Sudan University of Science and Technology

Collage of Graduate Studies

The Impact of Total Quality Management on The Construction Projects in The Sudan

أثر ادارة الجودة الشاملة في مشاريع التشييد في السودان

Thesis Submitted In Partial Fulfilment for the Requirements for the Degree of Master in Civil Engineering (Construction Management)

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الآية

قال تعالى:

﴿وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ وَسَتُرَدُّونَ إِلَى عَالِمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنَبِّئُكُم بِمَا كُنتُمْ تَعْمَلُونَ﴾

صدق الله العظيم

سورة التوبة الآية (105)

Dedication

This thesis dedication

To father and mother spirit

To my second mother princess

To my loving husband

To my sister and brother

To all the other, who had appositive influence in my life

Acknowledgment

First and last thank to our creator who bestowed me the understanding

and Perseverance to make this accomplishment possible

"Allah"

I would like to thank my honest appreciation to my respectful supervisor

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Having special appreciation, respect and love to my dear husband

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Having special thanks to my second mother who supported me I could do nothing without her

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Special thank for all people who give their time, efforts and all help

Abstract

This research aims to study the reality of the impact of TQM on the construction projects in the Sudan, and evaluate this reality in the light of the scientific basis for TQM in construction projects in Sudan, in order to reach for a product with high quality and lower costs for access to the customer satisfaction and the competition to stay in the area.

TQM has won widespread acceptance. Some companies have been able to successfully apply and understood some still try to understand and apply them to reach for success and continuity.

This thesis has presented the results of questionnaire on impact of the TQM on Sudanese companies has been done through the preparation of a survey of systems and specifications for the Sudanese construction companies stationed in the capital Khartoum and through survey of 100 people working in the field of construction and it found the TQM in construction projects in Sudan, with appreciable impacted in addressing that suffering of defects and shortcoming.

To gain access to a set of proposals and recommendations aimed at improving these projects to the best and the development level the reality of the Sudanese construction and improvement of companies using TQM in order

The researcher recommended using TQM methods on Sudanese construction companies.

المستخلص

يهدفهذاالبحثإلىدراسةواقع اثر إدارةالجودة الشاملة فيمشاريعالتشييدفيالسودان, وتقييم هذا الواقع في ضوء الأسس العلمية لإدارة الجودة الشاملة في مشاريع التشييد في السودان,وذلك للوصول إلى مجموعة من المقترحات والتوصيات التي تهدف إلى الارتقاء بهذه المشاريع إلى مستوى أفضل و تطوير واقع شركات التشييد السودانية وتحسينه وذلك باستخدام ادارة الجودة الشاملة من اجل الوصول لمنتج بجودة عالية وتكاليف اقل للوصول الي رضا الزبون والمنافسة للبقاء في المجال.

ادارة الجودة الشاملة قد حازت علي قبول واسع النطاق . بعض الشركات قد تمكنت من النجاح بتطبيقها وفهمها والبعض مازال يحاول فهمها وتطبيقها للوصول للنجاح والاستمرار .

هذه الاطروحةعرضت نتائج استبيان اثر ادارة الجودة الشاملة علي الشركات السودانية وقد تم القيام بذلك من خلال إعداد مسح للنظم والمواصفات الخاصة بشركات التشييد السودانية والتي تتمركز بالعاصمة الخرطوم ومن خلال إجراء استبيان شارك فيه (100) شخصًا من العاملين في مجال التشييد وتم ايجاد أن إدارة الجودة في مشاريع التشييد في السودان ذات اثر ملحوظ في معالجة ما تعانيه الشركات من الخلل والقصور.

وقدم الباحث بعض الحلول والمقترحات التي يمكن أن تسهم في تجنب بعض مشاكل إدارة الجودة وتساعد في تحسين مشاريع التشييد السودانية واستمرارية التحسين وصولا للرضا التام .

يوصي الباحث باستخدام ادارة الجودة الشاملة وطرقها المتعددة في شركات التشييد بالسودان

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List of Abbreviations

AFOM	American Federal Office of Management
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASQ	American Society for Quality
BBC	British Broadcasting Corporation
CAD	Computer-aided design
Cl	Continuous Improvement
EPSRC	Engineering and Physical Sciences Research Council
GPC	General People's Congress
GWC	General Workforce Corporation
HRM	Human resource management
IEC	Internal and External (employees) Customers
ILO	International LabourOrganisation
ISO	International Standards Organisation
MC	Management Commitment
MENA	Middle East and North Africa
MTD	Management Training and Development
SPC	Statistical Process Control
PDCA	Planning, Doing, Checking and Acting Phase
QA	Quality Assurance
QMS	Quality Management System
QTP	Quality through People
TQM	Total Quality Management
TW	Team Work
UN	United Nations
UNDP	United Nations Development Programme

Chapter 1

Introduction

Chapter 1

Introduction

1.1 General:

The construction industry of the oldest industries known to man, has flourished since the covenants historic old has advanced degrees have achieved excellence in their products and methods of implementation of this products, and is the ancient monuments **pyramids** in ancient Egypt and Romania theaters. **The Great Wall** of China and other testimony to the greatness of the industry and prosperity in the past and also that its products have been and continue to reflect the extent of civilization and sophistication.

