliability based on this internal uniformity is called coefficient alpha (Cronbach's alpha). This method has been proved to be a decent estimation of reliability in most study situations. Nunnaly (1978) proposed that the reliability of 0.5 to 0.6 would be satisfactory.

The next section will head the discussion on the process of examining instrument reliability and validity. This reliability analysis has been done for all the measuring instruments in the questionnaire, namely Overall Project Performance, Project Management Process, Top Management Commitment, Benchmarking, Developing and Determining of Key Performance Indicators (KPIs), Training and Development, Motivation, Customer Focus, Supplier Management, Process, Information Management Process and Information Management Performance.

6.5 Instrument's reliability and validity

Reliability and validity are very essential concerns to think about when planning and carrying out any type of research. In simple terms, reliability means how easily research could be duplicated by another individual. Validity refers to how clear the purpose and method are in terms of results obtained and whether these measure what they were intended to (Flick, 2002).

6.5.1 Reliability

Reliability is concerned with the accuracy (consistency, stability and repeatability) of a measure in representing the true score of the subject being assessed on a particular dimension.

The reliability analysis of an instrument assesses its ability to yield consistent measurements. The internal consistency of a set of measurement items refers to the degree to which the items are homogeneous, and can be estimated using a reliability coefficient such as Cronbach’s alpha (Nunnally, 1967). Cronbach’s alpha correlates each item with each other item, and gives the total score. Items with weaker correlations can be removed to leave an instrument with a high degree of homogeneity. Churchill (1979, p.68) stated that *“Coefficient alpha absolutely should be the first measure one calculates to assess the quality of the instrument”.* When the reliability of a latent variable is low, the standard practice is to drop items until the coefficient reaches the desired threshold coefficient.

The results in Table 6.2 show the Cronbach’s alpha values generated for the constructs ranged between 0.828 and 0.901. In general, reliability coefficients of 0.70 or more considered to be sufficient (Nunnally, 1967).Consequently, the instrument established for measuring TQM employment using Cronbach’s alpha was treated to be reliable enough.

Table 6-2: Instrument Reliability

Construct	Question Number	Number of Questions	Question Deleted	Alpha
Overall project performance	1-11	11	None	**0.89**
Project Management Process	12-28	17	None	**0.83**
Top management commitment	29-37	9	1	**0.83**
Benchmarking	38-42	5	None	**0.88**
Involvement in KPI development	43-48	6	2	**0.76**
Training and development	49-55	7	None	**0.85**
Motivation System	56-59	4	None	**0.90**
Customer focus	60-65	6	None	**0.83**
Supplier Management	66-71	6	1	**0.80**
Process Management	72-79	8	1	**0.85**
Information Management Process	80-83	5	None	**0.80**
Information Management Performance	84-87	4	None	**0.88**
Total No. Items	87		5	
	82			

6.5.2 Construct validity

Construct validity is a functioning concept that examines whether the measurement scales represent the features being measured (Cronbach 1971; Nunnally and Berinstein 1994). Cronbach's alpha is used to examine the validity of the measurement characteristics of attitude scales.

6.5.2.1 Results of construct validity

The construct validity of the scales in the measurement instrument used in this study was assessed by Cronbach's alpha through SPSS V (20). Cronbach's alpha for each designed construct was used to test the construct validity of each item. The data analysis showed that all items of the 12 measures were found to be more than 50 per cent. Tables 6.3 to 6.14 show the results of the test.

Table 6.3 shows the results of Cronbach's alpha for the items selected for **Overall Project Performance.** It was obvious from the table that the lowest value of Cronbach's alpha (0.871) was for item number one "*Generally our projects meet their time objectives*", whereas the highest value of Cronbach's Alpha (0.893) was for item number eight "*There are often clearly identified intangible benefits from the projects we carry out*". The overall Cronbach's alpha for the construct was (0.890), which was more than the recommended value of 0.5 as suggested by Nunnally (1978), and confirms that all items selected to measure **(OPP)** are statically valid measures.

Table 6-3: Cronbach's Alpha of the Overall Project Performance construct

	Corrected Item-Total Correlation	**Cronbach's Alpha of each item**	**Cronbach's Alpha of the construct**
Generally our projects meet their time objectives	0.746	0.871	**0.890**
We are usually good at delivering projects within budget	0.757	0,870	
Our projects usually result in tangible benefits for the organisation	0.544	0.884	
Generally customers of our projects are satisfied with the outcome	0.563	0.883	
Project specifications are usually met by the time of handover	0.590	0.881	
Our key stakeholders are usually happy with the way our projects are managed	0.705	0.874	
Project team members are usually happy working on projects	0.418	0.890	
There are often clearly identified intangible benefits from the projects we carry out	0.358	0.893	
End users are usually happy with the results from our projects	0.623	0.880	
We usually employ an effective project management process	0.654	0.877	
Overall, we are very successful at projects	0.735	0.872	

Table 6.4 shows the results of Cronbach's alpha for the items selected for **Project Management Process.** The highest value of Cronbach's alpha (0.871) was for item number one **"***Time, quality and cost are the only realistic measures we use for determining project success*". The lowest (0.812) was for item number eleven "*In our organisation, the project scope usually refers to the set of project deliverables*". The overall Cronbach's alpha for the construct was (0.83), and confirms that all items selected to measure **(PM Process)** are statistically valid measures.

Table 6-4: Cronbach's Alpha of the Project Management Process construct

	Corrected Item-Total Correlation	Cronbach's Alpha of each item	Cronbach's Alpha of the construct
Time, quality and cost are the only realistic measures we use for determining project success	0.137	0.871	**0.83**
We generally use financially-based criteria for justifying projects	0.397	0.823	
In our organisation all projects must demonstrate a pre-defined Return on Investment before they can be approved	0.562	0.814	
Our projects are restricted in size or impact to improve the chances of success	0.665	0.805	
Business benefits of a project are managed through to their realisation	0.570	0.814	
Projects are planned in terms of activities, milestones or deliverables	0.417	0.823	
Projects are subject to rigorous project risk analysis	0.683	0.808	
Tangible benefits are identified for each project	0.504	0.819	
Some of our projects get cancelled because the risk profile is too great	0.216	0.834	
In our organisation, the success criteria are specified for each project	0.519	0.817	
In our organisation, the project scope usually refers to the set of project deliverables	0.630	0.812	
The business benefits associated with a project are clearly identified	0.550	0.816	
The success of a project is measured against pre-defined criteria at the end of a project	0.482	0.819	
Intangible benefits are identified for each project	0.491	0.818	
Projects are reviewed after completion in terms of meeting original plans	0.398	0.824	
The organisation's quality department helps in ensuring project performance-targets are met	0.460	0.820	
Procedures from the quality department are used to guide the management of projects.	0.483	0.819	

Table 6.5 shows the results of Cronbach's alpha for the items selected for **Top Management Commitment.** It was observable from the table that the highest value of Cronbach's alpha (0.819) was for item number three "*Employees know the overall organisation's purpose*". However, the lowest value of Cronbach's Alpha (0.791) was for item number six "*Top management uses performance indicators to ensure*

adequate performance/quality improvement". The overall Cronbach's alpha for the construct was (0.825), and confirms that all items selected to measure **(TMC)** are statistically valid measures.

Table 6-5: Cronbach's Alpha of the Top Management Commitment construct

	Corrected Item-Total Correlation	Cronbach's Alpha of each item	Cronbach's Alpha of the construct
Top management involves major department heads/managers in determining long-term objectives.	0.500	0.811	0.825
Top management meet with their employees to explain the organisation policies and objectives.	0.512	0.810	
Employees know the overall organisation's purpose.	0.434	0.819	
Employees participate in setting the organisation objectives.	0.626	0.795	
Top management reviews its policies to ensure its adherence to the set objectives of the organisation	0.576	0.802	
Top management uses performance indicators to ensure adequate performance/ quality improvement.	0.665	0.791	
Top management provides necessary resources to fulfil overall organisation objectives	0.521	0.809	
Top management supports the use of procedures related to project management which have been developed by the quality department.	0.573	0.802	

Table 6.6 shows the results of Cronbach's alpha for the items selected for **Benchmarking**. It was noticeable from the four items construct, Table 6.6 that the highest value of Cronbach's alpha (0.892) was for item number four "*The organisation uses external benchmarking techniques for increasing project management performance*". Conversely, the lowest value of Cronbach's Alpha (0.828) was for item number two "*The organisation uses benchmarking data effectively for enhancing project management performance*". The overall Cronbach's alpha for the construct was (0.880), and confirms that all items selected to measure **(BM)** are statistically valid measures.

Table 6-6: Cronbach's Alpha of the Benchmarking

	Corrected Item-Total Correlation	Cronbach's Alpha of each item	Cronbach's Alpha of the construct
The organisation uses internal benchmarking techniques for increasing project management performance.	0.714	0.857	**0.88**
Information from benchmarking is perceived to be useful on projects.	0.764	0.845	
The organisation uses benchmarking data effectively for enhancing project management performance..	0.832	0.828	
Information from benchmarking activities is reliable:	0.727	0.853	
The organisation uses external benchmarking techniques for increasing project management performance.	0.565	0.892	

Table 6.7 shows the results of Cronbach's alpha for the items selected for **Involvement in KPI development.** It was clear from the four items construct, Table 6.7 below, that the highest value of Cronbach's alpha (0.765) was for item number four "*Top management is involved in the use of KPIs for projects*". On the other hand, the lowest value of Cronbach's Alpha (0.635) was for item number two "*Project managers are involved in the determining of KPIs*". The overall Cronbach's alpha for the construct was (0.760), and confirms that all items selected to measure **(KPI)** are statistically valid measures.

Table 6.7: Cronbach's Alpha of the Involvement in KPI development

	Corrected Item-Total Correlation	Cronbach's Alpha of each item	Cronbach's Alpha of the construct
KPIs are developed with involvement of the quality department.	0.552	0.705	**0.76**
Project managers are involved in the determining of KPIs.	0.690	0.635	
Supervisors are involved in the determining of KPIs.	0.588	0.682	
Top management is involved in the use of KPIs for projects.	0.419	0.765	

Table 6.8 shows the results of Cronbach's alpha for the items selected for **Training and development.** It was observable from training and development construct, Table 6.8 below, that the highest value of Cronbach's alpha (0.843) was for item number four "*Modern training methods are used in the organisation (i.e. Distance learning, e-learning.)*". In contrast, the lowest value of Cronbach's Alpha (0.819) was for item number two "*Managers/supervisors are in determining training needs of the employees under their supervision*". The overall Cronbach's alpha for the construct was (0.850), and confirms that all items selected to measure **(TD)** are statistically valid measures.

Table 6-8: Cronbach's Alpha of the Training and Development

	Corrected Item-Total Correlation	Cronbach's Alpha of each item	Cronbach's Alpha of the construct
Training is determined according to actual needs that have to be covered by training.	0.643	0.824	**0.85**
Managers/ supervisors are involved in determining training needs of the employees under their supervision.	0.679	0.819	
Resources are available to cover employees' training needs/ development.	0.662	0.821	
Modern training methods are used in the organisation (i.e. Distance learning, e-learning.)	0.512	0.843	
The organisation uses its facilities/ expertise to conduct on- the- job training. .	0.535	0.840	
The organisation evaluates training output.	0.601	0.830	
The organisation keeps training records as a guide for further training/ development.	0.646	0.824	

Table 6.9 shows the results of Cronbach's alpha for the items selected for **Motivation System.** It was recognisable from motivation system construct, Table 6.9 below; that the highest value of Cronbach's alpha (0.869) was for item number one "*The organisation has motivation systems to increase project management performance*", while the lowest value of Cronbach's Alpha (0.862) was for item number two "*The motivation system is monitored by top management*". The overall Cronbach's alpha for the construct was (0.896), and confirms that all items selected to measure **(MS)** are statistically valid measures.

Table 6-9: Cronbach's Alpha of the Motivation System

	Corrected Item-Total Correlation	Cronbach's Alpha of each item	Cronbach's Alpha of the construct
The organisation has a motivation system to increase project management performance.	0.761	0.869	**0.896**
The motivation system is monitored by top management.	0.780	0.862	
The feedback from the motivation system has a direct effect on project management performance..	0.770	0.866	
The feedback from the motivation system helps in ensuring overall project performance is satisfactory.	0.767	0.867	

Table 6.10 shows the results of Cronbach's alpha for the items selected for **Customer focus.** It was clear from the construct of customer focus, Table 6.10 below, that the highest value of Cronbach's alpha (0.816) was for item number one "*Considerations of customer (Internal-External) situations are taken into account when setting strategies for the organisation*", whereas the lowest value of Cronbach's Alpha (0.787) was for item number five "*The organisation's quality department ensures that customer complaints are dealt with to the customer's satisfaction*". Items two and six scored the same value of Cronbach's alpha of (0.829).The overall Cronbach's alpha for the construct was (0.896), and confirms that all items selected to measure **(CF)** are statistically valid measures.

Table 6-10: Cronbach's Alpha of the Customer Focus

	Corrected Item-Total Correlation	Cronbach's Alpha of each item	Cronbach's Alpha of the construct
Considerations of customer (Internal-External) situations are taken into account when setting strategies for the organisation.	0.530	0.816	**0.829**
The organisation determines current/ future customer requirements.	0.595	0.803	
The organisation uses information from customer services in improving its processes/ services.	0.588	0.804	
The organisation encourages employees to satisfy customers.	0.635	0.795	
The organisation's quality department ensures that customer complaints are dealt with to the customer satisfaction.	0.669	0.787	
The organisation has a Change Order process to ensure customer satisfaction.	0.596	0.803	

Table 6.11 shows the results of Cronbach's alpha for the items selected for **Supplier Management.** It was noticeable from the construct of supplier management, Table 6.11 below that the highest value of Cronbach's alpha (0.812) was for item number one "*The organisation establishes long-term relationships with suppliers*". However, the lowest value of Cronbach's Alpha (0.706) was for item number two "*The organisation ensures the quality of suppliers before delivery*". The overall Cronbach's alpha for the construct was (0.795), and confirms that all items selected to measure **(SM)** are statistically valid measures.

Table 6-11: Cronbach's Alpha of the Supplier Management

	Corrected Item-Total Correlation	Cronbach's Alpha of each item	Cronbach's Alpha of the construct
The organisation establishes long-term relationship with suppliers.	0.392	0.812	**0.795**
The organisation ensures the quality of supplies before delivery.	0.717	0.706	
The organisation conducts supplier quality audit.	0.714	0.709	
The organisation shares the information on production processes with the supplier.	0.577	0.755	
The organisation has an Approved Vendor List (AVL) system for choosing suppliers.	0.497	0.780	

Table 6.12 shows the results of Cronbach's alpha for the items selected for **Process Management.** It was noticeable from the construct of process management, Table 6.12 below that the highest value of Cronbach's alpha (0.841) was for item number six "*The organisation keeps its sites neat/clean all times*". Though the lowest value of Cronbach's Alpha (0.818) was for item number three "*The organisation makes clear efforts to reduce waste (i.e. Rework, returns time)*", there was also the same value for item number seven "*The organisation uses the recommendations of studies/research for improving its products/and services*". The overall Cronbach's alpha for the construct was (0.852), and confirms that all items selected to measure **(PM)** are statistically valid measures

Table 6-12: Cronbach's Alpha of the Process Management

	Corrected Item-Total Correlation	Cronbach's Alpha of each item	Cronbach's Alpha of the construct
The organisation uses clear working procedures.	0.568	0.838	**0.852**
The organisation uses tactical techniques for process analysis/, control/ and improvement.	0.586	0.835	
The organisation makes clear efforts to reduce waste (i.e. Rework, returns & time)	0.707	0.818	
The organisation uses teams in analysing processes for improvement.	0.603	0.832	
The organisation calibrates measuring / monitoring devices, in regular intervals, to ensure its accuracy.	0.604	0.832	
The organisation keeps its sites neat/ clean at all times.	0.546	0.841	
The organisation uses on the recommendations of studies/ research for improving its products/ and services.	0.697	0.818	

Table 6.13 shows the results of Cronbach's alpha for the items selected for **Information Management Process.** It was obvious from the construct of information management process, Table 6.13 below, that the highest value of Cronbach's alpha (0.873) was for item number two "*The organisation standards-/-performance indicators are compared with international standards*", whereas the lowest value of Cronbach's Alpha (0.862) was for item number one "*Information is used to make decisions in the organisation*". The overall Cronbach's alpha for the construct was (0.80), and confirms that all items selected to measure **(IMP)** are statistically valid measures

Table 6-13: Cronbach's Alpha of the Information Management Process

	Corrected Item-Total Correlation	Cronbach's Alpha of each item	Cronbach's Alpha of the construct
Information is used to make decisions in the organisation.	0.624	0.862	**0.80**
The organisation standards- /- performance indicators are compared with international standards.	0.518	0.873	
The organisation uses information- /- performance measurements in the improvement of its processes.	0.573	0.866	
The organisation uses information- /- performance measurements in the improvement of its services	0.570	0.867	

Table 6.14 shows the results of Cronbach's alpha for the items selected for **Information Management Performance.** It was observable from the construct of information management performance, Table 6.14 below, that the highest value of Cronbach's alpha (0.859) was for item number one "*The information generated by the organisation is reliable*", whereas the lowest value of Cronbach's Alpha (0.846) was for item number two "The *Information generated by the organisation is precise*". The overall Cronbach's alpha for the construct was (0.80), and confirms that all items selected to measure **(IMP)** are statistically valid measures

Table 6-14: Cronbach's Alpha of the Information Management Performance

	Corrected Item-Total Correlation	Cronbach's Alpha of each item	Cronbach's Alpha of the construct
The information generated by the organisation is reliable.	0.652	0.859	**0.80**
The information generated by the organisation is precise.	0.758	0.846	
The information generated by the organisation is comprehensive.	0.739	0.849	
The information generated by the organisation is clear.	0.653	0.858	

6.6 Descriptive analysis

Descriptive analysis is used to classify and summarise variables, either graphically or numerically, and limits generalisations or conclusions, based on statistical analysis, to the particular group of individuals or cases observed. Techniques include simple univariate measures of dispersion and central tendency, such as means, medians, standard deviations, and percentiles of the variables. These analyses can also produce bivariate information describing the relationship between variables, such as regression prediction equations or correlation coefficients.

This part shows details describing how the survey questions were answered by the respondents. Items in each of the 12 constructs have been collected together and details of mean, standard deviation and frequency of responses are given in the tables below. This gives a common feeling of respondents' attitudes towards items in the different constructs.

6.6.1 Overall project performance

Answers to items in the overall project performance construct demonstrated a broad range of means varying between 'strongly agree' and 'neutral' (SA=39%, A=52%, N=6.2%)**.** It is observable from Table 6.15 below that the highest percentage of respondents (96.9%) ranged between 'strongly agree' and 'agree' was for item number three "*Our projects usually result in tangible benefits for the organisation*". The second highest percentage (96.2%) ranged between 'strongly agree' and 'agree' was for item number nine of the construct "*End users are usually happy with the results from our projects*". The third one (94.7%), ranged between 'strongly agree' and 'agree' for item number three "*Our projects usually result in tangible benefits for the organisation*".

Table 6-15: Overall Project performance Construct: Mean, Standard Deviation & Frequency

Q No.	M	sd	SA (5)	A(4)	N(3)	D(2)	SDA(1)	n
Generally our projects meet their time objectives								
1	3.95	0.893	32 (24.4%)	76 (58.0%)	10 (7.6%)	11 (8.4%)	2 (1.5%)	131
We are usually good at delivering projects within budget								
2	4.18	0.881	53 (40.5%)	58 (44.3%)	11 (8.4%)	8 (6.1%)	1 (0.8%)	131
Our projects usually result in tangible benefits for the organisation								
3	4.53	0.648	76 (58.0%)	51 (38.9%)	2 (1.5%)	1 (0.8%)	1 (0.8%)	131
Generally customers of our projects are satisfied with the outcome								
4	4.32	0.572	49 (37.4%)	75 (57.3%)	7 (5.3%)	0 (0%)	0 (0%)	131
Project specifications are usually met by the time of handover								
5	4.31	0.755	58 (44.3%)	61 (46.6%)	8 (6.1%)	3 (2.3%)	1 (0.8%)	131
Our key stakeholders are usually happy with the way our projects are managed								
6	4.24	.732	49 (37.4%)	69 (52.7%)	8 (6.1%)	5 (3.8%)	0 (0%)	131
Project team members are usually happy working on projects								
7	4.27	.605	45 (34.4%)	77 (58.8%)	8 (6.1%)	1 (0.8%)	0 (0%)	131
There are often clearly identified intangible benefits from the projects we carry out								
8	4.04	0.574	23 (17.6%)	91 (69.5%)	16 (12.2%)	1 (0.8%)	0 (0%)	131
End users are usually happy with the results from our projects								
9	4.04	0.574	57 (43.5%)	66 (50.4%)	7 (5.3%)	1 (0.8%)	0 (0%)	131
We usually employ an effective project management process								
10	4.35	0.733	63 (48.1%)	54 (48.1%)	11 (8.4%)	3 (2.3%)	0 (0%)	131
Overall, we are very successful at projects								
11	4.31	0.713	57 (43.5%)	61 (46.6%)	10 (7.6%)	3 (2.3%)	0 (0%)	131
CONSTRUCT RELIABILITY				**0.89**				

Sample size = 131 **sd = Standard** Deviation **M=Mean**

SA = Strongly Agree (5) A = Agree (4) **N** = Neutral (3) D=Disagree (2) **SDA** = Strongly Disagree (1)

6.6.2 Project management process

The means of responses to items in the project management process construct showed almost similar patterns of means to the previous construct, with means varying between 'strongly agree' and 'neutral' (SA=35%, A=52%, N=9.2%). Around 55% of the respondent either 'strongly agree' or 'agree' with half of the items in the construct; 98% of respondents agree or strongly agree with the statement '*Projects* *are planned in terms of activities, milestones or deliverables'*. Also, around 95% of respondents agree or strongly agree with the statement *'The success of a project is measured against pre-defined criteria at the end of a project*', and 94% of respondents agree or strongly agree with the statement *'The business benefits associated with a project are clearly identified'*. The only exception to this was the first item "*Time, quality and cost are the only realistic measures we use for determining project success*", where those who strongly disagreed or slightly disagreed with this statement (26.7%) were more than other items in this construct.