This confirms the great diversity of the achievements of modern civilization in which we live and walk by including and work that affect the social, political and economic life of the human. the large funds invested in the projects annually through contracting varying in size and value, underscoring the importance of the construction industry in everyday life for a person in the national economy of different countries and this confirms that the achievement of quality in the industry has economic repercussions lead to lower production costs through the elimination of defects and errors, and the costs of re-implementing some of the rejected business correction costs, and achieve user satisfaction and satisfaction and reduce maintenance costs during the period of use, thus contributing to the increasing age of economic facilities the executing agency also earns the confidence of its business and increase its share of the labor market and allow them the possibility of competition and continue. They will be searching about modern approach to achieve the desirability's companies for exllence finally they found total qualitymanagement (TQM) it considered important approach.

TQM has become a necessity in today's society amongst businesses and consumers. Companies and consumers believe that quality is very important, and it will make or break Companies. Ensuring quality in products or services helps eliminate liability that would come from defective products, and it increases the rate of the returning consumer. Companies are liable if there products were made poorly, and if they cause a disaster from the use of their products. it defines total quality management as :a holistic business management methodology that aligns the activities of all employees in an organization with the common focus of customer satisfaction to be achieved through continuous improvement in the quality of all activities processes, goods and services. according to Wikipedia(1998), it defines total quality management as:a management strategy aimed at embedding awareness or quality in all organizational processes. TQM has been widely used.

This research aims to study the impact of quality management in the construction projects in Sudan and rated compared with the supposed situation provided, identify vulnerabilities, and try to make some proposals and recommendations which will help to improve quality management and development in the construction sector in Sudan and is done through a review of the systems and specifications for construction projects in Sudan and the current status of quality management in construction projects in Sudan, has been turning research into important aspects of quality management in the various stages of the construction projects , so as to have a clear idea about.

This research includes definition of the concept of quality and its applications in civil engineering projects

1.2 The Research Problem:

The real problem of the construction companies and projects in the Sudan and through the reality of work noted the low quality of the product or service and high cost which led to lack of customer satisfaction

1.3 Research Importance:

As a result of economic openness and physical movement giant country led to the intensity of competition in the field of construction where we found that at least 2500 companies working in the field of construction in Sudan. The construction sector of the sectors that need to apply total quality management to be able to do its job more efficient, effective and consistent with the requirements of change, and to raise the level of performance, and to meet the wishes of the company's employees and customers

1.4 Research aims:

1.4.1 Try to improving the TQM process at the construction phase in the Sudanese construction companies.

14.2 Try to Activating the competition between construction companies to gain access to the customer satisfaction

1.4.3 Try to Look for a method to do better manage for our projects and construction companies to higher quality, better value and low cost

1.4.4 Try to design a frame for the application of the TQM according to result of SPSS analysis conducted

1.5 Research objectives:

There are two main objectives

1.5.1 Total client satisfaction through quality product and service

1.5.2 Continuous improvement to processes, systems, people, suppliers, partners, products and services

1.6 Research society:

1.6.1 Owner's

1.6.2 Contractors

1.6.3 Consultant

1.7 The research methodology:

It is the title of chapter four which rich it after identifying the problem statement aims and objectives literture review ,collecting, scheduling data derived from answers to the questionnaire, which was distributed on a slide study population (construction companies)and targeting (contractor – consultant – owner) in the Khartoum state to review the impact of TQM in the construction To analyze the data using statistical program **(SPSS**) and to reach results through them and forms that represent graphical analysis. Results lead us to the discussion and recommendations in Chapter five, as well as anchor tied to the subject of research and represent the general and specific recommendations in the field of these search.

Chapter 2

Literature review

&

Previous studies

Chapter 2

Literature Review

2.1 General:

Total quality management (TQM) is often termed a journey, not a destination (Burati and Oswald 1993) Much research has been done with regard to the implementation of TQM and it is believed that the benefits of higher customer satisfaction, better quality products, and higher market share are often obtained following the adoption of TQM by construction companies. It requires a complete turnaround in corporate culture and management approach(Quazi and Padibjo 1997) as compared to the traditional way of top management giving orders and employees merely obeying them it is believed that the important determinant of the success an organization in implementing TQM is its ability to translate, integrate, and ultimately institutionalize TQM behaviors into everyday practice on the job. TQM is a way of thinking about goals, organizations, processes, and people to ensure that the right things are done right the first time. (Motwani ~2001) feels that implementing TQM is a major organizational change that requires a transformation in the culture, process, strategic priorities, beliefs, etc. of an organization. TQM is an approach to improving the competitiveness, effectiveness, and flexibility of the whole organization. Oakland(1995)observed that it is essentially a way of planning, organizing, and understanding each activity that depends on each individual at each level. Ideas of continuous learning allied to concepts such as empowerment and partnership, which are facets of TQM, also imply that a change in behavior and culture is required if construction firms are to become learning organizations.The experience of applying TQM concepts provided the organization with improvements, information, and learning that occurred only because of the TQM process. This is in addition to positive customer responses and client referrals that the organization received as a result of implementing TQM.

2.2 Total Quality Management (TQM):

The management philosophy based on TQM has generated significant interest in various economies across the World. The increased awareness by senior management, that quality is an important strategic issue, has made it an important focus for attention at all levels of an organization, Crosby (1979), Juran (1986) and Deming (1986) all point to as evidence that the organization has adopted a TQM philosophy.

However, different researchers have adopted different definitions of TQM. Smith(1993) said one of the common reasons for the failure of TQM is the cultural position of the company.. The literature will identify the important TQM elements that contribute to successful implementation of TQM. These elements should be adopted by the construction project in implementing TQM, Further, companies are prepared to only implement those aspects of total quality management (TQM) programs that will provide them with competitive advantage and improve their overall performance and the organizations must use a systems approach to manage their interrelated processes. Wilkinson (1994) cited that TQM is a philosophy of management derived from the work of the quality gurus. it is based on three fundamental principles:

- Customer orientation to satisfy customer requirements and expectations.
- Process orientation, the activities to be performed as process (input process output).
- Continuous improvement.