Table 6-16: Project management Process Construct: Mean, Standard Deviation & Frequency

Q No.	M	sd	SA (5)	A(4)	N(3)	D(2)	SDA(1)	n
Time, quality and cost are the only realistic measures we use for determining project success								
1	3.44	1.144	20 (15.3%)	59 (45.0%)	17 (13.0%)	28 (21.4%)	7 (5.3%)	131
We generally use financially-based criteria for justifying projects								
2	4.168	0.703	41 (31.3%)	75 (57.3%)	11 (8.4%)	4 (3.1%)	0 (0%)	131
In our organisation all projects must demonstrate a pre-defined Return on Investment before they can be approved								
3	4.12	0,732	69 (52.7%)	51 (38.9%)	7 (5.3%)	4 (3.1%)	0 (0%)	131
Our projects are restricted in size or impact to improve the chances of success								
4	3.924	0.99	42 (32.1%)	55 (42.0%)	16 (12.2%)	18 (13.7%)	0 (0%)	131
Business benefits of a project are managed through to their realisation								
5	4.206	0.698	46 (35.1%)	68 (51.9%)	15 (11.5%)	2 (1.5%)	0 (0%)	131
Projects are planned in terms of activities, milestones or deliverables								
6	4.328	0.508	45 (34.4%)	84 (64.1%)	2 (1.5%)	0 (0%)	0 (0%)	131
Projects are subject to rigorous project risk analysis								
7	4.412	0,678	66 (50.4%)	55 (42.0%)	8 (6.1%)	2 (1.5%)	0 (0%)	131
Tangible benefits are identified for each project								
8	4.282	0.572	45 (34.4%)	78 (59.5%)	8 (6.1%)	0 (0%)	0 (0%)	131
Some of our projects get cancelled because the risk profile is too great								
9	3.839	0.792	22 (16.8%)	74 (56.5%)	29 (22.1%)	4 (3.1%)	2 (1.5%)	131
In our organisation, the success criteria are specified for each project								
10	4.252	0.6485	47 (35.9%)	71 (54.2%)	12 (9.2%)	1 (0.8%)	0 (0%)	131
In our organisation, the project scope usually refers to the set of project deliverables								
11	4.473	0.636	70 (53.4%)	55 (42.0%)	4 (3.1%)	2 (1.5%)	0 (0%)	131
The business benefits associated with a project are clearly identified								
12	4.343	0.605	53 (40.5%)	71 (54.2%)	6 (4.6%)	1 (0.8%)	0 (0%)	131
The success of a project is measured against pre-defined criteria at the end of a project								
13	4.267	0.665	53 (40.5%)	71 (54.2%)	6 (4.6%)	1 (0.8%)	0 (0%)	131
Intangible benefits are identified for each project								
14	3.923	0.651	20 (15.3%)	84 (64.1%)	24 (18.3%)	3 (2.3%)	0 (0%)	131
Projects are reviewed after completion in terms of meeting original plans								
15	4.076	0.800	40 (30.5%)	68 (51.9%)	16 (12.2%)	7 (5.3%)	0 (0%)	131
The organisation's quality department helps in ensuring project performance-targets are met								
16	4.213	0.723	47 (35.9%)	68 (51.9%)	14 (10.7%)	1 (0.8%)	1 (0.8%)	131
Procedures from the quality department are used to guide the management of projects.								
17	4.328	0.649	55 (42.0%)	65 (49.6%)	10 (7.6%)	1 (0.8%)	0 (0%)	131
CONSTRUCT RELIABILITY				**0.83**				

Sample size = 131 **sd =** Standard Deviation **M=Mean**

SA = Strongly Agree (5) A = Agree (4) **N** = Neutral (3) D=Disagree (2) **SDA** = Strongly Disagree (1)

6.6.3 Top management involvement

Responses to items in the top management commitment construct showed almost similar patterns as the previous constructs, with means varying between 'strongly agree' and 'neutral' (SA=38.6%, A=51%, N=8%). Interestingly, 96% of respondents strongly agree and agree with the statement '*Top management uses performance indicators to ensure adequate performance/quality improvement'*, which indicates the importance of performance indicators which have been usually set by the quality department to ensure the performance and the quality of the projects. Remarkably, from Table 6.17 below it can be seen that the highest percentage of respondents (96.1%) ranged between ‘strongly agree’ and ‘agree’ was from statement “*Top management involves major department heads/managers in determining long-term objectives*”, and (92.4%) ranged between ‘strongly agree’ and ‘agree’ was from statement “*Top management reviews its policies to ensure its adherence to the set objectives of the organisation*”. These highest percentages reflected the importance of top management practices towards achieving high project performance.

Table 6-17: Top Management Involvement Construct: Mean, Standard Deviation & Frequency

Q No.	M	sd	SA (5)	A(4)	N(3)	D(2)	SDA(1)	n
Top management involves major department heads / managers in determining long-term objectives.								
1	4.458	0.623	67 (51.1%)	59 (45.0%)	3 (2.3%)	2 (1.5%)	0 (0%)	131
Top management meet with their employees to explain the organisation policies and objectives.								
2	4.229	0.685	47 (35.9%)	69 (52.7%)	13 (9.9%)	2 (1.5%)	0 (0%)	131
Employees know the overall organisation's purpose.								
3	4.183	.630	39 (29.8%)	78 (59.5%)	13 (9.9%)	1 (0.8%)	0 (0%)	131
Employees participate in setting the organisation objectives.								
4	4.000	0.859	38 (29.0%)	65 (49.6%)	18 (13.7%)	1 (0.8%)	0 (0%)	131
Top management reviews its policies to ensure its adherence to the set objectives of the organisation								
5	4.221	0.623	41 (31.3%)	80 (61.1%)	8 (6.1%)	2 (1.5%)	0 (0%)	131
Top management uses performance indicators to ensure adequate performance/ quality improvement.								
6	4.488	0624	71 (54.2%)	55 (42.0%)	3 (2.3%)	2 (1.5%)	0 (0%)	131
Top management provides necessary resources to fulfil overall organisation objectives								
7	4.236	0.752	52 (39.7%)	62 (47.3%)	13 (9.9%)	4 (3.1%)	0 (0%)	131
Top management supports the use of procedures related to project management which have been developed by the quality department.								
8	4.282	0.659	51 (38.9%)	67 (51.1%)	12 (9.2%)	1 (0.8%)	0 (0%)	131
CONSTRUCT RELIABILITY				**0.83**				

Sample size = 131 **sd = Standard** Deviation **M=Mean**

SA = Strongly Agree (5) A = Agree (4) **N** = Neutral (3) D=Disagree (2) **SDA** = Strongly Disagree (1)

6.6.4 Benchmarking

Answers to items in the Benchmarking construct demonstrated a broad range of means varying between 'strongly agree' and 'disagree' (SA=27%, A=54.4%, N=13.5%, D=4.2%). It is noticeable from Table 6.18 below that the highest percentage of respondents (87.1%) ranged between 'strongly agree' and 'agree' was for item number one "*The organisation uses internal benchmarking techniques for increasing project management performance*". However, the lowest percentage 81.7%) ranged between 'strongly agree' and 'agree' was for item number five of the benchmarking construct "*The organisation uses external benchmarking techniques for increasing project management performance*".

Table 6-18: Benchmarking Construct: Mean, Standard Deviation & Frequency

Q No.	M	sd	SA (5)	A(4)	N(3)	D(2)	SDA(1)	N
The organisation uses internal benchmarking techniques for increasing project management performance.								
1	4.061	0.721	31 (23.7%)	83 (63.4%)	12 (9.2%)	4 (3.1%)	1 (0.8%)	131
Information from benchmarking is perceived to be useful on projects.								
2	4.099	0.773	38 (29.0%)	75 (57.3%)	12 (9.2%)	5 (3.8%)	1 (0.8%)	131
The organisation uses benchmarking data effectively for enhancing project management performance..								
3	4.00	0794	31 (23.7%)	78 (59.5%)	14 (10.7%)	7 (5.3 %)	1 (0.8%)	131
Information from benchmarking activities is reliable:								
4	4.190	0.851	55 (42.0%)	52 (39.7%)	19 (14.5 %)	4 (3.1%)	1 (0.8%)	131
The organisation uses external benchmarking techniques for increasing project management performance.								
5	3.748	0.844	21 (16.0%)	68(51.9%)	31(23.7%)	10(7.6%)	1 (0.8%)	131
CONSTRUCT RELIABILITY			**0.88**					

Sample size = 131 **sd =** Standard Deviation **M=Mean**

SA = Strongly Agree (5) A = Agree (4) **N** = Neutral (3) **D** = Disagree (2) **SDA** = Strongly Disagree (1)

6.6.5 KPI development

Responses to items in the KPI development construct demonstrated a broad range of means varying between 'strongly agree' and 'neutral' (SA=34%, A=58%, N=9.5%). It is obvious from Table 6.19 below of the KPI development construct that the highest percentage of respondents (93.9%) ranged between ‘strongly agree’ and ‘agree’ was for item number four “*Top management is involved in the use of KPIs for projects*”. This showed the importance of top management practices in determining the KPIs to achieve maximum project performance; whereas the lowest percentage (84.7%) ranged between ‘strongly agree’ and ‘agree’ was for statement number three of the KPI development construct “*Supervisors are involved in the determining of KPIs*”.

Table 6-19: KPI Development Construct: Mean, Standard Deviation & Frequency

Q No.	M	sd	SA (5)	A(4)	N(3)	D(2)	SDA(1)	N
KPIs are developed with involvement of the quality department.								
1	4.167	0.795	47 (35.9%)	66 (50.4%)	11(8.4%)	7 (5.3%)	0 (0%)	131
Project managers are involved in the determining of KPIs.								
2	4.190	0.633	38 (29.0%)	83 (63.4%)	7 (5.3%)	3 (2.3%)	0 (0%)	131
Supervisors are involved in the determining of KPIs.								
3	4.106	0.786	41 (31.3%)	70 (53.4%)	13 (9.9%)	7 (5.3%)	0 (0%)	131
Top management is involved in the use of KPIs for projects.								
4	4.313	0.608	50 (38.2%)	73 (55.7%)	7 (5.3%)	1 (0.8%)	0 (0%)	131
CONSTRUCT RELIABILITY				**0.76**				

Sample size = 131 **sd = Standard** Deviation **M=Mean**

SA = Strongly Agree (5) A = Agree (4) **N** = Neutral (3) D = Disagree (2) **SDA** = Strongly Disagree (1)

6.6.6 Training and development

Responses to items in the Training and Development construct showed an almost similar pattern of means to the previous construct with means varying between 'strongly agree' and 'neutral' (SA=28%, A=58%, N=9.5%). It is observable from Table 6.20 below of the training and developments construct that the highest percentage of respondents (91.6%) ranged between ‘strongly agree’ and ‘agree’ was for item number five “*The organisation evaluates training output*”. However, the lowest percentage (80.2%) ranged between ‘strongly agree’ and ‘agree’ was for statements number four of the construct “*Modern training methods are used in the organisation (i.e. Distance learning, e-learning)*”.

Table 6-20: Training and Development Construct: Mean, Standard Deviation & Frequency

Q No.	M	sd	SA (5)	A(4)	N(3)	D(2)	SDA(1)	N
Training is determined according to actual needs that have to be covered by training.								
1	4.084	0.712	34 (26.0%)	79 (60.3%)	13 (9.9%)	5 (3.8%)	0 (0%)	131
Managers/ supervisors are involved in determining training needs of the employees under their supervision.								
2	4.335	0.708	59 (45.0%)	60 (45.8%)	9 (6.9%)	3 (2.3%)	0 (0%)	131
Resources are available to cover employees' training needs/ development.								
3	4.099	0.763	38 (29.0%)	74 (56.5%)	14 (10.7%)	4 (3.1%)	1 (0.8%)	131
Modern training methods are used in the organisation (i.e. Distance learning, e-learning.)								
4	4.015	0.774	34 (26.0%)	71 (54.2%)	20 (15.3%)	6 (4.6%)	0 (0%)	131
The organisation uses its facilities/ expertise to conduct on- the- job training. .								
5	4.099	0.666	30 (22.9%)	90 (68.7%)	5 (3.8%)	6 (4.6%)	0 (0%)	131
The organisation evaluates training output.								
6	4.007	0.818	33 (25.2%)	76 (58.0%)	13 (9.9%)	8 (6.1%)	1 (0.8%)	131
The organisation keeps training records as a guide for further training/ development.								
7	4.045	0.712	30 (22.9%)	83 (63.4%)	13 (9.9%)	4 (3.1%)	1 (0.8%)	131
CONSTRUCT RELIABILITY				**0.76**				

Sample size = 131 **sd =** Standard Deviation **M=Mean**

SA = Strongly Agree (5) A = Agree (4) **N** = Neutral (3) D = Disagree (2) **SDA** = Strongly Disagree (1)

6.6.7 Motivation system

The majority of items in this construct presented a comparable pattern in the distribution of frequencies, leaning more towards 'strongly agree' and 'neutral' (SA=27%, A=54%, N=13%). It is clear from Table 6.21 below of the motivation system construct that the highest percentage of respondents (83.2%) ranged between 'strongly agree' and 'agree' was for items number one and two respectively "*The organisation has a motivation system to increase project management performance*" and "*The motivation system is monitored by top management*". Conversely, the lowest percentage (78.6%) ranged between 'strongly agree' and 'agree)' was for statement number four of the construct "*The feedback from the motivation system helps in ensuring overall project performance is satisfactory*". The standard deviation ranged between (0.76) and (0.83.)

Table 6-21: Motivation System Construct: Mean, Standard Deviation & Frequency

Q No.	M	sd	SA (5)	A(4)	N(3)	D(2)	SDA(1)	N
The organisation has a motivation system to increase project management performance.								
1	4.061	0.801	38 (29.0%)	71 (54.2%)	14 (10.7%)	8 (6.1%)	0 (0%)	131
The motivation system is monitored by top management.								
2	4.068	0.786	38 (29.0%)	71 (54.2%)	15 (11.5%)	7 (5.3%)	0 (0%)	131
The feedback from the motivation system has a direct effect on project management performance..								
3	4.022	0.827	38 (29.0%)	66 (50.4%)	19 (14.5%)	8 (6.1%)	0 (0%)	131
The feedback from the motivation system helps in ensuring overall project performance is satisfactory.								
4	3.938	0.762	27 (20.6%)	76 (58.0%)	21 (16.0%)	7 (5.3%)	0 (0%)	131
CONSTRUCT RELIABILITY				**0.90**				

Sample size = 131 **sd =** Standard Deviation **M=Mean**

SA = Strongly Agree (5) A = Agree (4) **N** = Neutral (3) D = Disagree (2) **SDA** = Strongly Disagree (1)

6.6.8 Customer focus

The majority of items in the customer focus construct showed a broad range varying between 'strongly agree' and ‘neutral’ (SA=41%, A=50%, N=8%). Furthermore, at least 50% of respondents either strongly agree or agree in most items. It is observable from Table 6.22 below of the customer focus construct that the highest percentage of respondents (83.2%) ranged between ‘strongly agree’ and ‘agree’ was for item number four “*The organisation encourages employees to satisfy customers*. Contrariwise, the lowest percentage (84.8%) ranged between ‘strongly agree’ and ‘agree’ was for statements number five of the construct “*The organisation’s quality department ensures that customer complaints are dealt with to the customer satisfaction*”. The standard deviation ranged between (0.54) and (0.76).

Table 6-22: Customer Focus Construct: Mean, Standard Deviation & Frequency

Q No.	M	sd	SA (5)	A(4)	N(3)	D(2)	SDA(1)	N
Considerations of customer (Internal-External) situations are taken into account when setting strategies for the organisation.								
1	4.137	0.537	29 (22.1%)	91 (69.5%)	11 (8.4%)	0 (0%)	0 (0%)	131
The organisation determines current/ future customer requirements.								
2	4.351	0.606	55 (42.0%)	67 (51.1%)	9 (6.9%)	0 (0%)	0 (0%)	131
The organisation uses information from customer services in improving its processes/ services.								
3	4.229	0.651	45 (34.3%)	72 (55.0%)	13 (9.9%)	1 (0.8%)	0 (0%)	131
The organisation encourages employees to satisfy customers.								
4	4.396	0.616	60 (45.8%)	64 (48.9%)	6 (4.6%)	1 (0.8%)	0 (0%)	131
The organisation's quality department ensures that customer complaints are dealt with to the customer satisfaction.								
5	4.297	0.761	61 (46.6%)	50 (38.2%)	18 (13.7%)	2 (1.5%)	0 (0%)	131
The organisation has a Change Order process to ensure customer satisfaction.								
6	4.458	0.693	73 (55.7%)	47 (35.9%)	9 (6.9%)	2 (1.5%)	0 (0%)	131
CONSTRUCT RELIABILITY				**0.83**				

Sample size = 131 **sd = Standard** Deviation **M=Mean**

SA = Strongly Agree (5) A = Agree (4) **N** = Neutral (3) D = Disagree (2) **SDA** = Strongly Disagree (1)

6.6.9 Supplier management

The majority of items in the Supplier Management construct showed a broad range varying between 'strongly agree' and 'neutral' (SA=43%, A=48%, N=7%). It is observable from Table 6.23 below of supplier management that the highest percentage of respondents (96.9%) ranged between 'strongly agree' and 'agree' was for item number five "*The organisation has an Approved Vendor List (AVL) system for choosing suppliers*". Inversely, the lowest percentage (84.0%) ranged between 'strongly agree' and 'agree' was for statements number four of the construct "*The organisation shares the information on production processes with the supplier*". The standard deviation ranged between (0.67) and (0.73). Furthermore, at least 50% of respondents either strongly agree or agree in most items.

Table 6-23: Supplier Management Construct: Mean, Standard Deviation & Frequency

Q No.	M	sd	SA (5)	A(4)	N(3)	D(2)	SDA(1)	N
The organisation establishes long-term relationships with suppliers.								
1	4.251	0.671	47 (35.9%)	73 (55.7%)	8 (6.1%)	3 (2.3%)	0 (0%)	131
The organisation ensures the quality of supplies before delivery.								
2	4.366	0.725	64 (48.9%)	54 (41.2%)	10 (7.6%)	3 (2.3%)	0 (0%)	131
The organisation conducts supplier quality audit.								
3	4.404	0.676	63 (48.1%)	61 (46.6%)	5 (3.8%)	1 (0.8%)	1 (0.8%)	131
The organisation shares the information on production processes with the supplier.								
4	4.099	0.688	36 (27.5%)	74 (56.5%)	19 (14.5%)	2 (1.5%)	0 (0%)	131
The organisation has an Approved Vendor List (AVL) system for choosing suppliers.								
5	4.526	0.688	73 (55.7%)	54 (41.2%)	4 (3.1%)	0 (0%)	0 (0%)	131
CONSTRUCT RELIABILITY				**0.80**				

Sample size = 131 **sd = Standard** Deviation **M=Mean**

SA = Strongly Agree (5) A = Agree (4) **N** = Neutral (3) D = Disagree (2) **SDA** = Strongly Disagree (1)

6.6.10 Processes management

Most items in the Process Management construct showed a similar pattern in the distribution of frequencies, which leaned more towards 'agree' and 'strongly agree' (SA=43%, A=48%, N=7%). It is recognisable from Table 6.24 below of process management that the highest percentage of respondents (97%) ranged between ‘strongly agree’ and ‘agree’ was for statement number one “*The organisation uses clear working procedures”*. In reverse, the lowest percentage (84.0%) ranged between ‘strongly agree’ and ‘agree’ was for statements number three of the construct “*The organisation makes clear efforts to reduce waste (i.e. Rework, returns & time)*”. The standard deviation ranged between (0.57) and (0.88).

Table 6-24: Process Management Construct: Mean, Standard Deviation & Frequency

Q No.	M	sd	SA (5)	A(4)	N(3)	D(2)	SDA(1)	N
The organisation uses clear working procedures.								
1	4.404	0.578	58 (44.3%)	69 (52.7%)	3 (2.3%)	1 (0.8%)	0 (0%)	131
The organisation uses tactical techniques for process analysis/, control/ and improvement.								
2	4.282	0.659	51 (38.9%)	67 (51.1%)	12 (9.2%)	1 (0.8%)	0 (0%)	131
The organisation makes clear efforts to reduce waste (i.e. Rework, returns & time)								
3	4.190	0.878	55 (42.0%)	55 (42.0%)	13 (9.9%)	7 (5.3%)	1 (0.8%)	131
The organisation uses teams in analysing processes for improvement.								
4	4.152	0.673	40 (30.5%)	72 (55.0%)	18 (13.7%)	1 (0.8%)	0 (0%)	131
The organisation calibrates measuring / monitoring devices, of regular intervals, to ensure its accuracy.								
5	4.274	0.713	54 (41.2%)	61 (46.6%)	14 (10.7%)	2 (1.5%)	0 (0%)	131
The organisation keeps its sites neat/ clean at all times.								
6	4.305	0.580	48 (36.6%)	75 (57.3%)	8 (6.1%)	0 (0%)	0 (0%)	131
The organisation uses on the recommendations of studies/ research for improving its products/ and services.								
7	4.297	0.751	60 (45.8%)	52 (39.7%)	17 (13.0%)	2 (1.5%)	0 (0%)	131
CONSTRUCT RELIABILITY				**0.85**				

Sample size = 131 **sd = Standard** Deviation **M=Mean**

SA = Strongly Agree (5) A = Agree (4) **N** = Neutral (3) D = Disagree (2) **SDA** = Strongly Disagree (1)

6.6.11 Information management process

The majority of items in the Information Management Process construct presented a similar pattern in the distribution of frequencies, which inclined more towards 'agree' and 'strongly agree' (SA=35%, A=57%). Items number four *'The organisation uses information- /- performance measurements in the improvement of its services'* and number three *'The organisation uses information- /- performance measurements in the improvement of its services'* showed more than 90% of respondents 'agree' and 'strongly' agree, which reflects the importance of performance measurements to the organisation. The highest percentage of respondents (95.5%) ranged between ‘strongly agree’ and ‘agree’ was for statement number one “*Information is used to make decisions in the organisation”*. The standard deviation ranged between (0.61) and (0.7).

Table 6-25: Information Management Process Construct: Mean, Standard Deviation & Frequency

Q No.	M	sd	SA (5)	A(4)	N(3)	D(2)	SDA(1)	N
Information is used to make decisions in the organisation.								
1	4.496	0.612	72 (55.0%)	53 (40.5%)	5 (3.8%)	1 (0.8%)	0 (0%)	131
The organisation standards- /- performance indicators are compared with international standards.								
2	4.152	0.695	39 (29.8%)	77 (58.8%)	11 (8.4%)	4 (3.1%)	0 (0%)	131
The organisation uses information- /- performance measurements in the improvement of its processes.								
3	4.190	0.621	39 (29.8%)	79 (60.3%)	12 (9.2%)	1 (0.8%)	0 (0%)	131
The organisation uses information- /- performance measurements in the improvement of its services								
4	4.160	0.605	33 (25.2%)	89 (67.9%)	6 (4.6%)	3 (2.3%)	0 (0%)	131
CONSTRUCT RELIABILITY			**0.80**					

Sample size = 131 **sd = Standard** Deviation **M=Mean**

SA = Strongly Agree (5) A = Agree (4) **N** = Neutral (3) D = Disagree (2) **SDA** = Strongly Disagree (1)

6.6.12 Information management performance

Responses to items in the information management performance construct showed a consistent mean with all between 'strongly agree' to 'neutral' (SA=38%, A=50%, N=11%). Item number two "*The information generated by the organisation is precise*" showed a more even spread of frequencies. It is remarkable from Table 6.26 below of the information management performance construct that the highest percentage of respondents (93.2%) ranged between 'strongly agree' and 'agree' was for statement number one "*The information generated by the organisation is reliable"*; whereas the lowest percentage (84.7%) ranged between 'strongly agree' and 'agree' was for statement number two of the construct "*The information generated by the organisation is precise*". The standard deviation ranged between (0.62) and (0.76).

Table 6-26: Information Management Performance Construct: Mean, Standard Deviation & Frequency

Q No.	M	sd	SA (5)	A(4)	N(3)	D(2)	SDA(1)	N
The information generated by the organisation is reliable.								
1	4.419	0.619	64 (48.9%)	58 (44.3%)	9 (6.9%)	0 (0%)	0 (0%)	131
The information generated by the organisation is precise.								
2	4.221	0.757	52 (39.7%)	59 (45.0%)	17 (13.0%)	3 (2.3%)	0 (0%)	131
The information generated by the organisation is comprehensive.								
3	4.167	0.681	42 (32.1%)	70 (53.4%)	18 (13.7%)	1 (0.8%)	0 (0%)	131
The information generated by the organisation is clear.								
4	4.190	0.645	41 (31.3%)	75 (57.3%)	14 (10.7%)	1 (0.8%)	0 (0%)	131
CONSTRUCT RELIABILITY				**0.88**				

Sample size = 131 **sd =** Standard Deviation **M=Mean**

SA = Strongly Agree (5) A = Agree (4) **N** = Neutral (3) **D**=Disagree (2) **SDA** = Strongly Disagree (1)

6.6.13 Overall frequency of responses to items in constructs

The table below presents a summary of frequency of responses to items in each of the individual constructs. The main pattern visible from the responses is that the most popular response is that of the "Agree" category followed by the "Strongly Agree" and the "Neutral". On the other hand very few responses fell into the "Disagree" category and virtually none in "Strongly Disagree".

Table 6-27: Average Frequency of Responses to Items in Constructs

Construct	S A (%)	A (%)	N (%)	D A (%)	S D A (%)
Overall Project performance:	39	52	6.2	2.6	0.2
Project Management Process	35	52	9.1	3.5	0.4
Top Management Commitment	39	51.3	8.3	1.4	0
Benchmarking	27	54.4	13.5	4.3	0.8
KPI Development	33.6	56	7	3.4	0
Training and Development	28.2	58	9.5	4	0.3
Motivation	27	54	13	6	0
Customer Focus	41	50	8.3	0.7	0
Supplier Management	43.2	48.2	7	1.4	0.2
Process Management	40	49.2	9.2	1.5	0.1
Information Management Process	35	57	6.5	1.5	0
Information Management Performance	38	50	11	1	0

SA = Strongly Agree **A** = Agree **N** = Neutral **D** = Disagree **SDA** = Strongly Disagree

6.7 Correlation analysis

Correlation is a measure of a relationship or strength between two or more variables or sets of data. Pearson's Product Moment Coefficient (r) is the most often used and most precise coefficient. It is generally used with continuous variables and expressed in the form of a coefficient with +1.00 indicating a perfect positive correlation; -1.00 indicating a perfect inverse correlation; and 0.00 indicating a complete lack of a relationship. The Pearson correlations of the TQM practices and PMP constructs are tabulated in Table 6.28. The 12 TQM elements are significantly correlated with PMP. The table summarises the Pearson correlation; note that all of the correlations are positive and statistically significant. Process management is highly correlated with Overall Project Performance (0.769), Top Management Commitment is (0.754) and Benchmarking is (0.750).

Table 6-28: Bivariate Correlation Matrix of independent and dependent variable construct factor score

Constructs	OPP	PM Pro.	TMC	BM	KPIs	TD	M	CF	SM	PM	IM Pro.	IM Perf.
OPP	1											
PM Pro.	.725[a]	1										
TMC	.754[a]	.671[a]	1									
BM	.750[a]	.636[a]	.631[a]	1								
KPI's	.691[a]	.650[a]	.667[a]	.613[a]	1							
TD	.604[a]	.454[a]	.596[a]	.575[a]	.517[a]	1						
M	.604[a]	.454[a]	.596[a]	.575[a]	.517[a]	1.000	1					
CF	.740[a]	.606[a]	.749[a]	.617[a]	.517[a]	.659[a]	.667[a]	1				
SM	.713[a]	.653[a]	.621[a]	.552[a]	.575[a]	.639[a]	.639[a]	.670[a]	1			
PM	.769[a]	.788[a]	.743[a]	.703[a]	.719[a]	.591[a]	.591[a]	.720[a]	.684[a]	1		
IM Pro.	.690[a]	.682[a]	.701[a]	.632[a]	.612[a]	.422[a]	.422[a]	.667[a]	.645[a]	.738[a]	1	
IM Per.	.731[a]	.705[a]	.618[a]	.713[a]	.537[a]	.445[a]	.445[a]	.544[a]	.587[a]	.689[a]	.588[a]	1

[a] Correlation is significant at the 0.01 level (2-tailed).

OPP: Overall Project Performance	PM Pro.: Project Management Process	TMC: Top Management Commitment
BM: Benchmarking	KPIs : KPI Development	TD: Training and Development
M: Motivation	CF: Customer Focus	SM: Supplier Management
PM: Process Management	IM Pro. Information Management Process	IM Per. Information Management Performance

To know the correlation between the independent variables, which are TQM practices, and the dependent variables, which are the items of performances, construct number one, the correlation matrix has been calculated by using SPSS. Table 6.29 shows the results of correlation between variables; from Table 6.29 the strongest correlation appears in item 10, which is employment of an effective project management with most TQM practices, and then items 1, 2, 5, 9 and 11 respectively. The medium correlations were with items 3, 4, and 6, whereas the lowest correlation appears in item numbers 7 and 8, which is project team members, who are usually happy workings on projects.

Table 6-29: Correlation Matrix of independent variables and items of dependent variable

TQM practices		Elements of project performance										
		I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11
T1	Pearson Corr.	.522**	.522**	.473**	.447**	.554**	.480**	.299**	.405**	.587**	.611**	.595**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000	.001	.000	.000	.000	.000
T2	Pearson Corr.	.530**	.611**	.549**	.500**	.450**	.524**	.319**	.371**	.533**	.656**	.641**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
T3	Pearson Corr.	.649**	.645**	.495**	.458**	.573**	.614**	.280**	.173*	.523**	.544**	.613**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000	.001	.048	.000	.000	.000
T4	Pearson Corr.	.504**	.626**	.413**	.468**	.452**	.466**	.251**	.335**	.483**	.636**	.554**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000	.004	.000	.000	.000	.000
T5	Pearson Corr.	.539**	.588**	.388**	.316**	.423**	.451**	.178*	.346**	.297**	.514**	.436**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000	.042	.000	.001	.000	.000
T6	Pearson Corr.	.539**	.588**	.388**	.316**	.423**	.451**	.178*	.346**	.279**	.514**	.436**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000	.042	.000	.001	.000	.000
T7	Pearson Corr.	.564**	.666**	.531**	.478**	.579**	.497**	.243**	.346**	.494**	.573**	.571**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000	.005	.000	.000	.000	.000
T8	Pearson Corr.	.596**	.608**	.371**	.418**	.492**	.544**	.346**	.411**	.434**	.608**	.512**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
T9	Pearson Corr.	.610**	.696**	.442**	.484**	.556**	.577**	.262**	.334**	.555**	.621**	.607**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
T10	Pearson Corr.	.569**	.554**	.404**	.389**	.579**	.496**	.226**	.218**	.527**	.608**	.564**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
T11	Pearson Corr.	.619**	.616**	.437**	.437**	.519**	.580**	.353**	.252**	.481**	.561**	.595**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

**** Correlation is significant at the 99% level (2-tailed)**

T2.: Project Management Process
T2: Top Management Commitment
T3: Benchmarking
T4 : KPI's Development
T5: Training and Development
T6: Motivation
T7: Customer Focus
T8: Supplier Management
T9: Process Management
T10. Information Management Process
T11: Information Management Performance
I1: Generally our projects meet their time objectives
I2: We are usually good at delivering projects within budget
I3: Our projects usually result in tangible benefits for the organisation
I4: Generally customers of our projects are satisfied with the outcome
I5: Project specifications are usually met by the time of handover
I6: Our key stakeholders are usually happy with the way our projects are managed
I7: Project team members are usually happy working on projects
I8 There are often clearly identified intangible benefits from the projects we carry out
I9: End users are usually happy with the results from our projects
I10: We usually employ an effective project management process
I11: Overall, we are very successful at projects

6.8 Testing hypotheses

The researcher hypothesised eleven hypotheses, based on a theoretical analysis of the literature review as well as the results of semi-structured interviews, that TQM practices have a significant effect on PM performance. The correlation between independent variables, TQM practices and items of dependent variables, PM Performance, was tested (see Table 6-29). Cohen (1988 and 1992) gave the following guidelines of **(*r*)** coefficient values for the social sciences:

- 0.1– 0 classified as weak correlation.
- 0.3 – 0.5 classified as medium correlation.
- 0.5 – 1.0 classified as strong correlation.

Figure 6.2 below shows how the 11 hypotheses of TQM practices correlated with the items of the items of dependent variables, PM Performance. Six items of dependent variables, PM Performance, were correlated strongly with items of independent variables, TQM practices, three items were correlated medium, whereas two items were correlated weakly.

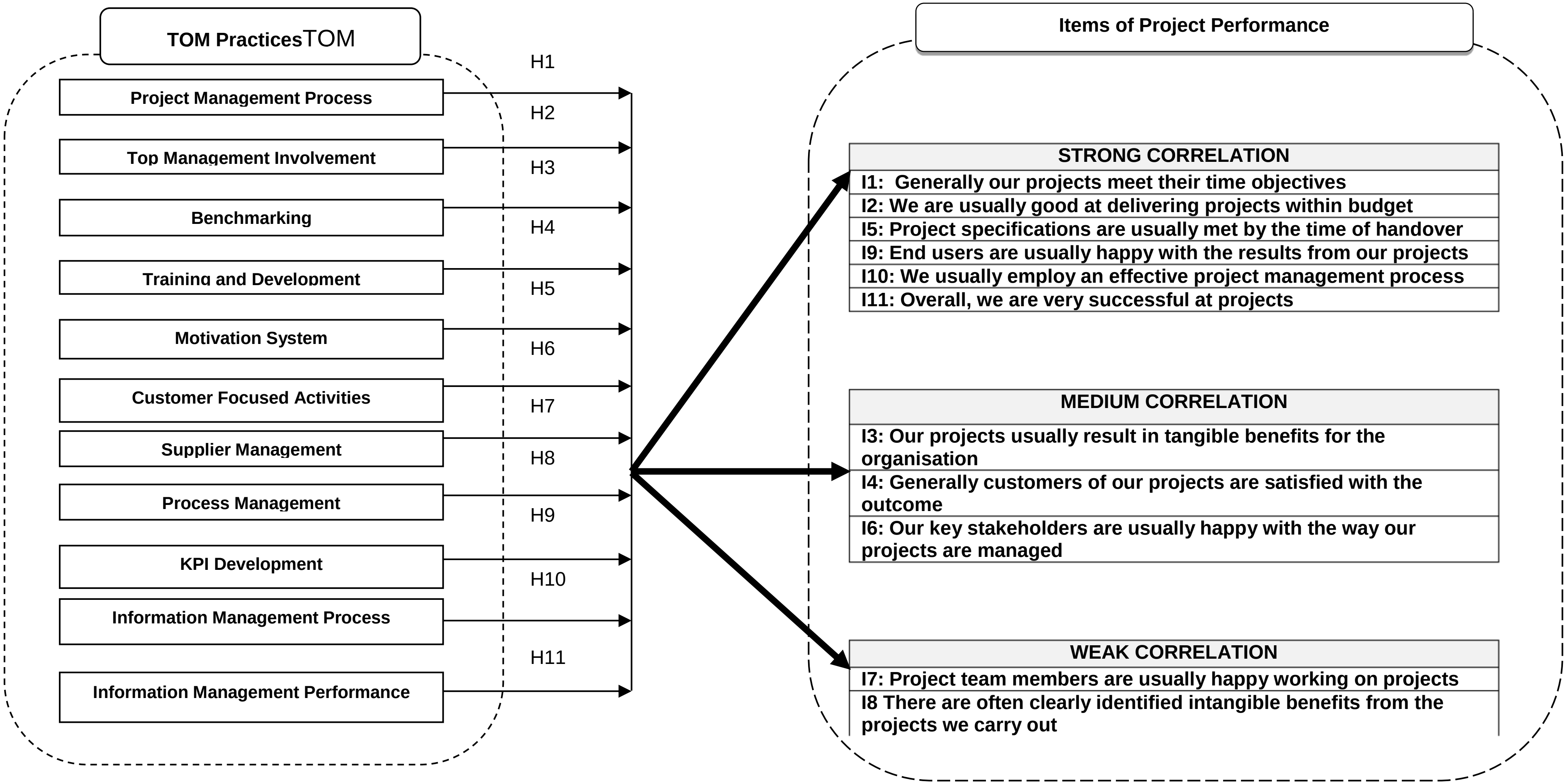

Figure 6.2: correlation between TQM practices and items of project performance

6.9 Multiple regression analysis

Multiple regression analysis is used to investigate the relationship between dependent variable project performance and independent variables, TQM practices. The multiple regression method is an appropriate technique in analysing the relationship between a single variable and several variables with an objective of explaining the single dependent value using independent variables whose values are known (Hair *et al*., 1998). The results of multiple regression analysis, including the standardised beta coefficients and the coefficient of determination, are tabulated in Table 6-32. Before conducting the test, a collinearity test was carried out. The figures in Table 6.30 show that there is no Tolerance value under 0.10 or VIF above the value 10. This indicates absence of a multi-collinearity problem amongst independent variables (Field, 2009).

Table 6-30: Multi-Collinearity Test

Independent variables	**Col-linearity Statistics**	
	Tolerance	VIF
Project Management Process	0.294	3.397
Top Management Involvement	0.304	3.288
Benchmarking	0.343	2.913
Involvement in KPI development	0.409	2.446
Motivation System	0.4	2.502
Customer Focus	0.302	3.308
Supplier Management	0.361	2.771
Process Management	0.219	4.568
Information Management Process	0.329	3.036
Information Management Performance	0.361	2.772

Stepwise regression method is considered a practical method that assists in recognizing variables. The benefit of stepwise is that at each phase it defines the involvement of each predictor (i.e. Independent variable) which is already in the model. This process aids in recognizing predictors that were measured useful at an early phase but have lost their helpfulness/involvement when additional predictors were brought into the model (Pedhazur, 1997).

The 11 factors were loaded into the regression model as the independent variables, with the composite measures of project performance as the dependent variable. Seven models were generated, which are illustrated in Table 6.31 below. All seven models gave good predictors of success (*R* values range from lowest of .769 of model one to .881 of model six); the best model is model six with *R* value of .881. After running a regression analysis, I M Process, KPI Development, Benchmarking (BM), Supplier Management (SM) and I M Process were the significant variables. Table 6.31 presents the R^2 value for the regression on the project performance results.

Table 6-31: Model Summary

Model	*R*	R^2	R^2 (Adj.)	Std. Error of the estimate
1	.769(a)	.592	.588	3.458
2	.824(b)	.678	.673	3.081
3	.852(c)	.726	.719	2.856
4	.869(d)	.755	.747	2.713
5	.876(e)	.767	.757	2.656
6	.881(f)	.776	.765	2.612
7	.879(g)	.773	.764	2.618

Model 1: Independent Variables: Process management.
Dependent Variables: Project Performance.
Model 2: Independent Variables: Process management, Benchmarking
Dependent Variables: Project Performance.
Model 3: Independent Variables: Process management, Benchmarking, Supplier Management
Dependent Variables: Project Performance.
Model 4: Independent Variables: Process management, Benchmarking, Supplier Management, Top Management Involved
Dependent Variables: Project Performance.
Model 5: Independent Variables: Process management, Benchmarking, , Supplier Management, Top Management Involved, I M Performance.
Dependent Variables: Project Performance.
Model 6: Independent Variables: Process management, Benchmarking, Supplier Management, Top Management Involved, I M Performance and Customer Focus.
Dependent Variables: Project Performance.
Model 7: Independent Variables: Benchmarking, Supplier management, Top Management Involved, I M Performance, Customer Focus.

Dependent Variables: Project Performance.

The result from the coefficients (Table 6.29) indicates that Model 6 and Model 7 are statistically significant. This suggests that the relationship between I M Performance, Benchmarking (BM), Supplier Management (SM), Top Management Involved (TM), and Customer Focus with project performance results is statistically significant.