The justification of adoption of the Total Quality Management is based normally on its benefits and their effects on the organization's future. the justification for a firm to become total quality management (TQM) is normally based on the premise that it will acquire benefits. And that increase of the awareness of quality in general is a benefit obtained by the organizations with the TQM program (Waldman, 1997) . According to Hellsten and Kelfsjo (2000) stated that total quality management (TQM) seen as a continuously evolved management system consisting of values, methodologies and tools, the aim of which is to increase external and internal customer satisfaction with a reduced amount of resources. Moreover different values are included in the concept of TQM by different authors, as well as in different quality awards.

2.3 Understanding TQM and the Requirements:

The TQM concept and approach are well-understood and widely practiced in Europe, North America, Japan and growing economies of East Asia. However, some firms have experienced difficulties in implementing TQM successfully. These difficulties may not be due to the TQM concept itself; rather, there might have been problems stemming from the cultural factors. However, this often resulted in missing the whole picture of TQM. According to Wong and Fung (1999) who indicated that the quality programs implementation in developing countries failed due to the lack of

understanding of quality management (QM). Yusof and Aspinwall, (2000) stated that failure of understanding of top management of TQM programs requirements and the implementation process. However, it is clear that top management need to have a good understanding of the purpose of the TQM, how its requirements are implemented, ways to measure its business impact and areas in which benefits may lie. the lack of understanding processes the people need to know and understand the internal and external processes that may be affected when improvement in any process is required. Also Lewis (1992) found no difference between the American and Spanish quality managers and he attributed this to their common lack of knowledge about TQM. Also one of the most critical challenges to the companies is to provide all staff with a comprehensive understanding of TQM.

2.3.1 Awareness of TQM:

TQM is a way of thinking and a set of continuous and improvement processes for individuals, groups and whole organizations by understanding awareness of TQM as discovering better process, (Juran1986). Crosby (1996), states that the purpose of awareness is to let everyone feel that they belong to a quality organization. In addition, awareness means that the staff in an organization understands the management's quality policy. if the levels of awareness of QMS issues in an organization are very low there may also be a poor understanding about the importance of quality in international trade and globalization of world markets. it is a result of lack of information, education and training programs available on quality issues AI-Zamany (2002). The majority of the studies were based on the assessment of managers' awareness of a specific principle or practice of TQM like teamwork or training.

2.3.2 TQM and Customer Satisfaction:

Total customer satisfaction requires the organization to know itself, its product, its competition, and its customers. (Fox, 1995) said the following ways as Know your customers: get to know your customers. Customers are all those people touched by the product or service, internal and external to the organization. To continue to satisfy the customers, all customers must be identified, and then the target customers are must be determined .once the target customers are identified, customer needs and expectations must be determined .customer expectations are dynamic; they continuously increase and change so a continuous review is necessary to ensure customer satisfaction.

2.3.2.1 Understanding Customer Needs and Expectations:

The identification of customer needs and expectations requires systematic, thorough, and continuous market research. The most important aspect of this process is to listen to the customer. changing customer needs: Customer needs are not static; they are always changing. Once customer needs are identified, they must be continuously monitored to ensure that the product or service still satisfy them.

2.3.2.2 Develop Customer Relationships:

To ensure that the organization is continuing to satisfy the customer, a relationship with the customer is critical. Relationship demand continuous attention it requires communication, support, and responsiveness communication, especially listening, is essential. The customer needs to be involved in as many aspect of the product as possible. Support must be available to help the customer with the product after it is received. Responsiveness is a key to continuing the relationship. TQM programs within the construction have a tendency to promote a corporate culture which emphasizes customer service. Advocates of cultural change strongly encourage management to identify the organizations' customers and satisfy their expectations (Juran 1992). Anderson et.al (1994) highlighted that TQM requires management of an organization to determine customer needs and expectation and change them to requirements. Then the top management should communicate these requirements among the organization and provide necessary resources to address customer satisfaction. However, satisfying of internal and external customers is one of the main reasons to adopt the new TQM because it is mentioned in many studies in different countries.

The principle of Customer is King emphasizes that quality is defined in terms of the customer and that the customer must judge the quality. Therefore, the customer as always being right. Based on this principle, the overall aim of the business must be customer satisfaction and meeting customers' needs and requirements. Kanji (1990) said the principle of everyone participates is based on the conception that everyone in the organization from all functional levels, including top and middle managers and first line operatives, must participat and be involved in the quality improvement process. principle also stresses that it is imperative to involve organizations suppliers and; customers in designing and planning for quality.

2.3.3 1nvolvement of People in TQM:

Empowerment usually requires changes in the organizations infrastructure. Employees will be more motivated to accomplish organizational goals and objectives if they have the authority to make decisions (Costin 1994). When the people at all levels are fully involved in the organization, this would enable their abilities to be used for the organizations benefits. (Hoyle 1994) stated the principle is expressed as follows "people at all levels are the essence of an organization and their full involvement enables their abilities to be used for the organizations ·benefits". Therefore organizations must encourage the involvement of people at all levels organizations must help people to develop and use their abilities. Cotton (1993) argued that most of the studies found that employees' participation had little consistent effect on productivity; however some 60% of those studies did find a ·positive relationship between employee's participation in decision-making and job satisfaction. Another key to the effective employee participation in decision-making is the existence of supportive organizational culture. To be successful however employee participation in decision-making must be more than just some systematic approach, it must become part of the managements philosophy (Werther 1981).