Table 6-32: Coefficients

Model		B	Std. Error	B (Standardised)	t	Sig.
1	(Constant)	11.927	2.573		4.635	.000
	Process Management	1.168	0.085	0.769	13.671	.000
2	(Constant)	6.659	2.363		2.8181	.000
	Process Management	0.726	0.107	0.478	6.784	.000
	Benchmarking	0.679	0.116	0.414	5.874	.000
3	(Constant)	6.659	2.363		2.818	.006
	Process Management	0.459	0.114	0.302	4.008	.000
	Benchmarking	0.610	0.108	0.372	5.633	.000
	Supplier Management	0.657	0.140	0.301	4.687	.000
4	(Constant)	3.376	2.401		1.406	.162
	Process Management	0.263	0.120	0.173	2.193	.030
	Benchmarking	0.527	0.105	0.321	5.020	.000
	Supplier Management	0.549	0.136	0.251	4.030	.000
	Top Management Involved	0.385	0.100	0.267	3.847	.000
5	(Constant)	2.751	2.364		1.164	.247
	Process Management	0.204	0.120	0.134	1.700	.092
	Benchmarking	0.411	0.113	0.250	3.650	.000
	Supplier Management	0.495	0.135	0.250	3.669	.000
	Top Management Involved	0.360	0.099	0.249	3.651	.000
	I M Performance	0.398	0.157	0.172	2.538	.012
6	(Constant)	1.673	2.372		0.705	.482
	Process Management	0.148	0.120	0.097	1.230	.221
	Benchmarking	0.371	0.112	0.226	3.309	.001
	Supplier Management	0.403	0.139	0.185	2.907	.004
	Top Management Involved	0.262	0.106	0.181	2.476	.015

Model		B	Std. Error	B (Standardised)	t	Sig.
	I M Performance	0.440	0.155	0.191	2.835	.005
	Customer Focus	0.315	0.138	0.167	2.284	.024
7	**(Constant)**	1.817	2.374		0.765	.446
	Benchmarking	0.402	0.109	0.245	3.678	.000
	Supplier Management	0.443	0.135	0.203	3.279	.001
	Top Management Involved	0.298	0.102	0.206	2.913	.004
	I M Performance	0.481	0.152	0.209	3.166	.002
	Customer Focus	0.349	0.135	0.185	2.581	.011

Factor 3 “Top management involvement” Factor 4 “Benchmarking” Factor 8 “Customer focused”
Factor 9 “Supplier management” Factor 10 “Process management Factor 12 “Information Management Performance”

6.10 Summary

This chapter has illustrated the results of the quantitative primary data in proportion to the second research objectives, which are:

1. To analyse the inter-relationship between TQM principles and PM Practices for oil and gas industry related projects.
2. To model the predictive value of TQM principles to PM performance in oil and gas industry related projects.

The data collected through a survey (Appendix 5) were cleaned, coded and then went through a reset SPSS (Statistical Package for Social Scientists) (20), and a series of analyses were carried out to test internal reliability and validity. A Cronbach alpha has been used to measure the internal consistency reliability. Table 6.2 shows the reliability coefficient ranged from 0.76 to 0.9, which was very significant and higher than the suitable level of 0.6 (Nunnaly, 1978), and then data were suitable for more analysis.

Descriptive statistics described how the survey questions were answered by the respondents. Items in each of the 12 constructs have been collected together and details of mean, standard deviation and frequency of responses are presented in this chapter. Correlation coefficient was used to indicate the strength of association between the independent variables (TQM) practices and items of dependent variable (PMP). Multiple regression analysis is used to investigate the relationship between dependent variable project performance and independent variables TQM practices by using a practical approach of stepwise analysis to model the predictive value of TQM principles to PM performance. The examining of *R* values showed the best model with *R* (0.881). The predictive model was:

1. Process management,
2. Benchmarking,
3. Supplier Management,
4. Top Management Involved,
5. I M Performance and
6. Customer Focus

Consequently, this answered all of the research questions posed for this study. All findings rising from this research will be discussed corresponding to the research objectives and the extant literature in the next chapter.

CHAPTER SEVEN

7 Interpretation and discussion of key findings

7.1 Introduction

The intention of this chapter is to provide evaluation of the key results from the semi-structured interviews and questionnaire which are presented in the previous two chapters, by examining these results with respect to the objectives of the research as well as the extant literature on TQM and PM. This will agree with the aim of the research to be an original contribution to knowledge.

The objectives of this research are:

1. **To review current definitions and models of PM performance in relation to theory and practice.**
2. **To examine current definitions and models of TQM in a project context.**
3. **To identify methodological norms in this research and propose a way forward.**
4. **To analyse the interrelationship between TQM principles and project performance practices for oil and gas industry related projects.**
5. **To model and propose predictive value of TQM principles that could be used to enhance project performance in the Libyan oil and gas sector.**

These objectives will be discussed with regard to the results presented in the last two chapters (five) and (six), which were gained through the literature review, semi-structured interviews with project managers and professionals within a sample of three categories of the oil and gas sector, which are mentioned in Figure 2.4, and finally the responses from project managers, professionals and section heads of the same companies to the carefully made questionnaire.

7.2 PM Performance

The analysis of the interviews revealed that PM Performance is not only measured in time, cost and quality. Seven out of 12 interviewees stressed time, cost, quality and Health and Safety Environment (HSE). The rest of the interviewees stated other factors that could help in PM Performance, such as manpower involved in the project and their unity in working towards best performance. In addition, clarity and client happiness were stated and by that they mean to keep the client up to date with the project activities in order to make them happy with the performance. The last two factors were deliverables and Return on Investments (ROI). Appendix 6 presents a summary of the interview findings.

This confirmed that performance is not measured in time, cost and quality only, but is a multifaceted concept that includes the iron triangle of cost, time and quality plus HSE and manpower. That was due to the nature of the projects, industry sector, and the respondents. The findings regarding the measuring of project management performance support the proposition that the performance has more than the iron triangle, as per various authors (Belout and Gauvreau, 2004; Bryde and Brown, 2005; Bekker and Steyn, 2008; Chan and Chan, 2004; Das and Ngacho, 2014; Low and Chuan, 2006; Milosevic and Patanakul, 2005; and Toor and Ogunlana, 2009).

7.3 Examine current definitions and models of TQM in a project context

The second objective of this study was to examine current definitions and models of TQM in a project context. The findings of the study revealed that all TQM practices were having a direct effect on PMP, which is confirmed by all three companies' respondents. However, the effect varies from one practice to another due to the nature and importance of the project itself. In this section, the researcher will explore and discuss the results of the interviews and how they explain the effect of TQM practices in the project context, also the results of the regression analysis that came out with the determinant TQM practices.

7.3.1 Top management involved

Top management commitment does not just happen; it is tough to make and keep going. It is a mixture of honest participating leadership, vision, interest, continual training and cooperation with the employee supported by the improvement of a acknowledgement, appreciation and reward system. In parallel with the literature review, all of the interviewees confirmed that top management involvement is one of the main requirements to accomplish maximum project management performance. Previous research in TQM practices accentuates the crucial role of top-management dedication in driving overall TQM implementation in the organisations (Flynn *et al*., 1994; Teh *et al*., 2008; Zakuan *et al*., 2010). Teh *et al*. (2008) noted that senior leaders and management lead the organisation and weigh up the organisational performance. Kanji (2001) declared that top-management commitment is the essential driver of business excellence. Furthermore, studies showed that top-management commitment extensively influences the quality performance (Adam *et al*. 1997 ; Ahire and O'Shaughnessy 1998; Arumugam *et al*., 2008; Cua *et al*. 2001; Das *et al*. 2000; Kannan and Tan 2005; Nair 2006; Nixon *et al.*, 2012; Prajogo and Brown, 2004; Talib *et al.,* 2013), in innovation performance (Feng *et al*., 2006; Hung *et al*., 2011; Phan *et al*., 2011; Prajogo and Sohal, 2004), in project performance (Shieh and Wu, 2002) and in aggregate performance (Cua *et al*., 2001; Powell, 1995).

Interviews quoted many different examples of top management involvement such as through the quality management system they follow in the company, through top management daily routine, through participating in putting in place the KPIs and finally through reporting, inspection and auditing. These quotations stress the significance of the top management involvement in following up the projects and attain maximum project performance.

The results of regression coefficients, see Table 6.31 in Chapter six, revealed that model six is the best model which contains top management involvement (B=0.262) as one of the best predictors along with other TQM practices.

7.3.2 Project management process

The project management process is very important for project performance, as the more control of the process the better the performance will be at the end of the project. The survey results showed that 81% of the respondents strongly agreed or agreed with all the statements in the project management construct. This indicates that the project management process is very significant for the project performance. The survey results showed that 88% of the respondents strongly agreed or agreed with the statement that "*The organisation's quality department helps in ensuring project performance-targets are met*". Also, 92% of the respondents strongly agreed or agreed with the statement that "*Procedures from the quality department are used to guide the management of projects*". These two reflect the strength of having tight project management processes within the three companies, which leads to good quality project. Moreover, the survey results revealed that 95% of the respondents strongly agreed or agreed with the statement "*The success of a project is measured against pre-defined criteria at the end of a project*". This gives the indication that the top management and the project managers in the three companies are very keen about the project management process, even before the project is launched.

In the results of the correlation between TQM practices, independent variables and the items of performance, dependent variables in construct one, which are presented in Table 6.29, the results showed very significant correlation starts from 0.299 up to 0.611 (at the 0.01 level). These reflect the importance of the project management process in achieving high project performance.

The outcome of the study findings in this practice emphasised the importance of the project management process practice on project performance. It appears that this practice was an essential and very significant practice for accomplishing maximum project performance. Additionally, the study results confirmed that this practice was crucial for project performance.

7.3.3 Benchmarking

The third TQM practice was benchmarking; benchmarking is the process of comparing information of performance within the company or organisation and outside the company or organisation as well. Additionally, it endeavours to measure the operations or processes of the company against the top class performers either inside or outside its division (Sit *et al.,* 2009) and that comes in line with interview results from the three companies. The survey results presented that 83% of the respondents strongly agreed or agreed with the statement that "*The organisation uses benchmarking data effectively for enhancing project management performance*". This points out the strength of feeling regarding the significance of benchmarking practice and its involvement in enhancing the project performance, and is quoted by interviewee A4, who agreed that benchmarking is a critical factor in enhancing project performance. It shows not just internally but externally where projects have failed, and the company aims to prevent similar failures in the future:

> *"Well I'd say the benchmarking is a very big one, because that has helped us in lessons learned, so the benchmarking is very critical. It shows not just internally but externally where projects have failed, and how we can get around that, and make sure that we don't have similar failures in the future; same with project close-out reporting, what went wrong in the project against different areas. [It's] not just quality, it is full business spectrum and each of these has assurance impact, so we looked at that side of it."*

The results of the multiple regression analysis illustrated the regression coefficients, see Table 6.31 in Chapter six, which showed that model six is the best model which contain benchmarking practices (B=0.371) as a third positive TQM practice of the best predictors along with other TQM practices. This met with the findings of previous studies, which revealed that benchmarking had a direct effect on performance (Talib. *et al*., 2013 and Yusuf *et al*., 2007).

The outcome of the findings of the benchmarking is recognition that the benchmarking practice is an essential and very important practice for accomplishing maximum project performance.

7.3.4 KPI development

This TQM practice was developed from the interview results. The results of phase one revealed that the development of KPIs will enhance the project performance. Interviewees quoted different ways of defining and developing KPIs. The owner company A and engineering company B had the same way, whereas construction company C went a slightly different way. Interviewee A4 said they define project performance and that quality management is as critical as any other business activity. They ensure that projects are delivered to the promised time and specification. They identify through project quality plans what the requirements are, and how they will be delivered and how the efficient use of resources is achieved.

> "*We define project performance: it's ensuring that QM manage same as any other critical business activity, so we do not see any different to any other critical business activity; we ensure the activities and projects [are] delivered to promise and facilities performance specified, so we identify through our project quality plans what the requirements are, and how we [are] going to deliver, and we monitor it against what we state, [and] achieve the efficient use of the resources around us*".

This is supported by the survey results on the statement "*KPIs are developed with involvement of the quality department*", with which 86% of the respondents strongly agreed and agreed. The survey results showed that 90% of the overall of items in the KPI development construct were categorised as strongly agreed and agreed. This forcefully explains how the KPI development TQM practice was important to project managers as well as the three companies. Moreover, the survey results revealed that 94% of the respondents strongly agreed or agreed with the statement that “*Top management is involved in the use of KPIs for projects* ". This indicates the strength of feeling regarding the significance of KPI development practice for the accomplishment of high project performance. In addition, these results linked with top management involvement in the practice and its significance in achieving high project management performance.

The outcome of the study findings in this practice stressed the importance of definition and development of KPIs on project performance. Apparently, this practice was an essential and very significant practice for accomplishing maximum project performance. In addition, the study result showed that this practice was crucial for project performance.

7.3.5 Training and development

Training and development broaden the knowledge of continuous improvement and innovation in the management process in companies to accomplish full profits and project performance. In line with the literature review in TQM and project performance contexts, the results of the study stressed the importance of employee training and development that met with the statement of Talib and Rahman (2010), who reported the decisive function of training and education in preserving a high quality level within the services industry. The survey results showed the average of 86% of the items in the training and development construct were between strongly agreed and agreed. That reflects how training and development were important to project managers as well as the companies and were crucial to spread the knowledge about the performance.

The results of interviews revealed that the training and development were carried out by the three companies by using different ways and tools in order to develop their project managers to be aware of project requirements and be up to date with the latest techniques. For instance, the results which are come out from NVIVO, see Figure 7.1 below, showed the ways of training and development processes of the three companies. Company A had a scheme for new project engineers to assure from the beginning of their career that they follow the right steps and are aware of the performance issues. Additionally, the same company had a compulsory HSE course to be attended by every single project manager in the company; that is due to the importance of the HSE factor and they considered it as a KPI for the success of each project they carried out. Whereas company B, the engineering company, by its nature invests in people and they believe them to be a key for the accomplishment of their business. This company had a system of a monthly training workshop, which starts with lessons learnt from either a success in any phase in a project or a failure; the success to be followed with future projects and the failure to be avoided. That is an indication of how the training and development of the staff helps the company to achieve the maximum project performance possible.

The results of the correlation between the TQM practices, independent variables and the items of performances, dependent variables in construct number one (see Table 6.29) showed that the training and development construct correlated positively with all the questions of project performance. These results came out in parallel with the literature (Talib, *et al*., 2013), who found in their study that training and development was one of the strongest determinant TQM practices on performance. Furthermore, the training practice was found to be very important with regard to performance in previous studies, in quality performance (Ahire and Drefus, 2000 and Quazi *et al*., 2000), in operating performance (Fuentes *et al*., 2006; Kaynak, 2003; and Anderson *et al*., 1998), in market and financial performance (Fuentes *et al.*, 2006; and Kaynak 2003), in employee performance (Fuentes *et al*., 2006; and Anderson *et al*., 1995).

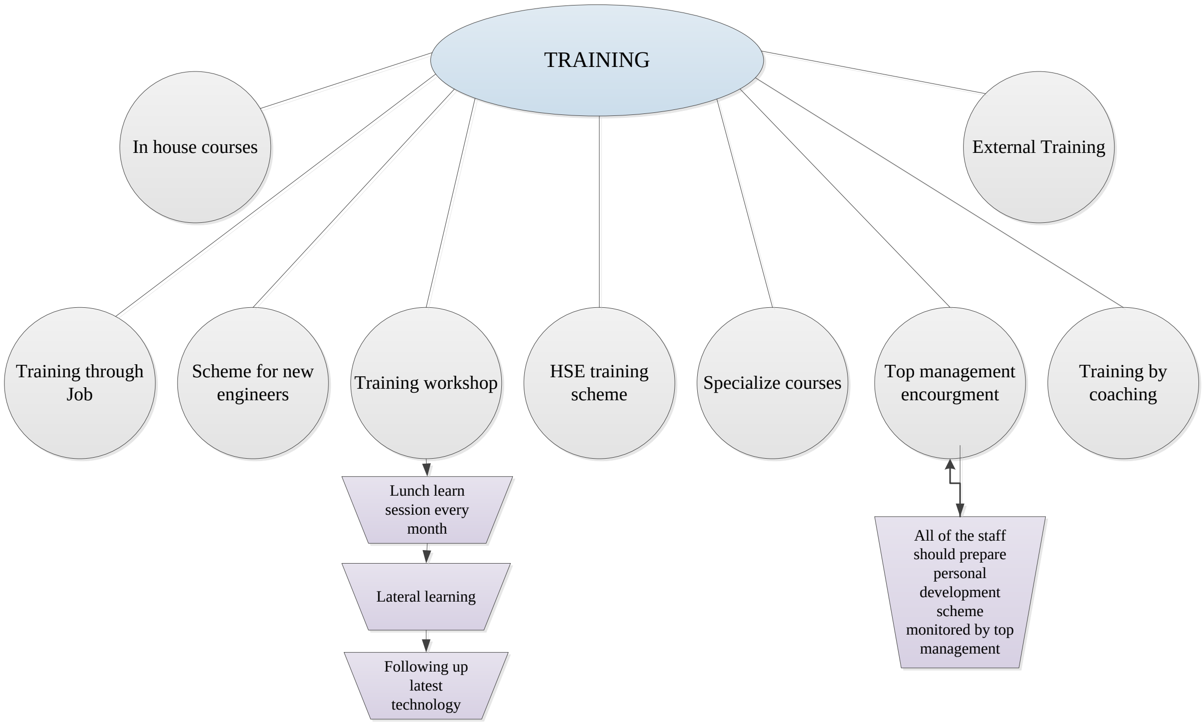

Fig. 7-1 NVIVO result

The outcome of the findings of the training and development practice is evidence that the training and development practice was an essential practice for accomplishing maximum project performance.

7.3.6 Motivation system

In line with the previous TQM literature review, the results of the study confirmed that the motivation practice had a positive effect and that will lead to a maximum performance. This met with the findings of previous studies, which revealed that motivation had a direct effect on performance (Rowland, 2013; Chen and Chang, 2013; Goncharuk and Monat, 2009). The results of the interviews revealed that motivation is a must to have a high performance. The three companies' interviewees stressed this practice and declared how they utilised it throughout different systems. For instance company A stressed the motivation and they considered it as crucial to them. The company established a system called "SHUKKRAN AWARD"; this system was managed and followed up by their top management and the results of this system helped in achieving high project performance.

The survey results showed that respondents strongly agreed or agreed with 81% of the overall of items in the motivation construct. This shows how the motivation TQM practice was important to project managers as well as to the three companies. Furthermore, the survey results revealed that 83% of the respondents strongly agreed or agreed with the statement that *“The motivation system is monitored by top management"*. This indicates the strength of feeling regarding the importance of motivation practice for the accomplishment of high project performance.

The TQM literature and outcome of the study findings in this practice stressed the importance of motivation on project performance. Apparently, this practice was essential and very significant for accomplishing high project performance. In addition, the study results confirmed that this practice was essential for project performance.

7.3.7 Customer focus

The customer focus, or customer satisfaction, or customer care practice, was very obvious and clear in the minds of company directors, section heads, project managers and project engineers of the three companies where the interviews were carried out. That supports the conclusion statement of the study completed by (Zakuan *et al*., 2010; and Zhang, 2000).

In the review of the response about the interview question related to the customer satisfaction issue, the answers showed that they care about the customer and that they have different ways of dealing with this practice. For instance, in Company A the customer care started from the beginning of the project and was dealt with and was documented and stated in the project scope of work. They stated clearly that, in case of any conflict, misunderstanding or extra work to be done during the project life, the contractor had the right to reissue another scope of work for that situation in the way of the company system called Change Order (CO). The reason behind issuing a CO was to make the company's customer happy and satisfied. Whereas the engineering company (B) had another way of dealing with their customers and that was stated in the reply to this question from their business manager: (B2), the Business Manager, said that this company is entirely customer focused. They work with customers, offering them offices in his company's premises, working with the same team. His company does not view customers as enemies, and they solve the problems together. His customers have direct access to him and he is authorised to solve their problems, sometimes in direct contact with the highest level in the client company

Interviewee B2, in answering ***"How does your organisation deal with customer demands and complaints?"***, said:

> "*We do that by ensuring that we are customer focused, that is all we do. We are customer focused, we work with the customers, offering them offices here, working with the same team; our customers are not enemies, and sometimes, customers, especially from international companies tend not to understand that, but we solve the problems, and if we solve the problems and sort the problems out, and understand what they want, do what they need to do, and if there is a complaint we try to sponsor them."*

The Interviewee from company C responded about this practice in a positive way: they support the customer and are enthusiastic about their own mechanism to make their customers happy and satisfied for the advantage of the project performance.

In addition to that, the survey results showed how the customer focus had a positive effect on project performance. The results of the multiple regression analysis showed the regression coefficients, which are available in Table 6.31 in Chapter six, revealing that model six is the best predicted model, which contains customer focus practices (B=0.315) and ranks as a fourth positive TQM practice.

The customer focus practice was found to be very significant with performance in previous studies, in quality performance (Prajogo and Sohal, 2004; Feng *et al*., 2006) in operating performance (Fuentes *et al*., 2004 and 2006; Nair, 2006), in market and financial performance (Fuentes *et al.*, 2004 and 2006; Nair, 2006), in employee performance (Fuentes *et al*., 2004 and 2006), in innovation performance (Prajogo and Sohal, 2004), production performance (Agus and Hassan, 2011) and in aggregate firm performance (Chong and Rundus, 2004; Nair, 2006).

The outcome of the study findings and literature reviewed of the customer focus practice was that it was an essential and very important practice for accomplishing maximum project performance.

7.3.8 Supplier management

In line with previous QM literature, interviews confirmed a supplier management practice as one of the essential success factors for performance. QM research classified supplier management as one of the main predictions for successful performance (Kanan and Tan, 2005; Cua *et al*., 2001) in operating performance (Fuentes *et al*., 2006; Kynak, 2003; Nair, 2006), in market and financial performance (Fuentes *et al*., 2006), in employee performance (Anderson *et al*., 1995; Fuentes *et al*., 2006), and in aggregate firm performance (Cua *et al*., 2001; Nair, 2006), and this was supported by many interviewees.

Interviewees cited different ways of establishing a system to control and guarantee the quality of goods and services in order to achieve high project performance. The interviewees of the owner company A and the engineering company B declared that they had a system called Approved Vendor List (AVL); this system secures the quality of goods through regular inspection of the supplier manufacturing units for the suppliers to remain on this list. Whereas construction company C relies on a quality agreement with the supplier and on an inspection and auditing system which they practised, and that was confirmed by interviewee C2, who stated that his company relies on quality agreements with suppliers and on an inspection and auditing system. Their Quality Assurance/Quality Control policies are rigorously enforced on suppliers, which are regularly audited to make sure that their quality policies are in line with his company's own policies.

Interviewee C2, in answering, "***How do you ensure the quality of goods/services from your project suppliers?",*** answered:

> *"We have quality, I mean policies in our quality QA/QC plans; we enforce those religiously on the suppliers, we actually put our suppliers only once we have ordered them; we check them, audit them and we keep on auditing them, their quality policies, make sure their quality policies are in line with our quality policies."*

This supports the conclusion of the studies conducted by Zakuan *et al*. (2010) and Zineldin and Fonssonm (2000).

Moreover, the results of the multiple regression analysis showed the regression coefficients; see Table 6.31 in Chapter six, which showed that model six was the best predictor model. The supplier management practice was the second positive predictor factor with (B=0.403); this indicates that the supplier management will no doubt enhance the project performance and this was supported by the above mentioned studies. The result of the study findings and literature reviewed of the supplier management practice was that it was a crucial and very imperative practice for achieving maximum project performance.

7.3.9 Process management

In parallel with previous TQM literature review, the results of the study confirmed the process management practice as one of the determinant practices that will lead to a maximum project performance. This met with the findings of the previous studies, which revealed that process management had a direct effect on performance, in quality performance (Kaynak, 2003; Prajogo and Sohal, 2004, Ahire and Dreyfus, 2000; Feng *et al*., 2006) in operating performance (Fuentes *et al*., 2006; Flynn *et al*. 1995), in market and financial performance (Ahire and Dreyfus, 2000; Nair, 2006; Wilson and Collier, 2000), in employee performance (Anderson *et al*., 1995; Fuentes *et al*., 2006), in innovation performance (Prajogo and Sohal, 2004) and in aggregate firm performance (Cua *et al*., 2001; Nair, 2006).

The survey results showed that respondents strongly agreed or agreed with 89.2% of the overall of items in process management construct. This indicates the strength of feeling and awareness of the project managers in the three companies regarding the importance of the process management TQM practice for achieving maximum project performance. Furthermore, the results of the multiple regression analysis showed the regression coefficients; see Table 6.31 in Chapter six, which showed that model six was the best predictor model. The supplier management practice was among the six positive predictor factors with a value (B=0.148); this points out that the process management will positively enhance the project performance and this was supported by the studies mentioned above. The result of the study findings and literature reviewed of the process management practice was that it was a critical and very necessary practice for attaining utmost project performance.

The outcome of the study findings and TQM literature reviewed stressed the importance of the process management practice. Obviously, this practice was an essential and very important practice for accomplishing maximum project performance and crucial for the project life.

7.3.10 Information management process

In line with previous TQM literature review, the results of the study confirmed the information management process practice as one of the positive practices that will lead to a good project performance. This fact met with previous studies on the relationship between TQM practices and different forms of performance. The studies showed that the information management process practice had a positive effect on performance, in quality performance (Choi and Eboch, 1998; Prajogo and Sohal, 2004, Ho *et al*., 2001; Quazi *et al*., 1998), in operating performance (Cua *et al*., 2001), in market and financial performance (Wilson and Collier, 2000), in innovation performance (Prajogo and Sohal, 2004), in aggregate firm performance (Nair, 2006), and in quality of decision making for a multi-project environment (Caniëls and Bakens, 2012).

The indication of the strength of feeling and awareness of the project managers in three of the companies regarding the importance of the information management process TQM practice for achieving maximum project performance is shown by the survey results, which showed that respondents strongly agreed or agreed with 92% of the overall items in the information management process construct. In addition, the survey results presented that 95.5% of the respondents strongly agreed or agreed with the statement "*Information is used to make decisions in the organisation*". This reflects the importance of the information management process for taking the accurate decisions that lead at the end to first-class project performance. Furthermore, 93% of the respondents strongly agreed or agreed with the statement "*The organisation uses information- /- performance measurements in the improvement of its services*". This indicates the strength of feeling regarding the significance of the information management process for the achievement of high project performance.

The outcome of the study findings and TQM literature reviewed emphasised the information management process practice. Obviously, this practice was an essential and very significant practice for carrying out maximum project performance. Additionally, the results assure that this practice is crucial for project performance.

7.3.11 Information management performance

In line with previous TQM literature review, the results of the study stressed the information management performance practice as one of the positive practices that will lead to a high-quality project performance. This result met with previous studies results that looked at the relationship between TQM practices and different forms of performance. The studies showed that the information management performance practice had a very affirmative effect on performance, in quality performance (Choi and Eboch, 1998; Prajogo and Sohal, 2004, Ho *et al*., 2001; Quazi *et al*., 1998), in operating performance (Cua *et al*., 2001), in market and financial performance (Wilson and Collier, 2000), in innovation performance (Prajogo and Sohal, 2004), in aggregate firm performance (Nair, 2006), and in the quality of decision making for a multi-project environment (Caniëls and Bakens, 2012).

The survey results demonstrated that respondents strongly agreed or agreed with 88% of the overall of items in information management performance construct. This shows the strength of feeling and awareness of the project managers in the three companies regarding the importance of the information management performance TQM practice for accomplishing highest project performance.

In addition, the survey results confirmed that 93.2% of the respondents strongly agreed or agreed with the statement "*The information generated by the organisation is reliable*". This confirmation of reliability of information will no doubt lead to high quality project performance. It also reflects the awareness of the project decision makers of the three companies about the importance of information management performance for taking the accurate decisions that lead at the end to first-class project performance. Furthermore, the results of the multiple regression analysis showed the regression coefficients; see Table 6.31 in Chapter six, which demonstrated that model six was the best predictor model. The information management performance practice was the first and most positive predictor factor with a value (B=0.440); this points out that the information management performance will positively enhance the project performance and this was supported by the studies mentioned above. The result of the study findings and literature reviewed of the information management performance practice was that it was a critical and very essential practice for attaining highest project management performance.

The outcome of the study findings and TQM literature reviewed emphasised the information management performance practice. Clearly, this practice was an essential and very important practice for achieving maximum project performance. Additionally, the results confirm that this practice is crucial for project performance.

7.4 Methodological norms in this research main

From the review of literature in TQM context, project and project management performance and their relation together, the researcher came out with a result that the methodological norms are survey and questionnaires, defining TQM as a management philosophy that aids managing companies to develop their overall efficiency and performance towards attaining first-class rank. The table below provides a detailed summary of the previous literature. Works are presented in chronological order:

Table 7-1: Detailed Summary of the previous literature presented in chronological order

Study	Year	Country	Sample Size	Nain Findings	Methodology
* Asrilhant *et al*.	2004	Brazil and UK	9	The study revealed the importance of strategic PM for the Oil and Gas sector.	Interview
Rahman & Bullock	2004	Australia & New Zealand	962 of 3000	They found considerable variation in the positions when defining cash resources used in cash flow statements.	Questionnaire
Asrilhant *et al*.	2005	Brazil & UK	31 Companies	The overall research finding was that there is a gap between managers practices and elements of successful strategic PM.	Mixed
Soltani *et al*.	2006	UK & China	150 companies	The survey evidence (from both questionnaire and interviews) showed that only a minority of respondents were satisfied with their TQM programmes.	Mixed
Bryde & Robison	2007	UK	176 out of 1200	They showed there is the existence of a link between TQM and PM practices in some practices and no link in others.	Questionnaire
*Kumar *et al*.	2008	Canada	14	The study provides useful insights on performance measurement by the most recognised TQM adopters in Canada.	Interview
Jung et al	2009	USA	268 of 650	Analysis of the results revealed a strong influence of the TQM practice on PMP.	Questionnaire
Sadikoglu & Zehir	2010	Turkey	373 out of 500	The results of the study illustrated the importance of continued efforts toward implementing TQM practices in firms by revealing the positive impacts of effective TQM practices on innovation performance, employee performance and firm performance.	Questionnaire
Agus & Hassan	2011	Malaysia	169 was derived from the Federation of Malaysian Manufacturing Directory-FMM	The findings of this study advise that TQM would be able to shore up and put emphasis on production performance as well as to increase the level of customer related performance. TQM would no doubt improve the process of producing value added products.	Questionnaire
Talib *et al*.	2013	India	600 from four Indian services industry	The study found 12 TQM practices (top-management commitment, customer focus, continuous improvement and innovation, supplier management, employee involvement, information and analysis, process management, human resource management, strategic planning, employee encouragement, product and service design, and communication) to be partially influencing the company's quality performance.	Questionnaire

7.5 Analyse the inter-relationship between TQM principles and project performance practices for oil and gas industry related projects.

To analyse the interrelationship between TQM principles and PM Practices for oil and gas industry related projects, a Pearson's correlation analysis was done in this part of the study to test the bivariate relationship amongst the key variables and to verify the existence of multicollinearity problem. Another Pearson's correlation analysis was carried out to evaluate the bivariate relationship between the independent variables, TQM practices and the items of dependent variable, items of performance. The following sections will discuss the results and explain them thoroughly within the context of TQM practices and project management performance.

7.5.1 Relationship between the main variables

The correlation matrix in Table 6.28 showed correlation between 11 variables and a dependent variable. The following sections will examine and explain the results of analysis of figures which were represented in the correlation matrix (see Table 6.28), from the highest to the lowest, as well as the results of the interviews.

7.5.1.1 Process management practice

The matrix presented in Table 6-28, showed a significant positive relationship between “process management" and "overall project performance" (r=0.769, p<0.01). This result has been confirmed also by previous studies which emphasised that process management had a significant positive effect on performance in different sectors, in quality performance (Kaynak, 2003; Prajogo and Sohal, 2004, Ahire and Dreyfus, 2000; Feng *et al*., 2006; Talib *et al*. 2013), in operating performance (Fuentes *et al*. 2006; Flynn *et al*. 1995), in market and financial performance (Ahire and Dreyfus, 2000; Nair, 2006; Wilson and Collier, 2000), in employee performance (Anderson *et al*., 1995; Fuentes *et al*., 2006), in innovation performance (Prajogo and Sohal, 2004) and in aggregate firm performance (Cua *et* *al*., 2001; Nair, 2006). This hard TQM practice had the most positive significant relationship with overall project performance; that is due to the nature of the oil and gas sector which concentrated on practical approaches that lead to project performance.

7.5.1.2 Top management involved

The second highest significant positive relationship was between “top management involved" and "overall project performance" (r=0.754, p<0.01). All the interviewees from the three companies confirmed the importance of top management involvement on project performance. This met also with the results of previous studies that the top management involved had a positive significant on performance in different sectors, in quality performance (Kaynak, 2003; Prajogo and Sohal, 2004; Ahire and Dreyfus, 2000; Feng *et al*., 2006; Talib *et al*. 2013), in operating performance (Fuentes *et al*., 2006; Flynn *et al*., 1995), in market and financial performance (Ahire and Dreyfus, 2000; Nair, 2006; Wilson and Collier, 2000), in employee performance (Anderson *et al.*, 1995; Fuentes *et al.*, 2006), in innovation performance (Prajogo and Sohal, 2004) and in aggregate firm performance (Cua *et al*., 2001; Nair, 2006).
The survey results showed that:

- 96% of the respondents strongly agreed or agreed with the statement *"Top management involves major department heads/managers in determining long-term objectives"*.
- 92.4 % of the respondents strongly agreed or agreed with the statement *"Top management reviews its policies to ensure its adherence to the set objectives of the organisation"*.
- 96% of the respondents strongly agreed or agreed with the statement *"Top management uses performance indicators to ensure adequate performance/quality improvement"*.

- 87% of the respondents strongly agreed or agreed with the statement *"Top management provides necessary resources to fulfil overall organisation objectives"*, and
- 90% of the respondents strongly agreed or agreed with the statement *"Top management supports the use of procedures related to project management which have been developed by the quality department*."

These reflect the importance of top management involvement with the activities of the project to achieve maximum project performance. The study results that were met by previous research showed that this soft TQM practice had the second most positive relationship with the overall project performance.

7.5.1.3 Benchmarking

The third highest significant positive relationship was between “benchmarking" and "overall project performance" (r=0.750, p<0.01). In addition to that, the interview results confirmed that the benchmarking practice had a positive effect on project performance. The survey results also showed that 81% of the overall respondents agreed or strongly agreed. This reflects the significance of this hard TQM practice on project performance particularly. This met with the findings of previous studies, which revealed that motivation had a direct effect on performance, (Sit *et al*., 2009; Talib. *et al*., 2013).

7.5.1.4 Customer focus

The fourth significant positive relationship was between “customer focus" and "overall project performance" (r=0.740, p<0.01). Additionally, from their answers, the interviewees showed how the three companies were keen on the matter of customer focus, and all of them stressed that customer focus was an important practice in project activities that lead to good project performance and had a positive effect on project performance. Furthermore, the survey results also confirmed that 91% of the overall respondents strongly agreed or agreed. This indicates that all activities related to customer focus were very important to the project performance. The previous studies concluded that customer focus was important to the performance, in quality performance (Prajogo and Sohal, 2004; Feng *et al*., 2006), in operating performance (Fuentes *et al*. 2004 and 2006; Nair, 2006), in market and financial performance (Fuentes *et al*., 2004 and 2006; Nair, 2006), in employee performance (Fuentes *et al*., 2004 and 2006), in innovation performance (Prajogo and Sohal, 2004), production performance (Agus and Hassan, 2011) and in aggregate firm performance (Chong and Rundus, 2004; Nair, 2006).

7.5.1.5 Information management performance

The fifth significant positive relationship was between “Information management performance" and "overall project performance" (r=0.731, p<0.01). In addition to that, the survey results showed that respondents strongly agreed or agreed with 88% of the overall of items in information management performance construct. This indicates the strength of feeling and understanding of the project managers in the three companies regarding the significance of the information management performance TQM practice for achieving maximum project performance. Also, the previous studies arrived at the same result in quality performance (Choi and Eboch, 1998; Prajogo and Sohal, 2004, Ho *et al*., 2001; Quazi *et al*., 1998), in operating performance (Cua *et al*., 2001), in market and financial performance (Wilson and Collier, 2000), in innovation performance (Prajogo and Sohal, 2004) and in aggregate firm performance (Nair, 2006).

7.5.1.6 Project management process

The sixth significant positive relationship was between “project management process" and "overall project performance" (r=0.725, p<0.01). The survey results showed that 81% of the respondents strongly agreed or agreed with all the statements in project management construct. This points out that the project management process is very important for the project performance. Generally, the study results revealed that the project management process was crucial for achieving high project performance.

7.5.1.7 Supplier management

The seventh significant positive relationship was between “supplier management" and "overall project performance" (r=0.713, p<0.01). All the interviewees from the three companies emphasised the importance of supplier management for achieving high project performance. Also, the significance of the supplier management practice on performance has been approved by previous studies, in operating performance (Fuentes *et al*., 2006; Kynak, 2003; Nair, 2006), in market and financial performance (Fuentes *et al*., 2006), in employee performance (Anderson *et al.* 1995; Fuentes *et al*., 2006), and in aggregate firm performance (Cua *et al*., 2001; Nair, 2006). Consequently, this was supported by many interviewees and survey results as well.

7.5.1.8 KPI development

The eighth significant positive relationship was between "KPI development" and "overall project performance" (r=0.691, p<0.01). The interviews results as well as the survey results showed that the KPI development would increase the project performance and stressed its importance for accomplishing maximum project performance.

7.5.1.9 Information management process

The ninth significant positive relationship was between "information management performance" and "overall project performance" (r=0.690, p<0.01). The study results confirmed that the information management performance was very significant for project performance. In addition to that, the importance of the information management process practice on performance has been approved by previous studies, in quality performance (Choi and Eboch, 1998; Prajogo and Sohal, 2004; Ho *et al*., 2001; Quazi *et al*., 1998), in operating performance (Cua *et al*., 2001), in market and financial performance (Wilson and Collier, 2000), in innovation performance (Prajogo and Sohal, 2004) and in aggregate firm performance (Nair, 2006).

7.5.1.10 Training and development

The tenth significant positive relationship was between "training and development" and "overall project performance" (r=0.604, p<0.01). This is the weakest correlation so far. The survey study showed that the training and development practice was significant for project performance. Additionally, this met with the TQM literature review that showed a positive relationship or correlation between training and development practice and performance, in quality performance (Choi and Eboch, 1998; Prajogo and Sohal, 2004; Ho *et al*., 2001; Quazi *et al*., 1998), in operating performance (Cua *et al*., 2001), in market and financial performance (Wilson and Collier, 2000), in innovation performance (Prajogo and Sohal, 2004) and in aggregate firm performance (Nair, 2006).

7.5.1.11 Motivation system

The eleventh significant positive relationship was between "training and development" and "overall project performance" (r=0.604, p<0.01). This is the weakest correlation so far. The study results revealed that the motivation system practice was significant for project performance. In addition to that, this met with the TQM literature review that showed a positive relationship or correlation between motivation system practice and performance (Rowland, 2013; Chen and Chang, 2013; Goncharuk and Monat, 2009).

The results also point out that defendants had great levels of project performance. Out of 78 correlations, all correlation coefficients are greater than 0.20. The highest coefficient of correlation in this research, though, is 0.769, which is lower than the limit of 0.90 for the collinearity problem. Additionally, the correlation coefficients between the independent variables and dependent variable were lower than 0.90, signifying that the data was not affected by a collinearity problem (Hair *et al.*, 1998). From now, collinearity and multicollinearity do not make data problems in this study. The results more showed that the most significant TQM practice impacting on project performance was process management (i.e. with the top result of correlation of

0.769), which goes to show that, where process management was recognized as a central TQM practice, improvements in project performance levels were significant. In the same way, top management involved; benchmarking; customer focus; information management performance; project management process; supplier management; KPI development and information management process were also found to affect project performance as their scores were also high.

7.5.2 Relationship between independent variables and the items of dependent variable

Table 6.29 showed Pearson's correlation between the independent variables, TQM practices, and items of performance. The following sections will examine and explain the results of analysis of figures which were represented in the correlation matrix (see Table 6.29); this will be represented in three tables, highest correlation, medium correlation and low correlation.

7.5.2.1 Strong correlation between independent variables and the items of dependent variable

Table 7.2 below shows the highest correlation items of dependent variables, items of overall project performance and items of independent variables, TQM practices. Clearly, from the table it is evident that most items of the overall project performance are highly correlated with independent variables, TQM practices. This revealed that the TQM practices had a positive relationship with items of project performance, and will enhance project performance towards high project performance.

The highest Pearson's coefficients were between Item number two of dependent variable *"We are usually good at delivering projects within budget"* and all of independent TQM variables; they vary from the lowest (r = 0.522) to highest (r = 0.696). The independent TQM variables that make the companies good at delivering the projects within the project budget are the process management (r = 0.696), customer focus (r = 0.666), benchmarking (r = 0.645), KPIs developing (r = 0.626), information management performance (*r* = 0.616), top management commitment (*r* = 0.611), supplier management (*r* = 0.608), training and development (*r* = 0.588), motivation system (*r* = 0.588), information management process (*r* = 0.554) and the lowest was the project management process (*r* = 0.522). However, the hard TQM practice scored high values of Pearson's coefficient more than soft ones. This indicates that impact of hard TQM practices are more significance than the soft and the oil and gas companies were more aware of hard TQM practices, and that is due to the complicated nature of the projects, their impact on the environment and HSE consequences, and the sector itself and its value to the global energy market.

The second highest Pearson's coefficients were between Item number ten of dependent variable *"We usually employ an effective project management process"* and all of independent TQM variables; they vary from the lowest, motivation system (*r* = 0.514), to highest, top management commitment (r = 0.656). Also, the hard TQM practices had high values of Pearson's coefficients. The results revealed that most of the high ratios of Pearson's coefficients were between the hard TQM practices and Item number ten of dependent variable *"We usually employ an effective project management process"*. That indicates the positive impact of hard TQM practices on oil and gas projects were more than the soft ones.