As part of the process of attempting to instill a quality, management may introduce TQM teams and seek to involve workers more in decision making. TQM teams are meant to empower public service workers nearest to the customer and invert the traditional hierarchy of organizational power and control, when introducing TQM teams, management may allocate considerable financial and time resources training team members in statistical analysis,(Brown, 1993). However, diminish where workers are expected to participate in process improvement team activities on top of their regular work tasks Morgan and Murgatroyd (1994), Ludwig-Baker (1999) stated that the effective decisions and actions are based on the logical and intuitive analysis of data and information. Scrap, rework, returns and customer information are all-important for decision making.

This principle leads the decision makers to approach the decision in a different ways; decide what decision will to be made, determine what facts to be needed to make .the decision and determine how much facts will be obtained and what methods to be used to get them (Hoyle1994). Organizations perform better when their decisions are based on facts. Therefore Organizations must base decisions on the analysis of factual information and data. Employee satisfaction should be one of a firm's key

performance measures, and employee satisfaction is defined as the degree to which employees like their jobs .

The people within an organization are communicated to know and understand the relevance and importance of their activities. Also, they should know how these contribute to organization objectives. Juran (1988, p.30) stated that".

2.3.4 TQM and Continuous Improvement:

Round and Chi (1985) in the implementation of TQM on construction projects, one important step is to institute continuous improvement. Continuous improvement would yield excellence in design, ensure communication in contracts and create a teamwork spirit in construction. The following are the keys to continuous improvement in the construction process:

- Learn to work smoothly in teams, i.e. respect the principle of internal supplier to internal customer chains.
- Be proactive to sense reasonable future change and be prepared. Do not wait until you are pressured into change or to act.
- Aim process improvement at the singular goal of meeting clients' expectations.
- Set benchmark at above average incremental process improvement to systems or subsystems and implement/monitor programs.
- Look for root causes when diagnosing the system malfunction or project process bottlenecks.
- Recognize the integrated and interdependent nature of project system and its parts.

Without top management commitment and support, the organization cannot achieve continuous improvement process of a TQM. Organizations are more efficient and effective when they continually try to improve. Continual improvement can be achieved by carrying out internal audits, performing management reviews, analyzing data, and implementing corrective and preventive actions. Therefore, customer satisfaction must be translated into a number of measurable models that evaluate customer satisfaction and organizational operating efficiency. Continual improvement would yield excellence in design, ensure communication in contracts and create teamwork spirit (Hele 2003).

Continual improvement should be an objective as it is a necessary objective of TQM implementation. A construction organization may outperform the competition by

being able to anticipate and respond quickly to customers' demands with new ideas and technologies and to produce constructed facilities that satisfy or exceed customers' expectations.

2.3.5 TQM and Leadership:

Experience, it is a part of Sudanese culture that some of the middle managers and supervisors would prefer not to write their opinions regarding the leadership of their organization. Influential obstacles to change, potential barriers to change should be to seek higher educational qualifications and training overseas, there is a growing demand for international training providers to introduce their expertise to this important market. the area of education and training and the ongoing development of human resources. Leaders should establish the unity and purpose for the internal environment of the organizations. Leadership has taken a number of different perspectives such as the trait approach, the behavioral approach, the contingency approach, and the charismatic approach (Yukl 2002). Despite their implications for the management of quality in organizations, these theories have not explicitly focused on quality and on the role of leaders as managers of quality. Much of the theory and research frameworks developed focus on leadership as a key managerial role.

Ludwig Baker (1999) highlighted that the hallmarks of good leaders are; communications, vision, change, respect for all individuals. Hoyle (1994) stated that the leadership must create and maintain the internal environment in the organizations to make people become fully involved in achieving the organizations objectives. In the TQM the leadership principle is reflected through the requirements addressing; internal communication, creating an effective work environment, planning and the setting of objectives and policies. organizations rely on leaders (Crosby 1979) thus the concept of leadership can be defined as the ability of top management to lead the firm in continuously pursuing long-term overall business success. This is exemplified by top management participation, top management encouragement, employee empowerment, top management learning, top management commitment to employee education and training, and top management pursuit of product quality and long-term business success.

Therefore Leaders must establish a unity of purpose and set the direction the organization should take. Leaders must create an environment that encourages people

to achieve the organizations' objectives. According to the action centered leadership, originally developed by Adair (1983) for leadership training.

2.3.6 Individual's Needs:

The Individual's needs should be considered first, because if the Individual's basic needs are not being satisfied then that person is unlikely to be able to contribute effectively to the team or task.

Team's needs - The team's needs to be effective must work together and interact as a team under a single point of responsibility, the team leader.

Task's needs - The task's needs for both Individual's needs and Team's needs the task's needs are to deliver the project's objectives , scope, time, cost, and quality through an effective planning and control system that includes integrating the project process, communication, organization structures and risk management by effectively solve problems and be committed to their decisions. Therefore to achieve maximum output from the workforce the managers must address both ability (The personal qualities and competency a person brings to management commitment is essential in TQM implementation and practice, as without management commitment no or little improvement can be attained.

Without management's commitment, the objectives of the above three principles would hardly be attained. Top management commitment has been identified as one of the major determinants of successful TQM implementation. They have to take charge personally, provide direction and exercise forceful leadership. These statements clearly suggests that management has to take the leading role in all aspects related to quality management and improvement; it also has to devote enough time to these issues and show visible commitment to them by their actions.