Table: 7-2 Strong Correlation Matrix of independent variables and items of dependent variable

TQM practices		Elements of project performance					
		I1	I2	I5	I9	I10	I11
T1	Pearson Corr.	.522**	.522**	.554**	.587**	.611**	.595**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000
T2	Pearson Corr.	.530**	.611**	.450**	.533**	.656**	.641**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000
T3	Pearson Corr.	.649**	.645**	.573**	.523**	.544**	.613**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000
T4	Pearson Corr.	.504**	.626**	.452**	.483**	.636**	.554**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000
T5	Pearson Corr.	.539**	.588**	.423**	.297**	.514**	.436**
	Sig. (2tailed)	.000	.000	.000	.001	.000	.000
T6	Pearson Corr.	.539**	.588**	.423**	.279**	.514**	.436**
	Sig. (2tailed)	.000	.000	.000	.001	.000	.000
T7	Pearson Corr.	.564**	.666**	.579**	.494**	.573**	.571**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000
T8	Pearson Corr.	.596**	.608**	.492**	.434**	.608**	.512**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000
T9	Pearson Corr.	.610**	.696**	.556**	.555**	.621**	.607**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000
T10	Pearson Corr.	.569**	.554**	.579**	.527**	.608**	.564**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000
T11	Pearson Corr.	.619**	.616**	.519**	.481**	.561**	.595**
	Sig. (2tailed)	.000	.000	.000	.000	.000	.000

**** Correlation is significant at the 99% level (2-tailed)**

T1.: Project Management Process
T2: Top Management Commitment
T3: Benchmarking
T4 : KPI's Development
T5: Training and Development
T6: Motivation
T7: Customer Focus
T8: Supplier Management
T9: Process Management
T10. Information Management Process
T11: Information Management Performance
I1: Generally our projects meet their time objectives
I2: We are usually good at delivering projects within budget
I5: Project specifications are usually met by the time of handover
I9: End users are usually happy with the results from our projects
I10: We usually employ an effective project management process
I11: Overall, we are very successful at projects

The third highest Pearson's coefficients were between Item number ten of dependent variable *“Generally our projects meet their time objectives”* and all of independent TQM variables; they vary from the lowest, KPI development (*r* = 0.504) to highest, benchmarking (r = 0.649). From Table 7.2, it was obvious that the hard TQM practices had high ratios of Pearson coefficient more that the soft TQM practices. The time objective is one of the biggest challenges encountered by the project managers and companies as well; moreover, it is the most important factor in project performance. The results further showed that the most important TQM practice affecting this item of performance was benchmarking (i.e. with the highest score of correlation of 0.649), and then information management performance (*r*=0.619), process management (*r*=0.610), supplier management (*r*=0.596) and information management process (*r*=0.569); it was obvious that the top five practices were the hard TQM practices. In addition, the soft practices scored decent values as well: customer focus (*r*=0.564), training and development (*r*=0.539), motivation system (*r*=0.539) and top management commitment (*r*=0.530).

The fourth highest Pearson's coefficients were between Item number ten of dependent variable *“Overall, we are very successful at projects”* and all of independent TQM variables; they vary from the lowest, motivation system (*r* = 0.436) to highest, top management commitment (r = 0.641). Yet again, the results showed the hard TQM practices with high ratios of Pearson coefficients, except the top management practice (*r*=0.641), customer focus (*r*=0.571), training and development (*r*=0.436) and motivation system (*r*=0.436) are soft practices. This reflects the significance of hard TQM practices on project performance in the oil and gas sector was more important than soft TQM practices.

The other items of project performance which scored high correlation with TQM practices were *"End users are usually happy with the results from our projects", " Project specifications are usually met by the time of handover”," Our key stakeholders are usually happy with the way our projects are managed", " Generally* *customers of our projects are satisfied with the outcome"* and *"Our projects usually result in tangible benefits for the organisation"*.

Generally, the results of correlation between dependent variables, items of overall project performance and items of independent variables, TQM practices, showed most of the high scores were with hard TQM practices. Also, the soft TQM practices correlated with decent ratios likewise to the hard TQM practices.

7.5.2.2 Medium correlation between Independent variables and the items of dependent variable

Table 7.3 below shows the medium correlation between the independent variables, TQM practices and items of independent variables, PM Performance. According to Cohen (1988 and 1992), medium correlation starts from **0.3 to 0.5** of Pearson correlation coefficient **(*r*)**. It is apparent from the table that the independent variables, TQM practices, were correlated in a medium range with three elements of dependent variables, PM Performance. The nearest element of dependent variables to strong correlation was element number six, which is *“Our key stakeholders are usually happy with the way our projects are managed”*. Its values of Pearson correlation **(*r*)** vary from lowest (*r* = 0.480), project management process practice, to highest (*r* = 0.614), benchmarking practice; whereas the nearest item of dependent variables to weak correlation was item number four, which is *“Generally customers of our projects are satisfied with the outcome”*, and values of values of Pearson correlation **(*r*)** vary from lowest (*r* = 0.316) with training and development practice to highest (*r* = 0.500) with top management involvement.

Generally, from Table 7.3 the results revealed that the items of independent variables, TQM practices, were correlated positively with these three elements of dependent variables, PM Performance, and clearly had a significant impact on PM Performance in oil and gas related projects.

Table 7-3: Medium Correlation Matrix of independent variables and items of dependent variable

TQM practices		Elements of project performance		
		I3	I4	I6
T1	Pearson Corr.	.473**	.447**	.480**
	Sig. (2tailed)	.000	.000	.000
T2	Pearson Corr.	.549**	.500**	.524**
	Sig. (2tailed)	.000	.000	.000
T3	Pearson Corr.	.495**	.458**	.614**
	Sig. (2tailed)	.000	.000	.000
T4	Pearson Corr.	.413**	.468**	.466**
	Sig. (2tailed)	.000	.000	.000
T5	Pearson Corr.	.388**	.316**	.451**
	Sig. (2tailed)	.000	.000	.000
T6	Pearson Corr.	.388**	.316**	.451**
	Sig. (2tailed)	.000	.000	.000
T7	Pearson Corr.	.531**	.478**	.497**
	Sig. (2tailed)	.000	.000	.000
T8	Pearson Corr.	.371**	.418**	.544**
	Sig. (2tailed)	.000	.000	.000
T9	Pearson Corr.	.442**	.484**	.577**
	Sig. (2tailed)	.000	.000	.000
T10	Pearson Corr.	.404**	.389**	.496**
	Sig. (2tailed)	.000	.000	.000
T11	Pearson Corr.	.437**	.437**	.580**
	Sig. (2tailed)	.000	.000	.000

**** Correlation is significant at the 99% level (2-tailed)**

T1.: Project Management Process
T2: Top Management Commitment
T3: Benchmarking
T4 : KPI's Development
T5: Training and Development
T6: Motivation
T7: Customer Focus
T8: Supplier Management
T9: Process Management
T10. Information Management Process
T11: Information Management Performance
I3: Our projects usually result in tangible benefits for the organisation
I4: Generally customers of our projects are satisfied with the outcome
I6: Our key stakeholders are usually happy with the way our projects are managed

7.5.2.3 Weak correlation between Independent variables and the items of dependent variable

Table 7.4 below shows the lowest correlation items of dependent variables, items of overall project performance and items of independent variables, TQM practices. It is apparent from the table that the lowest two items of the overall project performance are reasonably correlated with independent variables, TQM practices.

Item number 7 *"Project team members are usually happy working on projects"* had reasonably correlated ratio with most TQM practices except training and development (r=0.173, p<0.05) and motivation system (r=0.173, p<0.05); both are below 0.2, and this indicates that both TQM practices had very little correlation with this item of performance. The practices that had little correlation (r<0.3) were information management performance (r=0.226, p<0.01), customer focus (r=0.243, p<0.01), KPI development (r=0.251, p<0.01), process management (r=0.262, p<0.01) benchmarking (r=0.280, p<0.01) and project management process (r=0.299, p<0.01). The practices that scored low correlation were top management commitment (r=0.319, p<0.01), supplier management (r=0.346, p<0.01) and information management performance (r=0.353, p<0.01).

Table 7-4: Weak Correlation Matrix of independent variables and items of dependent variable

TQM practices		Elements of project performance I7	Elements of project performance I8
T1	Pearson Corr.	.299**	.405**
	Sig. (2tailed)	.001	.000
T2	Pearson Corr.	.319**	.371**
	Sig. (2tailed)	.000	.000
T3	Pearson Corr.	.280**	.173*
	Sig. (2tailed)	.001	.048
T4	Pearson Corr.	.251**	.335**
	Sig. (2tailed)	.004	.000
T5	Pearson Corr.	.178*	.346**
	Sig. (2tailed)	.042	.000
T6	Pearson Corr.	.178*	.346**
	Sig. (2tailed)	.042	.000
T7	Pearson Corr.	.243**	.346**
	Sig. (2tailed)	.005	.000
T8	Pearson Corr.	.346**	.411**
	Sig. (2tailed)	.000	.000
T9	Pearson Corr.	.262**	.334**
	Sig. (2tailed)	.000	.000
T10	Pearson Corr.	.226**	.218**
	Sig. (2tailed)	.000	.000
T11	Pearson Corr.	.353**	.252**
	Sig. (2tailed)	.000	.000

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

T2.: Project Management Process   T3: Top Management Commitment   T4: Benchmarking   T5 : KPI's Development   T6: Training and Development
T7: Motivation   T8: Customer Focus   T9: Supplier Management   T10: Process Management   T11. Information Management Process
T12: Information Management Performance

I7: Project team members are usually happy working on projects

I8 There are often clearly identified intangible benefits from the projects we carry out

The second lowest ratio scored between item number eight *"There are often clearly identified intangible benefits from the projects we carry out"* of dependent variable and independent variables, TQM practices. The very low correlation was between item eight and benchmarking (r=0.173, p<0.05). The practices that scored low correlation with this item of performance were information management process (r=0.218, p<0.01) and information management performance (r=0.252, p<0.01). The low correlated practices with items of performance were project management process (r=0.334, p<0.01), KPI development (r=0.335, p<0.01), training and development (r=0.346, p<0.01), motivation system (r=0.346, p<0.01), customer focus (r=0.346, p<0.01), top management commitment (r=0.371, p<0.01), project management process (r=0.405, p<0.01) and supplier management (r=0.411, p<0.01).

Generally, even with little and low correlation between the items on performance, dependent variable and TQM practices, independent variables, still the TQM practices had a positive relationship with items of project performance, and will enhance project performance towards high project performance. Also, the TQM literature review stressed a significant relationship between TQM practices and different forms of performance, which revealed that process management had a direct effect on performance, in quality performance (Kaynak, 2003; Prajogo and Sohal, 2004, Ahire and Dreyfus, 2000; Feng *et al*., 2006, Talib *et al*. 2013), in operating performance (Fuentes *et al*., 2006; Flynn *et al*., 1995), in market and financial performance (Ahire and Dreyfus, 2000; Nair, 2006; Wilson and Collier, 2000), in employee performance (Anderson *et al*., 1995; Fuentes *et al*., 2006), in innovation performance (Prajogo and Sohal, 2004) and in aggregate firm performance (Cua *et al*., 2001; Nair, 2006). Moreover, all interviewees from the three companies emphasised the positive relationship between the TQM practices and project performance.

7.6 Model and propose predictive value of TQM principles that could be used to enhance PM Performance in the Libyan oil and gas sector.

The results of the multiple regression analysis revealed seven models (i.e. shown in Table 6.30) that predict values of TQM practices to project management performance in oil and gas sector related projects. The following sections will discuss each model separately.

7.6.1 Model – One

Model one consists of one independent variable, TQM practices, which is process management. The results showed that this practice represents 59.2% (R^2=0.952) of variance of the dependent variable, PM Performance. This result met with previous studies that concluded the positive relationship and direct impact on performance, in quality performance (Kaynak, 2003; Prajogo and Sohal, 2004, Ahire and Dreyfus, 2000; Feng *et al*., 2006), in operating performance (Fuentes *et al*., 2006; Flynn *et al*., 1995), in market and financial performance (Ahire and Dreyfus, 2000; Nair, 2006; Wilson and Collier, 2000), in employee performance (Anderson *et al.*, 1995; Fuentes *et al*., 2006), in innovation performance (Prajogo and Sohal, 2004) and in aggregate firm performance (Cua *et al*., 2001; Nair, 2006).

7.6.2 Model – Two

Model two consists of two independent variables, TQM practices, which are process management and benchmarking. The results revealed that these two independent variables, TQM practices represent 67.8% (R^2=0.678) of variance of the dependent variable, PM Performance. These two TQM practices are classified as hard TQM practices. The impact of benchmarking on performance met with the results of the finding of previous studies, which revealed that benchmarking had a direct effect on quality performance in the services sector (Yusuf *et al*., 2007; Talib. *et al*., 2013).

7.6.3 Model – Three

Model three consists of three independent variables, TQM practices, which are process management, benchmarking and supplier management. The results showed that these three independent variables, TQM practices, together explain 72.6% (R^2=0.72.6) variance of the dependent variable, PM Performance. The third practice, supplier management, also found in previous papers, had a positive impact on different forms of performance, in operating performance (Fuentes *et al*., 2006; Kynak, 2003; Nair, 2006), in market and financial performance (Fuentes *et al.*, 2006), in employee performance (Anderson *et al*., 1995; Fuentes *et al*., 2006), and in aggregate firm performance (Cua *et al*., 2001; Nair, 2006), and this was supported by many interviewees as well.

7.6.4 Model – Four

Model four consists of four independent variables, TQM practices, which are process management, benchmarking, supplier management and top management involved. The results revealed that these four independent variables, TQM practices, together explain 75.5% (R^2=0.75.5) variance of the dependent variable, PM Performance. Moreover, the top management involved practice, which was described as a driving force for TQM, found in previous studies had a significant positive impact on different forms of performance, in operating performance (Kannan and Tan, 2005; Adam *et al.*, 1997; Ahire and O'Shaughnessy, 1998; Nair, 2006; Cua *et al*., 2000), in operating performance (Ahire and Dreyfus, 2000; Funtes *et al*., 2006), in marketing and financial performance (Nair, 2006; Sanchez-Rodriguez and Martinze-Lorente, 2004; Adam *et al*. 1997; Kannan and Tan, 2005; Funtes *et al*., 2006; Kynak, 2003), in employee performance (Flynn *et al*., 1995; Rungtusantham *et al*., 1998; Funtes *et al*., 2006), in innovation performance (Prajogo and Sohal, 2004; Feng *et al*., 2006), in project performance (Shieh and Wu, 2002) and in aggregate performance (Powell, 1995; Cua *et al.*, 2001). Furthermore, the top management involved was strongly stressed by all interviewees in the three companies.

7.6.5 Model – Five

The fifth model consists of five independent variables, TQM practices, which are process management, benchmarking, supplier management, top management involved and information management performance. The results showed, that these five independent variables, TQM practices, jointly explain 76.7% (R^2=0.76.7) variance of the dependent variable, PM Performance. The importance of information management performance was also found by previous studies to have a direct effect on performance, in quality performance (Choi and Eboch, 1998; Prajogo and Sohal, 2004, Ho *et al*., 2001; Quazi *et al*., 1998), in operating performance (Cua *et al*., 2001), in market and financial performance (Wilson and Collier, 2000), in innovation performance (Prajogo and Sohal, 2004) and in aggregate firm performance (Nair, 2006).

7.6.6 Model – Six

The sixth model consists of six independent variables, TQM practices, which are process management, benchmarking, supplier management, top management involved, information management performance and customer focus. The results revealed that these six independent variables, TQM practices, equally explain 77.6% (R^2=0.77.6) variance of the dependent variable, PM Performance. This model scored the highest ratio to be the best predictive model value of TQM practices. The practice of customer focus was also in previous studies that found that the customer focus had a positive impact on performance, in quality performance (Prajogo and Sohal, 2004; Ahire and O'Shaughnessy, 1998; Nair, 2006; Grandzol and Gershon, 1997; Feng *et al*., 2006) in operating performance (Fuentes *et al*., 2004 and 2006; Nair, 2006; Cua *et al*., 2001; Flynn *et al*., 1995), in market and financial performance (Fuentes *et al*., 2004 and 2006; Nair, 2006), in employee performance (Fuentes *et al*., 2004 and 2006), in innovation performance (Prajogo and Sohal, 2004), production performance (Agus and Hassan, 2011) and in aggregate firm performance (Chong and Rundus, 2004; Nair, 2006).

7.6.7 Model – Seven

The seventh model consists of five independent variables, TQM practices, which are benchmarking, supplier management, top management involved, information management performance and customer focus. The results revealed, that these five independent variables, TQM practices equally explain 77.3% (R^2=0.773) variance of the dependent variable, PM Performance. This model scored the second best value of TQM practices to project management performance in oil and gas industry related projects.

From the above discussion, it was clear that all independent variables, TQM practices, had a significant impact on project management performance in oil and gas industry related projects. The impact varied from one practice to another, as was discussed above about the results of regression analysis for finding the best predictive model value of TQM principles to project management performance in the oil and gas sector. The results revealed that the list of model from best to worst is as follows:

- Model six (R^2=0.776), which consists of six TQM practices, process management, benchmarking, supplier management, top management involved, information management performance and customer focus.
- Model seven (R^2=0.773), which consists of five TQM practices, benchmarking, supplier management, top management involved, information management performance and customer focus.
- Model five (R^2=0.767), which consists of five TQM practices, process management, benchmarking, supplier management, top management involved and information management performance.

- Model four (R^2=0.755), which consists of four TQM practices, process management, benchmarking, supplier management and top management involved.
- Model three (R^2=0.726), which consists of three TQM practices, process management, benchmarking and supplier management.
- Model two (R^2=0.678), which consists of two TQM practices, process management and benchmarking.
- Model one (R^2=0.592), which consists of only one TQM practice, process management.

Obviously, the hard TQM practices, four out of six practices revealed by the results, had more impact on project management performance in oil and gas industry related projects than the soft ones. The reason for that was the nature of the oil and gas industry, which is complicated; it is the main source of global energy; and its relation with the environment, which means it has to adhere strictly to environmental regulations. The soft practices that had a significant impact are top management involvement, which is considered to be the driving force behind the implementation of TQM and the dynamo of it. The other soft practice was customer focus; the most important ambition of all organisations in any service or industry is to satisfy their customers.

Figure 7.2 below shows the results of testing hypotheses, which clearly identify the strength of correlation between the independent variables TQM practices, and dependent variable PM performance. The highest correlation was between independent variables TQM practices and six items of dependent variable, PM Performance, which are: item one (generally our projects meet their time objectives), item two (we are usually good at delivering projects within budget), item five (project specifications are usually met by the time of handover), item nine (end users are usually happy with the results from our projects), item ten (we usually employ an effective project management process) and item eleven (overall, we are very successful at projects).

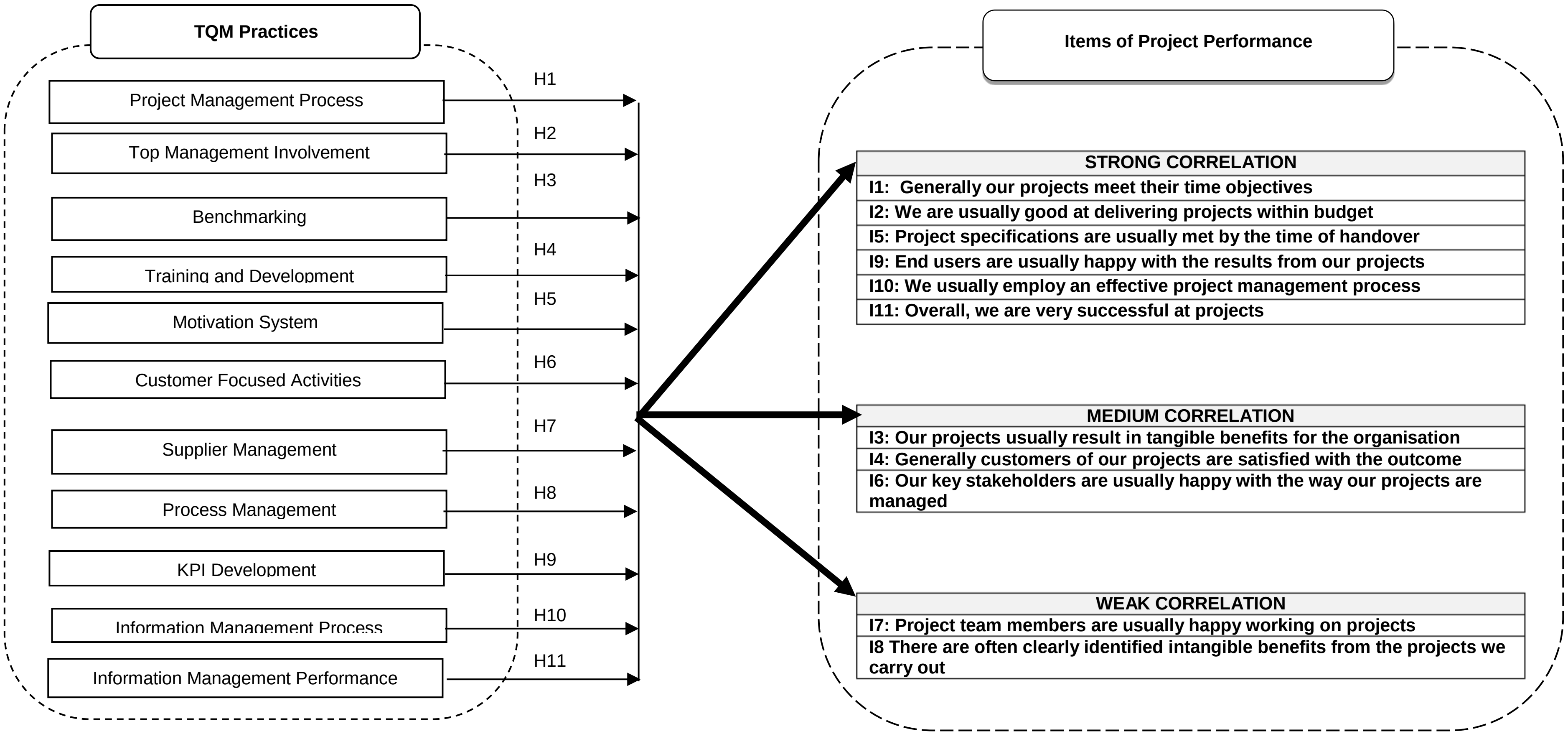

Figure 7.2: correlation between TQM practices and items of project performance

The results of the correlation matrix between the independent variables, TQM practices and dependent variables, PM Performance (see Table 6.29) revealed that Pearson correlation values **(*r*)** were above **0.5**, and ranged from **0.514 to 0.656**. According to Cohen (1988 and 1992) these values are classified in the category of strong correlation, which means that the TQM practices have a significant impact on these items of PM Performance.

Additionally, the results correlation matrix shown in Table 6.29 revealed that the independent variables of TQM practices correlated in a medium range according to Cohen (1988 and 1992) with three items of dependent variables, which are: item three (our projects usually result in tangible benefits for the organisation), item four (generally customers of our projects are satisfied with the outcome) and item six (our key stakeholders are usually happy with the way our projects are managed). The values of Pearson correlation **(*r*)** ranged from **0.316 to 0.580**. These indicate that TQM practices also correlated positively with these items and have an impact on PM Performance.

The last two items of dependent variables, PM Performance, correlated weakly with independent variables, TQM practices. These items were: item seven (project team members are usually happy working on projects) and item eight (there are often clearly identified intangible benefits from the projects we carry out). According to Cohen (1988 and 1992), the weakest correlations have a value of Pearson **(*r*)** ranging from **0.1 to 0**. The results of correlation matrix which are shown in Table 6.29 revealed that these two items correlated weakly with values of **(*r*)** ranged from **0.178 to 0.411.** Although the values of Pearson correlation are considerably low, still the independent variables, TQM practices, have a positive correlation with these two items of dependent variables, PM Performance, and have reasonable impact on PM Performance.

Clearly, the results of the correlation matrix between independent variables, TQM practices and dependent variables (see Table 6.29 and Figure 7.2) revealed that TQM practices are correlated positively with items of PM performance and have a significant impact on PM Performance. Therefore, *H1, H2, H3, H4, H5, H6, H7, H8, H9, H10 and H11* were supported. However, these practices have provided long term (strategic), operational, and tactical (supportive) as well as infrastructural benefits necessary for the continuous improvement in the relationship with PM performance in oil and gas related projects.

7.7 Summary

This chapter has discussed the findings from both the qualitative and quantitative aspects of this research and has linked findings to previous studies which were presented in Chapter three.

The first part of this chapter has presented the main findings regarding the definitions and models of project management performance. The discussion stressed that the project management performance was not measured only in time, cost and quality, which are known as the "iron triangle", but was a multifaceted concept, and that met the results of previous studies mentioned above in the discussion.

The second part of this research has discussed the second objective of the study, which was establishing the current definitions and models of TQM practices in the project context. The discussion presented the findings of the interviews and the opinion of the project managers as well as the results of the questionnaire, which confirmed that TQM practices were important, especially the hard TQM practices, to the project management performance. The interview findings and results were linked and met with previous studies.

The third part of this chapter has introduced a table to identify the methodological norms of this research. The literature review showed that the methodological norms are survey and questionnaires.

The fourth part of this chapter, which analysed the interrelationship between TQM principles and PM Practices for oil and gas industry related projects, has been discussed in two parts: the first part has the correlation between the independent variables, TQM practices and dependent variables, project management performance throughout Pearson's correlation analysis. The analysis showed that the TQM practices were correlated positively with project management performance. The second part of this section was to analyse the correlation between TQM practices, the independent variables and the item of dependent variables, project management performance. The results presented in most of the project management performance items had high correlation; only two items had little correlation.

The fifth section of this chapter introduced the results of the regression analysis which ended up with the best predictive models of TQM principles to project management performance in oil and gas industry related projects. The results showed a model with more hard TQM practices than soft one.

The next chapter (eight) will summarise the whole thesis and present limitations, opportunities for future work, recommendations and contribution to knowledge that this study has made.

CHAPTER EIGHT

8 Conclusion and recommendations

8.1 Introduction

This study is for Appraising Project Management Performance and Total Quality Management (TQM) Practices in the Libyan oil and gas sector. The process through which the study was established was in eight chapters. Chapter one provided the introduction, overview about the study and summary of the research. Chapters two and three were devoted to the history of the oil and gas industry, review of the energy sector in Libya, oil and gas in Libya, the Libyan economy and the impact of the energy sector on it, and the whole thing related to the development that mainly depends on the national income of the Libyan state (i.e. from the oil and gas sector), and review of the related literature. Chapter four considered the research design and methodology that has been used. Chapter five considered and presented the findings of 12 interviews carried out with professionals in the sector of oil and gas. Chapter six discussed the responses to one hundred and thirty-one questionnaires. Chapter seven dealt with the interpretation and discussion findings of the analysis (i.e. Qualitative and Quantitative analysis). Lastly, this chapter, eight, draws the Thesis conclusion.

This chapter concerns with the thesis conclusions and recommendations for further research in the context of project management performance. The chapter discusses the achievement of the research objectives in order to highlight the contributions of the research and presents the main limitations of the study. The chapter concludes with recommendations for further research that can be conducted, based on the conclusion and limitations of the study.

8.2 Achievements of research objectives

The main aim of this research is to explore the relationship between PM performance and TQM techniques in the Oil and Gas industry. In order to achieve the aim of the research, research objectives were developed in Chapter one. Table 8.1 below summarises the methods used to accomplish the objectives of thesis.

Table 8-1: Methods used to achieve the research objectives

	Objective details	Method of achievement	Chapter
1	Review current definitions and models of project performance in relation to theory and practice.	Literature review of previous research and results of 12 semi-structured interviews.	**3** **5**
2	Examine current definitions and models of TQM in a project context.	Literature review of previous research and results of 12 semi-structured interviews.	**3** **5**
3	To identify methodological norms in this research and propose a way forward.	Literature review of previous research, presented in Table 7.1	**3**
4	To analyse the interrelationship between TQM principles and PM Practices for oil and gas industry related projects	Results of 12 semi-structured interviews. Correlation analysis between the independent variables, TQM practices, and dependent variable, PM Performance. Correlation analysis between the independent variables, TQM practices, and dependent variable, items of PM Performance.	**5** **6** **6**
5	To model and propose predictive value of total quality management principles that could be used to enhance project management performance in the Libyan oil and gas sector.	Results of regression analysis by using multiple regression analysis	**6**

8.2.1 Meeting the objectives

The literature review recommended that TQM can help an organisation to achieve maximum PM performance. The findings regarding the impact of TQM specifically on project management performance support the propositions that there is a positive effect of TQM on PM performance as per Jung *et al.* (2009) and Kumar *et al.* (2008). The first objective of this research was to review current definitions and models of project performance in relation to theory and practice. The findings of this research, from the literature review, 12 semi-structured interviews and questionnaire respondents, stressed that the project performance in oil and gas industry related projects is not measured in time, cost and quality only, but is a multifaceted concept that includes the iron triangle of cost, time and quality plus HSE and manpower. That was due to the nature of the projects, industry sector, and the respondents. This conclusion met with previous studies that confirmed the multi-faceted concept of project performance, as per various authors (Belout and Gauvreau, 2004; Bryde and Brown, 2005; Bekker and Steyn, 2008; Chan and Chan, 2004; Das and Ngacho 2014; Low and Chuan, 2006; Milosevic and Patanakul, 2005; and Toor and Ogunlana 2009).

From the above, it is clear that this objective has been met and the study has contributed to the oil and gas industry that the project management performance should be measured with the iron triangle (i.e. time, cost and quality) and HSE plus the other factors mentioned above and is dependent on where the activity of the project is being carried out.

In response to research question one, "*What are the current definition and models of P M Performance?"*, the findings presented that the project performance is measured by the iron triangle, HSE and other factors depending on the situation of the project and type of company activity.

The second objective was to examine current definitions and models of TQM in a project context. In response to this question, the research indicated a number of TQM practices have been defined and developed from the literature that will have a positive outcome on the project management performance, and became a theoretical framework of the relationship between TQM practices and project performance. The practices are top management involvement, project management process, benchmarking, defining and development of KPIs, training, motivation, and customer focus and supplier management. The interviewees stressed the significance of these practices on project management performance. From the interview analysis, the conceptual framework has been developed to become the nine above-mentioned practices plus process management, information management process and information management performance. These practices were also important to the project management performance and would have a positive impact on performance.

In response to research question two, “*What are the current definition and models of TQM in a project context?"*, the findings indicated that the current definition and models of TQM in a project context are 11 TQM practices (top management involvement, project management process, benchmarking, defining and development of KPIs, training, motivation, customer focus supplier management, process management, information management process and information management performance) to be influencing the project management performance.

The third objective was to identify methodological norms in this research and propose away forward. In response to this research question, the methodological norms are survey and questionnaires, defining TQM as a management philosophy that assists managing organisations and companies to develop their overall efficiency and performance to attaining first-rate rank. This study Results showed that the nature of project management needs continuous research and investigation, and that is due to the nature of the sectors, where project management practices vary from one to the other. Amaratunga *et al*. (2002) recommended a mixed methodology for Built Environment research as a mixed method has some advantages to enhance the quality of the research in this area. Accordingly, the proposed format for research in this area is mixed between interviews between the questionnaires (i.e. qualitative and quantitative).

The fourth objective was to analyse the interrelationship between TQM principles and PM Practices for oil and gas industry related projects. In response to this research question, the study found that the 11 TQM practices had a positive relationship with project management performance, and the findings presented empirical evidence that TQM practices have a significant and positive association with project performance. Likewise, the findings revealed that TQM practices correlated positively with the items of project performance and the study provided empirical evidence of that. Furthermore, the study provided a useful framework for evaluation of TQM implementation in project management in the Libyan oil and gas sector companies, as measured by the survey tool, and recognised 11 TQM practices to be useful for implementation.

The fifth objective was to model and propose the predictive value of TQM principles that could be used to enhance project management performance in the Libyan oil and gas sector. In response to this question, the study findings indicated seven predictive models, shown in Table 6.31, and the coefficients in Table 6.32. The lowest ***R*** value was for model one (i.e. ***R= 0.769***), whereas the highest was for model six (i.e. ***R= 0.881***). All seven models were reasonable to use to enhance the project management performance in the Libyan oil and gas industry, but the proposed model is number six, which achieved the highest ***R*** value, as shown in Table 6.31, which contains six TQM practices: process management, benchmarking, supplier management, top management involved, information management performance and customer focus. Therefore, the results of the research reported six practices of TQM that have more significantly predictive value to project management performance and provide evidence of the positive impact of TQM on project management performance. Four of these six practices are classified as hard TQM practices, which are process management, benchmarking, supplier management and information management performance; whereas the other two TQM practices, which are top management involved and customer focus, are classified as soft practices. This concluded that the hard TQM practices will have more impact on project management performance than the soft ones. This research provided the impact of TQM on project management performance in both qualitative and quantitative terms.

8.3 Contribution to knowledge

Overall, the main achievements of this study in terms of contribution to knowledge fall into two categories, which are theory and industry.

8.3.1 Contribution to theory

- The literature review revealed that very little research has been carried out in project management performance in the oil and gas industry and the relationship between TQM practices and project management performance. The research used qualitative and quantitative methods to make sure that '*triangulation*' takes place in order to have a clear image of how TQM practices had a relationship with project management performance, and the utilisation of TQM practices could potentially impact on project management performance in the Libyan oil and gas sector. Therefore, this study has deepened the understanding of project management performance and adds a broader dimension to current oil and gas project management literature by identifying the TQM practices that have a significant impact on project management performance. The research stressed the relationship between TQM practices and project management performance and underlined the importance of TQM practices in achieving maximum project performance in oil and gas industry related projects. This research contributed to the body of knowledge by identifying various TQM practices related to oil and gas industry projects which influence project performance improvement.

- This research highlighted the issues affecting the project management performance of the oil and gas industry related projects in terms of the use of TQM practices. This research provided a valuable insight into project management performance in the oil and gas industry in the light of lack of publications in this field. This research explored the adaptability of TQM practices in the context of project management as a novel implement in contrast with the traditional measurement system of the project performance. In addition, the research explored the current project management performance to address the issues affecting the performance under-achievement. Consequently, regardless of the old approach of a measurement system for project management performance, performance was still unsatisfactory. This provided a justification for conducting this study to build up a framework for improving the project management performance of the oil and gas industry related projects.

- A further contribution was provided through analysis of semi-structured interviews held with 12 project managers who are involved in management of projects in the three oil and gas companies. The investigation explored the TQM practices that would enhance project management performance in the Libyan oil and gas sector. Also, the investigation identified TQM practices to become 11 practices that would improve project management performance.

- The study proposed a useful framework for evaluation of TQM implementation in project management as measured by survey instrument and identified 11 TQM practices for its successful implementation.

- To the best of my knowledge, this is the first study undertaken within oil and gas industry companies to examine the relationship between project management performance and TQM practices. Consequently, the findings of this research provide valuable knowledge in TQM from the oil and gas sector perspective. Furthermore, the findings can help academics, professionals, project managers and companies that would like to support and promote TQM in the oil and gas industry.

- The research has made an important contribution to my personal development. I have become gradually more critical towards a number of management approaches, many of which are directly associated with TQM. I now think with a more open mind of the possibilities needed to reach the target using different approaches and diversity. This personal development will make it easier for me to provide a good input in the future to help in spreading the TQM concept in the oil and gas sector in Libya with the aim of improving my country's competency.

8.3.2 Contributions to industry and practice

- This study presumes that superior project performance in implementation of TQM practices necessitates Libyan oil and gas sector company's focus on process management, benchmarking, supplier management, top management involvement, information management performance and customer focus.

- One of the key issues that this study sought to address was to explore how the Libyan oil and gas industry related project performance can be improved. Consequently, the study findings provided a framework and predicted models measured by instrument and identified 11 TQM practices with a positive relationship to project performance and seven models that would predict best values of project performance.

- The research findings proved that hard TQM practices are more valuable to project management performance than soft TQM practices in Libyan oil and gas industry related projects.

- The remaining TQM practices which are indirectly related to the project performance are providers of long-term (strategic), operational and tactical (supportive) as well as infrastructural benefits necessary for the continuous improvement over time; however, with a less significant relationship with project performance. The findings of the study support the argument that the TQM practices must be implemented holistically rather than on a progressive basis to acquire the full potential of recognised TQM practices.

- The finding of the research serves as a valuable guide for both researchers and project managers to review their TQM programmes and accomplish them on a priority basis, so as to smooth the progress of project performance within the Libyan oil and gas sector companies.

8.4 Limitations of the study

It is expected that the study contributes to the knowledge of implementing TQM practices in the Libyan oil and gas sector related projects. As any other research studies, this thesis has a number of limitations, which are mainly related to the breadth of the topic under investigation. Since the second phase of this study was empirical research, this research also was subject to limitations of time, access to information, scope of generality, and other resources. For this reason it is necessary to take into account these limitations, which are discussed in detail in the sub-sections below:

- TQM in project management activity is an area of research where theory is still insufficient. This allows for the choice to follow the investigative approach in this research. This is mainly the case as the researcher pursues to get a holistic and integrative understanding of the relationship between TQM and project management performance, a feature which requires expansion of the scope of the study in reviewing a large body of related literature and gathering an enormous set of suitable data. Nevertheless, whereas the researcher has tried to meet such requirements by studying several bodies of literature, and looking for dissimilar types of data from both semi-structured interviews and survey respondent sources, it is not possible to declare that the results of the examination of this research has dealt with all of the issues related to this perception, however, those subjects were dealt with in the literature. Time frame and limited access to organisational and companies information were the key constraints.

- Although there have been a number of publications in relation to project performance and project success, few have been written mainly about oil and gas industry related projects and there is limited information on this topic.
- The number of semi-structured interviews and number of survey respondents for generating transferability of the findings. Twelve semi-structured interviews and 131 survey respondents are not enough to declare a generalisability of the findings.
- The study was limited to the downstream section in the oil and gas industry due to availability of contacts in the companies that facilitated carrying out and holding the interviews as well as collecting survey questionnaires.
- The study was limited to three companies of the downstream section in the oil and gas industry.
- The identification of TQM practices was limited to those touching the enhancement of the Libyan oil and gas sector project performance; consequently, the findings are contextual and cannot apply to other industry as a whole.

8.5 Recommendations for further research

Based on the limitations of this study in section 8.3 above, some of the key relevant issues that need further research are suggested below.

1. The oil and gas sector is a huge industrial sector and a very rich environment for research. At the same time, the nature of this sector is industrial and operational; this requires more research to be done to explore the impact of TQM practices on all fields of performance.
2. Further research is required to assess the impact of TQM practices in the projects of operations and maintenance departments in the owner companies,

due to the huge size of the projects they carry out as well as their significance to the industry.

3. This research identified a number of TQM practices, based on the literature review of the researcher and the semi-structured interviews results, that would improve project management performance in the Libyan oil and gas industry, but further research is required to examine more TQM practices in order to obtain a wider and deeper view about the impact of TQM practices on project management performance.

4. The upstream section is also an area that utilises project management to achieve its goals. As the nature of this oil and gas section is completely different from the downstream, further research is required in this section to examine the TQM practices that would impact on their project performance.

5. This research was conducted to appraise project performance and TQM practices in the downstream section of the Libyan oil and gas sector. As the projects in the oil and gas industry involve on-shore projects and offshore projects, further research is required to examine the TQM practices in each field and compare the two results.

6. This research has introduced a framework; however, this framework has not been validated or tested. According to Eishenhardt (1989), the quality of the framework could have been increased through validating it with five case studies or with five focus group sessions (Bryman, 2012). Accordingly, case studies are required to validate the framework.

8.6 Conclusion

This chapter has started with a discussion on meeting the five objectives of the research according to the method selected to achieve them. Brief explanations accompanied this discussion and concluded each objective.

Following this, the research has detailed the main contribution to knowledge emerging as a result of this study. The contributions were discussed in two categories. First, in relation to theory, the researcher highlighted a number of points that related to PM performance and TQM practices that will benefit both branches of management science. This allowed the research to be positioned within the project management as well as TQM theories. Also, contribution to the industry and practices has been discussed and the researcher highlighted some practical points that will have an impact on oil and gas related projects.

The limitations of the research finding to management practices were pointed out. As with any study, some limitations always exit and these were discussed and, where possible, justified.

Then the chapter, finally, turned to discussion of the recommendations for further research. A clear agenda has appeared out of this research, and been suggested for future studies, and this was discussed in the final section.

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Frequently Asked Questions About ISO 9000

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APPENDICES

Appendix 1 - Participant Information Sheet

LIVERPOOL JOHN MOORES UNIVERSITY

PARTICIPANT INFORMATION SHEET

Appraising Project performance and Total Quality Management (TQM) practices in the Libyan oil and gas sector.

Khalil Sawalim, Liverpool Business School, Faculty of Business and Law, Liverpool John Moores University

You are being invited to take part in a research study through completing the attached questionnaire. Before you decide it is important that you understand why the research is being done and what it involves. Please take time to read the following information. Please contact me if there is anything that is not clear or if you would like more information and please take time to decide if you want to take part in the survey or not.

Many oil and gas companies are intend to increase its project performance, with the aim of using the Total Quality Management (TQM) techniques to help improve their performance. As yet, though, there has been little research undertaken into the use of TQM in oil and gas companies. Therefore, as part of my PhD studies, I am researching the role of TQM in the oil and gas companies. I am specifically interested in understanding how staff working in oil and gas companies perceives TQM, which is the purpose of the questionnaire enclosed. By undertaking the research it is hoped that a better understanding of how TQM can be effectively utilised in the oil and gas companies will be achieved, which will be of benefit to staff working in the sector.

The research will last 5 years, from 2008 – 2015, and will take the form of interviews with staff in different oil and gas companies and a wider staff survey, in the form of a questionnaire. The questionnaire which you are now being asked to complete should take no more than 30 minutes of your time. All data will be treated as confidential and no information that would enable identification of individuals will be published. Participation in the research is voluntary and it is up to you to decide whether or not to take part. You are free to withdraw at any time and without giving a reason. If you do so, all data collected from you will be destroyed.