2.3.7 Education and Training to Achieve TQM:

Employees can generate innovative ideas for solving working problems. Training provides a forum for communication of new organizational strategy, values, and ways of performing work. Employees' commitment may be enhanced. Deming (1986) stressed the importance of education and training for continual updating and improvement, identifying one source of human motivation at work as intrinsic motivation; more generally, growing, learning, and developing one's self. Employees inherently want to learn and develop. In Sudan, despite the progress made in the education and training programs and the money spent on its development, its

inefficiency remains crucial, and this due to the corruption in the management levels, as well as the lack of qualified teachers and this due to a very low wages and salaries which can be considered as a basic construction project professionals are aware of the importance of quality training. Engineering, architecture and construction management students who eventually become the project's future leaders must be instructed in the basics of quality management education and training in TQM theory and practice at all levels (design, construction, and operation phases) are essential to enhance competitiveness.

2.3.8 Quality Management Systems (QMS):

Quality management has been an important component of the overall organizational movement for the past twenty years (Lee et.al. 2003). A Quality Management System (QMS) is defined in many forms (Gryna 2001 , Juran 1995) determined it as a system for formally managing and controlling the tasks and activities that must be in place in order to ensure that requirements are met consistently and in an effective and efficient manner. lt defines the Quality environment within a business. Customers are becoming more sophisticated, better informed and their expectations are growing. For any business, the only way to keep up is to offer a commitment to quality. Saunders and Preston(1995) said in fact any organization; whatever their size or project sector can give themselves a secure future by introducing a quality management system such as total quality management (TQM). David and Murat (1997) stated construction firms for a variety of reasons pursue total quality management (TQM) ideally, the main motivator for total quality should be the achievement of quality in a company's internal procedures in order to optimize resources and better satisfy customers' requirements. Many organizations are pursuing certification in order to satisfy specific requirements from one or more customers. (Arnold, 1994) stated this is true for local and international firms where TQM is increasingly becoming a mandatory requirement for bidding in public projects. Other firms take advantage of TQM as an effective marketing tool through an improved company reputation. The application of TQM in construction has its advocates and opponents.

Supporters believe that TQM can be applied successfully in construction and can generate substantial benefits. lt is believed that a construction company's operations can improve through the establishment of a quality system designed to standardize corporate procedures (Chung 1999), Lee and Quazi (2001) and Stebbing (1993) all

mentioned that (QMS) is a key factor in gaining competitive advantage, understanding of the QMS practices of other countries is very important for decision makers in western cooperation, Quality systems have gained attention of top managers and quality professionals worldwide, which in turn, has encouraged individuals to implement the quality improvement practice (Kanji, 1998). Any organization embarking upon a TQM should use the available QMS as guidance documents.

Also, Oakland (2000) stated that an appropriate TQM can make organizations' objectives cited in the quality policy to be received. Hamali(1999) pointed out that QMS in a public sector organization is not easy to implement through; lack of competition to push principles of QMS, lack of effective top management, the centralized government control that limits the flexibility and acceptance to change, the environmental differences of their customers that make it difficult for public sector organizations to please or delight their clients.

2.4 TQM and the Construction Project:

TQM concepts in construction have pulled the project out of a crisis mode that existed for quite some time and the management philosophy of TQM directs all strategic and operational policies in which the company engages. The ability of management and employees to control their work processes, to recognize problems, traces their root causes and to implement effective remedies is the cornerstone of a continuous quality improvement program. all participants in the construction process especially top or senior management is necessary if, the construction project is to improve its performance. wide range of quality tools and techniques are available to companies, which provide a common. language, a consistency of approach to continuous quality improvement. These tools range from simple techniques such as brainstorming to a more sophisticated option including statistical process control techniques. The most widely used techniques are listed below. While the tools may appear to be little more then applied common-sense, they have been proven in many industries and together they from a powerful methodology by which individuals or team are able to continuous improve their work process. While data collection is the foundation on which a TQM program is built, it is important that each company selects those tools that work for it and avoids collecting data as an end itself (Oakland, 1995). Within the construction project, architects, quantity surveyors, engineers, contractors and other

specialists all have, in addition to their special technical skills, their own trade or professional custom's and practices. These may have an effect on the building process either individually or collectively. Drensek and Grubb (1995) gave some of the benefits to total quality management may also be inferred from its potential disadvantages and benefits in construction the application of these techniques has led to the development of TQM for improving the broader overall performance within the company.

2.4.1 The Concept of Quality in Construction Practice:

Quality may mean different things to different people. Sun (2000) stated that some take it to represent the products and customers satisfaction, and others interpret it as compliance with requirements. Moreover, quality was defined as the totality of features and characteristics of a product or service that bear on its ability to stated and implied needs. For construction the needs must be defined by the client. The inclusion of services is pertinent to construction, where both designers and constructors supply services as well as the product (i.e. the completed work). Juran (1989) stated that although the need for quality has existed since the beginning of time, the ways and means of meeting this need for managing quality have changed dramatically. Wong and Fung (1999) stated the construction project is being viewed as one with poorquality emphasis compared to other sectors like the manufacturing and service sectors. Moreover they said (TQM) is increasingly being adopted by construction companies as an initiative to solve quality problems in the construction project. In fact, a building is good quality if it will as intended for its design life. As a true quality of the building may not be revealed until many years after completion, the notion of quality can only be interpreted in terms of the design attributes. (Battikha and Russell, 1998), Deming (1986), and Worldwide, there are several Quality Awards such as the Deming Prize (1996) in Japan, the European Quality Award (1994) in Europe, and the Malcolm Baldrige National Quality Award (1999) in the United States of America. Each award model is based on a perceived model of TQM and provides a good understanding of the TQM philosophy, principles, and practices.