Liverpool Business School, Liverpool John Moores University would like to thank you for agreeing to take part in this research.

Khalil Sawalim
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Appendix 2 – Consent Form

LIVERPOOL JOHN MOORES UNIVERSITY

CONSENT FORM

Appraising Project performance and Total Quality Management (TQM) practices in the Libyan oil and gas sector.

Khalil Sawalim, Liverpool Business School, Faculty of Business and Law

1. I confirm that I have read and understand the information provided for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and that this will not affect my legal rights. ☐
3. I understand that any personal information collected during the study will be anonymised and remain confidential ☐
4. I agree to take part in the above study ☐

Name of Participant	Date	Signature
______________________	__________	____________________
Name of Researcher	Date	Signature
______________________	__________	____________________
Name of Person taking consent *(if different from researcher)*	Date	Signature
______________________	__________	____________________

Note: When completed 1 copy for participant and 1 copy for researcher

Appendix 3 - Research Briefing (EC6) Sheet

LIVERPOOL JOHN MOORES UNIVERSITY

RESEARCH BRIEFING (EC6) SHEET

Title of the Study:

Appraising Project performance and Total Quality Management (TQM) practices in the Libyan oil and gas sector.

Thank you for considering participating in my research study. Please keep this information sheet for your later reference if you wish to contact me again with any concerns, questions or further information on the outcomes of the research process.

Again I would like to reiterate that any participant in the research process has the right to withdraw from the study at any time without prejudice to access of services which are already being provided or may subsequently be provided to the participant.

Researchers Name: **Khalil Sawalim**

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or

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Appendix 4- Semi-Structured Interview List of Questions

LIVERPOOL JOHN MOORES UNIVERSITY

Semi-Structured Interview

List of Questions

1. How does the top management perform in project environments?
2. How do you define project performance?
3. Can you tell me how TQM practices influence project performance?
4. How does your organisation deal with customer demands and complaints?
5. How does your organisation measure the performance of the projects?
6. Does your organisation identify any performance indicator?
7. How are staff trained and developed to be able to perform effectively in project environments?
8. What kind of motivation system is applied in your organisation to improve the quality of project performance?
9. How do you ensure the quality of goods/ services from your suppliers?
10. Has your organisation undertaken a project to install a formal quality management system in your organisation?

Not planned ○	in preparation ○	already ○

If you have a system in place, how does it influence project performance?

11. Which quality-related approaches, tools and techniques has your organisation implemented?

- ☐ TQM
- ☐ ISO- series
- ☐ Six sigma
- ☐ Reengineering
- ☐ Benchmarking
- ☐ National Quality Award

☐ 5S Programme

☐ Other (Specify)

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

12. What are the reasons for implementing the quality programme?

Appendix 5- Questionnaire

Appraising Project performance and Total Quality Management (TQM) practices in the Libyan oil and gas sector.

You are being invited to take part in a research study which I am undertaking as part of a PhD programme at Liverpool Business School, Liverpool John Moores University through completing the attached questionnaire. Before you decide it is important that you understand why the research is being done and what it involves. Please take time to read the following information. Please contact me if there is anything that is not clear or if you would like more information and please take time to decide if you want to take part in the survey or not.

Many oil and gas companies are seeking to increase project performance by using Total Quality Management (TQM) techniques. As yet, though, there has been little research undertaken into the use of TQM in oil and gas companies. Therefore, as part of my PhD studies, I am researching the role of TQM in the oil and gas sector. I am specifically interested in understanding how staff working in oil and gas companies perceives TQM, which is the purpose of the questionnaire enclosed. By undertaking the research it is hoped that a better understanding of how TQM can be effectively utilised in the oil and gas companies will be achieved, which will be of benefit to staff working in the sector.

The questionnaire which you are now being asked to complete should take no more than 30 minutes of your time. All data will be treated as confidential and no information that would enable identification of individuals will be published. Your participation in the research is voluntary and it is up to you to decide whether or not to take part and you are not obliged to complete the questionnaire.

If you wish to receive a summary of the research findings once the study is complete please contact me at the email address below.

Liverpool John Moores University would like to thank you for agreeing to take part in this research.

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Part One

Understanding your performance

Please indicate your level of agreement with the following statements regarding your organisation's overall performance.

	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Generally our projects meet their time objectives	☐	☐	☐	☐	☐
We are usually good at delivering projects within budget	☐	☐	☐	☐	☐
Our projects usually result in tangible benefits for the organisation	☐	☐	☐	☐	☐
Generally customers of our projects are satisfied with the outcome	☐	☐	☐	☐	☐
Project specifications are usually met by the time of handover	☐	☐	☐	☐	☐
Our key stakeholders are usually happy with the way our projects are managed	☐	☐	☐	☐	☐
Project team members are usually happy working on projects	☐	☐	☐	☐	☐
There are often clearly identified intangible benefits from the projects we carry out	☐	☐	☐	☐	☐
End users are usually happy with the results from our projects	☐	☐	☐	☐	☐
We usually employ an effective project management process	☐	☐	☐	☐	☐
Overall, we are very successful at projects	☐	☐	☐	☐	☐

Part Two

How projects are managed

Please indicate your level of agreement with the following statements regarding how your projects are managed.

	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Time, quality and cost are the only realistic measures we use for determining project success	☐	☐	☐	☐	☐
We generally use financially-based criteria for justifying projects	☐	☐	☐	☐	☐
In our organisation all projects must demonstrate a pre-defined Return on Investment before they can be approved	☐	☐	☐	☐	☐
Our projects are restricted in size or impact to improve the chances of success	☐	☐	☐	☐	☐
Business benefits of a project are managed through to their realisation	☐	☐	☐	☐	☐
Projects are planned in terms of activities, milestones or deliverables	☐	☐	☐	☐	☐
Projects are subject to rigorous project risk analysis	☐	☐	☐	☐	☐
Tangible benefits are identified for each project	☐	☐	☐	☐	☐
Some of our projects get cancelled because the risk profile is too great	☐	☐	☐	☐	☐
In our organisation, the success criteria are specified for each project	☐	☐	☐	☐	☐
In our organisation, the project scope usually refers to the set of project deliverables	☐	☐	☐	☐	☐
The business benefits associated with a project are clearly identified	☐	☐	☐	☐	☐
The success of a project is measured against pre-defined criteria at the end of a project	☐	☐	☐	☐	☐
Intangible benefits are identified for each project	☐	☐	☐	☐	☐
Projects are reviewed after completion in terms of meeting original plans	☐	☐	☐	☐	☐
The organisation's quality department helps in ensuring project performance-targets are met	☐	☐	☐	☐	☐
Procedures from the quality department are used to guide the management of projects.	☐	☐	☐	☐	☐

Part Three

Top Management commitment

Please indicate your level of agreement with the following statements regarding how top management in your organisation supports projects.

	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Top management involves major department heads / managers in determining long-term objectives.	☐	☐	☐	☐	☐
Top management meet with their employees to explain the organization policies and objectives.	☐	☐	☐	☐	☐
Employees know the overall organization's purpose.	☐	☐	☐	☐	☐
Employees participate in setting the organization objectives.	☐	☐	☐	☐	☐
Top management reviews its policies to ensure its adherence to the set objectives of the organization	☐	☐	☐	☐	☐
Top management uses performance indicators to ensure adequate performance/ quality improvement.	☐	☐	☐	☐	☐
Top management provides necessary resources to fulfil overall organization objectives	☐	☐	☐	☐	☐
Top management supports the use of procedures related to project management which have been developed by the quality department.	☐	☐	☐	☐	☐

Part Four

Benchmarking

Please indicate your level of agreement with the following statements regarding how your organisation manages expectations of customers

	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
The organisation uses internal benchmarking techniques for increasing project management performance.	☐	☐	☐	☐	☐
Information from benchmarking is perceived to be useful on projects.	☐	☐	☐	☐	☐
The organisation uses benchmarking data effectively for enhancing project management performance..	☐	☐	☐	☐	☐
Information from benchmarking activities is reliable:	☐	☐	☐	☐	☐
The organisation uses external benchmarking techniques for increasing project management performance.	☐	☐	☐	☐	☐

Part Five:

Involvement in KPI development

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
KPIs are developed with involvement of the quality department.	☐	☐	☐	☐	☐
Project managers are involved in the determining of KPIs.	☐	☐	☐	☐	☐
Supervisors are involved in the determining of KPIs.	☐	☐	☐	☐	☐
Top management is involved in the use of KPIs for projects.	☐	☐	☐	☐	☐

Part Six

Training and Development

Please indicate your level of agreement with the following statements regarding training and development in your organisation

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Training is determined according to actual needs that have to be covered by training.	☐	☐	☐	☐	☐
Managers/ supervisors are involved in determining training needs of the employees under their supervision.	☐	☐	☐	☐	☐
Resources are available to cover employees' training needs/ development.	☐	☐	☐	☐	☐
Modern training methods are used in the organization (i.e. Distance learning, e-learning.)	☐	☐	☐	☐	☐
The organization uses its facilities/ expertise to conduct on-the- job training. .	☐	☐	☐	☐	☐
The organization evaluates training output.	☐	☐	☐	☐	☐
The organization keeps training records as a guide for further training/ development.	☐	☐	☐	☐	☐

Part Seven

Motivation

Please indicate your level of agreement with the following statements regarding training and development in your organisation

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The organisation has a motivation system to increase project management performance.	☐	☐	☐	☐	☐
The motivation system is monitored by top management.	☐	☐	☐	☐	☐
The feedback from the motivation system has a direct effect on project management performance..	☐	☐	☐	☐	☐
The feedback from the motivation system helps in ensuring overall project performance is satisfactory.	☐	☐	☐	☐	☐

Part Eight

Customer Focus

Please indicate your level of agreement with the following statements regarding how your organisation manages expectations of customers

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Considerations of customer (Internal-External) situations are taken into account when setting strategies for the organization.	☐	☐	☐	☐	☐
The organization determines current/ future customer requirements.	☐	☐	☐	☐	☐
The organization uses information from customer services in improving its processes/ services.	☐	☐	☐	☐	☐
The organization encourages employees to satisfy customers.	☐	☐	☐	☐	☐
The organization's quality department ensures that customer complaints are dealt with to the customer satisfaction.	☐	☐	☐	☐	☐
The organisation has a Change Order process to ensure customer satisfaction.	☐	☐	☐	☐	☐

Part Nine

Supplier Management

Please indicate your level of agreement with the following statements regarding your organisation's relationship with its suppliers

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The organization establishes long-term relationship with suppliers.	☐	☐	☐	☐	☐
The organization ensures the quality of supplies before delivery.	☐	☐	☐	☐	☐
The organization conducts supplier quality audit.	☐	☐	☐	☐	☐
The organization shares the information on production processes with the supplier.	☐	☐	☐	☐	☐
The organisation has an Approved Vendor List (AVL) system for choosing suppliers.	☐	☐	☐	☐	☐

Part Ten

Processes Management

Please indicate your level of agreement with the following statements regarding the management of processes in your organisation

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The organization uses clear working procedures.	☐	☐	☐	☐	☐
The organization uses tactical techniques for process analysis/, control/ and improvement.	☐	☐	☐	☐	☐
The organization makes clear efforts to reduce waste (i.e. Rework, returns & time)	☐	☐	☐	☐	☐
The organization uses teams in analysing processes for improvement.	☐	☐	☐	☐	☐
The organization calibrates measuring / monitoring devices, in regular intervals, to ensure its accuracy.	☐	☐	☐	☐	☐
The organization keeps its sites neat/ clean at all times.	☐	☐	☐	☐	☐
The organization uses on the recommendations of studies/ research for improving its products/ and services.	☐	☐	☐	☐	☐

Part Eleven

Information Management Process

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Information is used to make decisions in the organization.	☐	☐	☐	☐	☐
The organization standards- /- performance indicators are compared with international standards.	☐	☐	☐	☐	☐
The organization uses information- /- performance measurements in the improvement of its processes.	☐	☐	☐	☐	☐
The organization uses information- /- performance measurements in the improvement of its services	☐	☐	☐	☐	☐

Part Twelve

Information Management performance

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The information generated by the organisation is reliable.	☐	☐	☐	☐	☐
The information generated by the organisation is precise.	☐	☐	☐	☐	☐
The information generated by the organisation is comprehensive.	☐	☐	☐	☐	☐
The information generated by the organisation is clear.	☐	☐	☐	☐	☐

PERSONAL DETAILS

Function/Department: ______________________________

Job: ______________________________

Length of time in Organisation (years): ______________________________

Age:	29 or younger	30 – 39	40 – 49	50 – 59	60 or Older

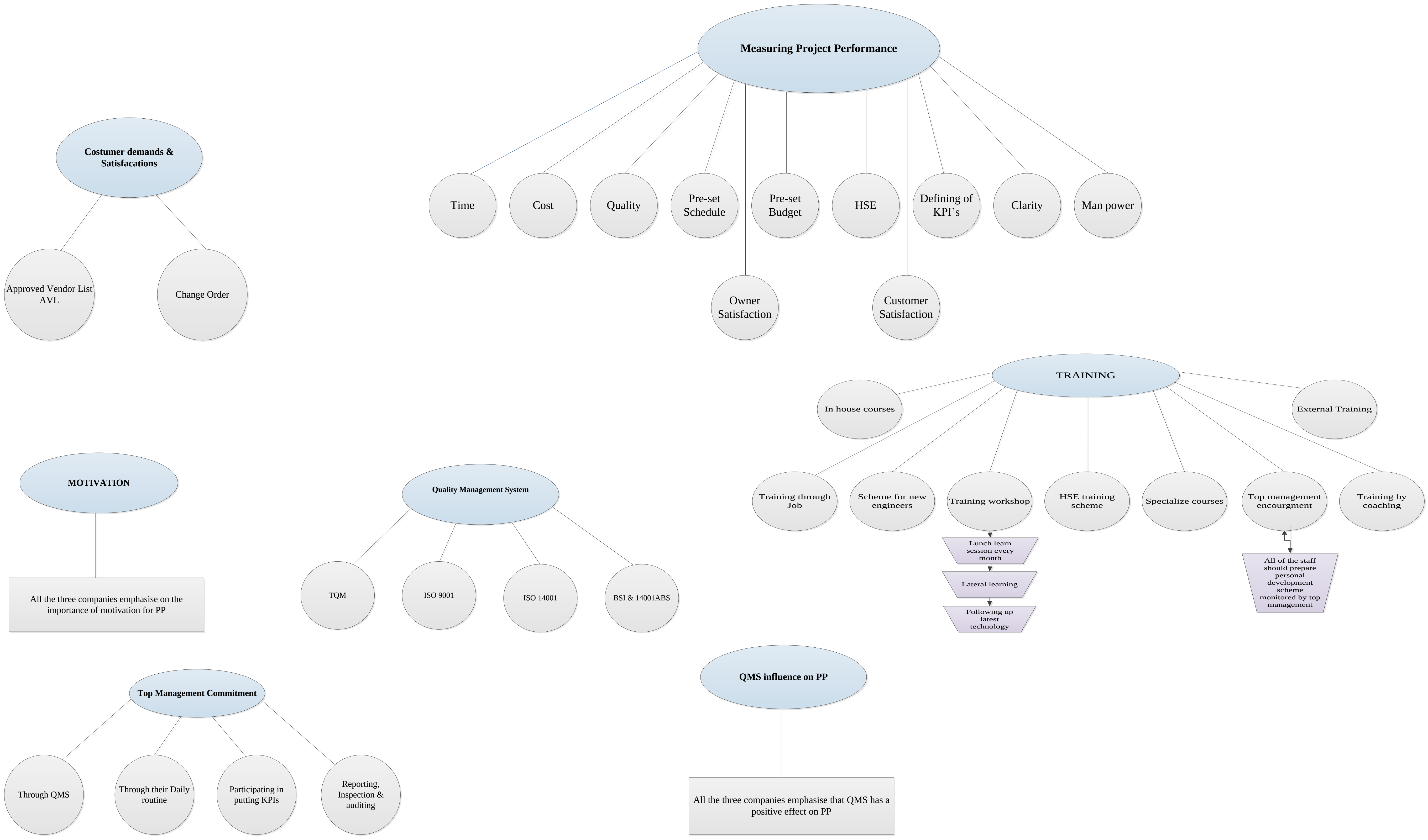
Thank you for taking the time to complete the questionnaire.

When you have finished, please return it in the envelope provided.

Appendix 6 - Summary of Interview findings

Co.	Quality system		Title / Role	Definition of performance	TQM practices in projects						
					Top management activities	**Benchmarking**	**Defining and Measurement of KPIs**	**Training**	**Motivation**	**Managing Customer Satisfaction**	**Assuring the Quality of goods and services**
A											
Owner	**A1**	Own QS (Mix)	PM	T/C/Q/HSE	Establishing System	Internally / Externally	Establishing System through QD	Different Schemes	(Shukren Award)	Establishing System through CO	Establishing System through AVL
	A2	Own QS (Mix)	PM	T/C/Q/HSE	Establishing System	Internally / Externally	Establishing System through QD	Different Schemes	(Shukren Award)	Establishing System through CO	Establishing System through AVL
	A3	Own QS (Mix)	PM	T/C/Q/HSE	Establishing System	Internally / Externally	Establishing System through QD	Different Schemes	(Shukren Award)	Establishing System through CO	Establishing System through AVL
	A4	Own QS (Mix)	DM	T/C/Q/HSE	Establishing System	Internally / Externally	Establishing System through QD	Different Schemes	(Shukren Award)	Establishing System through CO	Establishing System through AVL
B											
Engineering Contractor	**B1**	TQM	SPM	Time & manpower	Committed through TQM	Internally	Manpower, financial	Different Schemes	Establishing System	Top management duties	Establishing System through AVL
	B2	TQM	BM	T/C/Q/HSE	Committed through TQM	Internally	Establishing System through QD	Different Schemes	Establishing System	Customer focus	Establishing System through AVL
	B3	TQM	PPM	T/C/Q/HSE (deliverables)	Committed through TQM	Internally	Establishing System through QD	Different Schemes	Establishing System	Top management duties	Establishing System through AVL
	B4	TQM	SPM	ROI, deliverables within (T/C/Q/HSE) and manpower	Committed through TQM	Internally	Breaking the project into No. Of packages to manage KPI in time basis and deliverable basis.	Different Schemes J P Kenny academy	Bonus and reward system	Customer focus CO system is applied	Establishing System through AVL and through /a confirmed agency
C											
Construction contractor	**C1**	ISO	PM	Clarity, cost, time client happiness	Supporting through technical team	Internally	Breaking the project into No. Of packages to manage KPI in time basis and deliverable basis. Performance evaluation & feedback	Coaching system	Self motivation employee Praise by manager being happy	Generally meeting customer complaints & demands if happen **(Talent of project managers is key)**	1_Good relationship with the suppliers 2_Documentation Clarity. 3_Specification clarity. 4_Quality agreement to the client to meet.
	C2	ISO	PM	Time, cost and specifications	Supporting through technical team	Internally	Defined in terms of time, cost and specifications and considering them as main KPI	Coaching system & management courses	Self motivation employee Praise by manager being happy	1_Technical agreement with the customers 2_ mechanism to deal with the complaints.	1_QA/QC to the supplier 2_Inspection and auditing system
	C3	ISO	PM	T/C/Q	Encourage to the staff to get the best they can do	Internally	Stated & sorted by top management	Coaching system & management courses	Self motivation employee Praise by manager being happy	1_relationship with the customer 2_ mechanism to deal with the complaints.	1_Inspection and auditing system. 2_Rely on client reputation.
	C4	ISO	PPM	T/C/Q/manpower, deliverables. approvals done.	Parent company established procedures	Internally	Breaking the project into No. Of packages to manage KPI in time basis and deliverable basis.	Coaching system & management courses	Self motivation employee Praise by manager being happy	1_relationship with the customer 2_ mechanism to deal with the complaints.	1_Quality agreement to the client to meet. 2_Inspection and auditing system

Appendix 7 - Summary of NVIVO findings



Measuring Project Performance
Time
Cost
Quality
Pre-set Schedule
Pre-set Budget
HSE
Defining of KPI's
Clarity
Man power
Owner Satisfaction
Customer Satisfaction
Costumer demands & Satisfacations
Approved Vendor List AVL
Change Order
TRAINING
In house courses
External Training
Training through Job
Scheme for new engineers
Training workshop
HSE training scheme
Specialize courses
Top management encourgment
Training by coaching
Lunch learn session every month
Lateral learning
Following up latest technology
All of the staff should prepare personal development scheme monitored by top management
MOTIVATION
All the three companies emphasise on the importance of motivation for PP
Quality Management System
TQM
ISO 9001
ISO 14001
BSI & 14001ABS
Top Management Commitment
Through QMS
Through their Daily routine
Participating in putting KPIs
Reporting, Inspection & auditing
QMS influence on PP
All the three companies emphasise that QMS has a positive effect on PP