Defining quality on construction projects expressions have been adopted to define quality in the construction project. Crosby (1979) defined quality as "**conformance to requirements".** Juran's definition pointed to quality as "**fitness for use**" in terms of design;conformance, availability, safety, and field use. According to Hart (1994)

qualityhas a three-fold meaning in construction , it means getting the job done on time; it means ensuring that the basic characteristics of the final project fall within therequired specifications; it means getting the job done within budget. Kanji and Wortg (1998) stated that the construction project has numerous problems because of its complicated nature of operation. Moreover said project is comprised of a multitude of occupations, professions and organizations. A quality construction project has to comprise all these dimensions. Actually, quality in construction is directly connected with conformance to specifications and fitness for use. According to Wong and Fung (1999), higher customer satisfaction, better project quality and higher market share often come with the adoption of TQM by such companies. These definitions are interdependent andthe choice of one depends ·on the domain and the purpose of its use. In construction quality may be defined as "conformance to established requirements".

Laszlo (2000, P.1) cited that quality management (QM) is "the quality of Management" which contains leadership, communication, team work and ability to change and improve and pleasing the customer. lt includes the ongoing search for opportunities to improve total quality management (TQM) is an overall concept that should be committed to by top management. According to Juran and Gryna (1993), quality management is the "process of establishing long-range quality goals and defining the approach to meeting those goals". However, construction companies are adopting TQM to improve their performance. In addition, there is much dissimilarity between manufacturing and construction, so TQM techniques must be adapted for the construction project. Understanding the customers' requirements is essential in ensuring customers satisfaction, and the demand for the construction product must be viewed in relation to the intended use of the facility.

• The establishment of Construction Project Board, as a strategic forum for debate within the project

• Legislation on a fair payment and adjudication put in place through the Housing grants, Construction and Regeneration Act 2008 (Khartoum, 2008).

• An increased use of partnering and framework agreements (targeting fragmentation) in place of contract-based procurement and project management.

• An increasing interest in successful tools and methods proven in other industries, such as team working, TQM and benchmarking.

Addressing relevant issues and more government-funded research programs encouraging such research initiatives (e,g. Engineering and Physical Sciences Research Council (EPSRC) Innovative Manufacturing initiatives, Construction as a Manufacturing Process). For instance research project have focused on the improvement of teamwork in construction; overcoming barriers to communication; the enhancement of understanding among different parties involved in the construction process (e:g. building designer and site worker).

Also according to Low and Goh, 1996 stated that total quality management (TQM) philosophy for the construction project, this is to be accomplished by:

• **Explaining** the rationale for TQM in construction;

• **Discussing** the factors which affect construction quality;

• **Proposing** a framework for implementing TQM in the construction project;

• **Proposing** a framework for implementing TQM at the project levels in construction.

Rethinking Construction - Rethinking Construction report produced by the government-commissioned construction task force, headed by Sir John Egan (Egan, 1998). According to this report; "Much of construction does not yet recognize that its people are its greatest asset. Too much talent is simply wasted, particularly through failure to recognize the significant contribution that suppliers can make to innovation. Difficulties are posed by the fragmented structure of the project, but construction cannot afford not to get the best from the people who create value for clients and profit 5s (**five Key Drivers to Change**) for companies." (Egan 1998:17). Overall, Sir John Egan recognized that "the project can and indeed must do better" and established that through the application of best practices.

The five Key Drivers to Change, as shown in figure 4 signified the following:

- **Committed Leadership**: Management believing in and being totally committed to driving forward an agenda for improvement, cultural and operational changes throughout the whole of the organization.
- **A focus on the customer**: the best companies provide precisely what the customer needs, when the customer needs it and at a price that reflects the product's value to the customer.
- **Integrate the process and the team around the product**: the most successful business does not fragment their operations -the work back from the customer. The process and the production and the value it delivers to the customer.

- **A quality driven agenda**: Quality means the total package- not only zero defects but right first time, exceeding customer expectations, delivery on time and to budget, innovating for the benefit of the client and stripping out waste in all its forms.
- **Commitment to people**:

This means not only decent site conditions, fair wages. It means a commitment to training and development of managers and supervisors, Egan (2002) added social and environmental considerations and the range and diversity of initiatives are frequently referred to as the post-Egan agenda. These lessons highlighted by Latham and Egan because the principles they uncovered have been widely accepted by the international community and reflect problems of a generic nature in construction industries of all countries, Drivers for Change Improving the Project Process Product Partnering the Development Supply Chain Project Production of Implementation Components Annual Targets for Improvement.

The study has lessons for knowledge transfer in project, for the gap between conceptualizing improvement, both in advocacy and criticism of continuous improvement. Moreover, Nancy and David (2004) stated that the reports from Latham (1994) and Egan (1998) give a better understanding of us to learn together and aim for a more positive future experience. Finally; provides a unique bridge between project and government. And it would appear that the quality of construction work is dependent to a large extent on the attitudes of the contractors and consultants. lt is therefore necessary to adopt a total quality approach in all construction projects in order to eliminate all factors which have an adverse effect on the quality of construction works.

2.5 Barriers to TQM Implementation:

Many of the major issues in construction projects require effective intervention by individuals, groups and organizations. The fundamental challenge is to enhance communication among individuals, groups and organizations so that obstacles in the way of improving interpersonal relations may be removed. Some behavior science concepts are helpful in overcoming communication difficulties that block cooperation and coordination. The key element of this study was to identify and analyses the barriers affecting TQM implementation in Sudan construction project public sector organizations.

The implementation of a TQM is faced with many different barriers in many organizations' overall the world. point out that the quality philosophy requires that employees and managers within and across departments in the organization work together to identify and resolve quality problems. There is a shortage of the topic of barriers affecting the implementation of TQM.

2.5.1 Criticisms of TQM:

TQM critics can make significant contributions to the quality of a TQM program and the achievement of its goals. The reveals that there is no a precise definition of the term "quality", as it means different things to different people.

Moreover two reasons why TQM can go wrong. First, the changes may be so ambitious and involve such fundamental alterations of the social system, which is relevant to this research; second, the changes may be more like window dressing than real changes. Quality management concepts have evolved over time; therefore, TQM could be regarded as an extension of the previous quality management concepts and methods. The survey of the literature further reveals that made a great contribution to the development of TQM. Each of these writers offered to management a number of methods and management techniques for managing quality and improving organizational processes, even though they did not agree on a specific model or approach to transfer their methods and approaches into practice. Moreover, the authors above have demonstrated that there is value in raising constructive criticism about the paths taken, or not taken, in the TQM process.

Listening closely to employees who are less than enthusiastic about TQM is important. that the TQM is intended to overcome some of the disadvantages and critics faced by the concepts, In every stage of TQM there was a requirement to establish and maintain documented procedures to control some aspects of an organizations' operations and TQM is a philosophy which applies equally to all parts of the organization, moreover all employees assume responsibility for the quality of their work. ~his led to the perception that TQM built a bureaucracy of procedures, records and forms with very little effect on quality. Despite these criticisms, TQM played an important role in trading between different countries. The survey of the literature shows that there are a number of features and characteristics (knowledge and understanding of TQM, internal and external customer satisfaction, employee participation, team work, leadership, continuous improvement, and management

commitment). Finally critics of TQM have not, and should not, limit their critiques to the theory of TQM, but the assessment of how, during implementation, that TQM takes a long time to implement as it requires major organizational changes in culture and employee mindset.

2.5.2 Organizational Culture Barriers:

Culture is defined by Oakland (2000, p.22) as "the beliefs that pervade the organization about how business should be conducted and how employees should be treated and should be have". The culture within the organization contains behaviors based on people interactions, norms resulting from working groups, dominant values adopted by the organization, rules and the climate in the organization (Oakland, 2000)and Maull (2001) stated that culture includes knowledge, belief, art, morals, law, customs and habits and capabilities acquired: by employees in the organization. Culture is the adhesive material that holds the organization together. Furthermore, the successful implementation of a TQM requires an assessment of the organizational culture and the implementation of an integrated process for change in organizational behavior.

A review of TQM literature shows that TQM culture can be considered to be one which uses team, promotes pride in workmanship, drives out fear, allows participative management, promotes leadership in place of supervision and promotes long term orientation among the members of the organization. Companies in the UK are beginning to understanding this "culture barriers" and deal with it. For many years, the Japanese have been held up as having a culture of efficiency, hard work and achievement. However, as Japanese business set up in the UK, we see that where the UK culture is mixed with this Japanese working style.

Hofstede defines 'culture' as the collective programming of the mind that distinguishes the members of one group or category of people from another. In this definition, the 'mind' stands for thinking, feeling, and acting, with consequences for beliefs, attitudes, and skills.

Hofstede (1991.p.51) defined individualism versus collectivism in broad terms: "Individualism pertains to societies in which the ties between individuals are loose; everyone is expected to look after himself or herself and his or her immediate family. Collectivism pertains to societies in which people from birth onwards are integrated

into strong, cohesive in-groups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty".

• Power distance is defined as the extent to which the members of a society accept that power in institutions and organization's is distributed unequally.

• Uncertainty avoidance has to do with the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity, leading them to support beliefs that promise certainty and to maintain institutions that protect conformity.

• Femininity stands for a society in which social gender roles overlap: both men and women are supposed to be modest, tender, and concerned with the quality of life.

Additional studies have shown Hofstede's cultural measure to be generalizable across multiple contexts and societies service quality in forest recreation settings. AI-Khalifa (2000) added an organization's culture provides the basis for forming and modifying behaviors, attitudes, and values deemed very important to the power structure of the organization. The culture is often a barrier to change in TQM programs.

Culture change is necessary to create the changes in attitudes and behaviors to enhanced desired behaviors. However, the greatest challenge with respect to removing the barriers to the effectiveness of TQM is the managing of cultural change in adverse economic and social environments (Ciaver, et. al. 2001).

Also. Dale (1999) added that the organizational culture barriers are the most important barriers to overcome to make an organization successful in implementing TQM (Farid and Wahba 2004), Every culture has assumptions about how people should relate to each other; the culture of any organization is affected by the culture of a society. For example in studies of North America managers, efficiency, high productivity, leadership and individuality are popular, in studies of Japanese managers, efficiency, high productivity and leadership are also popular. lt is important that those employed in an organization should try to understand the culture they share. And the group is always more important than the individual. Managers in general, and personal managers in particular, have to understand the text to which culture can be changes and how the change can be made, and we have to understand that the culture need time to adapt with it (Ouaziet.a/1998).

2.5.3 Lack of Information and Communication:

In very large projects, professional behavior scientists may be necessary in diagnosing the problems and advising the personnel working on the project (Samson 1997). The

power of the organization should be used judiciously in resolving conflicts, Communication defined in Goetsch and Davis (2000, p.307) as "the transfer of a message (information, idea, emotion, intent and feeling) that is both received and understood". Likewise, Daft (1997) defined organizational communication as "the process by which information is exchanged and understood by two or more people, usually with the intent to motivate or influence behavior". Furthermore, Balzarova et.al (2003) quoted Thiagrajan et.at (1997) who highlighted that effective communication involves maintaining enthusiasm, employees' full involvement, understanding roles and responsibilities in processes and enhance personnel capabilities. Another view, given by Macedo-Soares and Lucas (1996) , who quoted Schall (1983) who believed that culture can be studied by looking at the communication rules of the organization. Fuentes et.al (2000) cited that lack of information and communication routes where this necessary information could flow is a barrier to implement TQM in Spanish organizations. Furthermore, Samson (1997) pointed out that lack of sharing information between management and shop floor employees to close the loop between improvement actions and their sequences is a barrier to implement TQM in Australia and New Zeland. Najmi and Kehoe (2000) cittedLaza and Wheaton (1990), Boyett et.al.(1992), Brown (1993), Katz (1993), Goodman et.al.(1994), Zangwill (1994), Dale and Cooper (1994) and Tatikonda and Tatikonda (1996) who all found that a lack of integration between quality information system and existing management information system is a major barrier for TQM implementation.

2.5.4 Lack of Customer Satisfaction:

The significance of customer satisfaction and its use for evaluating the quality from the customer's"[' perspective, have been emphasized by many authors all construction (Hellard 1993, Torbica and Stroh 2001, Maloney 2002, Yasamis et. a/ 2002, Fewing 2005, Hofstede 1991 and 2001). This study examines customer satisfaction in construction, as perceived by two customer groups: public and private customers. Ouazi et.al (2002) and Fuentes et.a/(2000), lack of commitment to satisfy customers , lack of integration of customer satisfaction in a firm's goals, vision and knowledge of customer needs and expectations, lack of cooperation from customers.

Also, lack of usage of customer feedback in new product design, monitoring customer satisfaction, responsiveness to customer complaints and levels of interaction with

customer are big problems to implement TQM standards. The absence of the customer's voice and lack of alternatives for the customer to accept or not are barriers impeding TQM implementation.

Customer satisfaction:

Is one of the key elements in total quality management (TQM), an approach that emphasizes overall satisfaction through the continuous improvement of product. Construction companies are adopting TQM to improve their performance. Measurement of the customer satisfaction is an important factor in the determination of .the effectiveness and implementation of the TQM. Regarding customer satisfaction requirements TQM, top management should determine customer needs and expectations and change them to requirements. Communication of the importance of meeting customer requirements throughout the organization and the awareness of customer requirements must be further promoted by the management representative .The customer focus principle is reflected through the requirements addressing the communication with the customer and management commitment, Vouzas and Gotzamani (2004) quoted Conti (1999) who identifies that customer satisfaction is a key requirement for verifying the effectiveness of the TQM.

2.5.5 Organizational Culture and its Change:

Numerous studies above report the most frequent reason given for the failure of planned organizational change was due to a neglect of the organizational culture. Up of reengineering, total quality management, strategic planning, technology adoption and downsizing efforts have failed or created problems affecting the survival of the organization.

The resistance to change happened by middle managers, first line managers and employees when new tasks and responsibilities are given to them, For example, resistance to change with its different forms from management, or employees, is a common aspect that emerged with any new change process in the organization. the management should work to investigate the existing organizational culture, to implement the new process effectively. It will not be possible to transfer management tools from one industrial sector to the other without substantial redesign. The culture within construction was found to be a "project culture" in comparison to manufacturing, which was found to be a "company culture." The Construction Project

would benefit significantly from the study and adoption of best practices from manufacturing and other industries.

Elements are identified which could lead to early advantage: they include better supply chain management and considerable improvements in culture and organization". Moreover human resource management means managing people within the employer-employee relationship. it involves the productive use of people in achieving the organizations' strategic business objectives and the satisfaction of Individual employee needs. Ghobadian and Gallear (1997) stated barriers can influence the culture of an organization such as education and training of employees, participation programs of employees, enhanced communication programs, revision of procedures and policies, modification of reward system and behavior of top management. To successfully implement a TQM, cultural change is required to replace the traditional methods and ideas with newer ideas and beliefs in the way work should be done.

Low and Alfelor (2000, p.134) quoted Low (1998) who stated that there are two basic approaches to implementing TQM, which meets the requirements of TQM, technical and non-technical (behavioral) approaches The technical elements of TQM are always the most visible quality management components, the improper identification and disregard for the non-technical attributes such as an organizational politics, leadership styles, socio-political conflicts, change management, etc, as figure cross cultural influences on quality department below have been regarded as the root cause of an organizations' failure to fulfil its quality objective.

Cross- cultural influences can also affect the work of quality departments in construction projects.

- Technical Influences
- Management responsibility
- Quality system
- Contract review
- Design control Document and date control
- Purchasing
- Control of customer supplied
- Process control Inspection and test
- Control of nonconforming product
- Corrective and preventive action

• Handling, storage, packaging

• Control of quality records

• Internal quality audits

• Training

• Servicing

• Statistical techniques Quality Department Non-technical Influences

Power in Organization

• Authority

• Responsibility

• Organization politics

• Empowerment

• Employees' resistance to change

• Leadership styles

• Conflicts management.

• Change management and managing.

Innovation- integrative versus segment list (organizations+ Regional + project+ professional+ Functional+ Corporate)

Tata and Prasad (1998), outlined that organizations with culture are characterized by behavior matches slogans, customer input is actively sought and used to continually improve quality, employees are both involved and empowered, work is done with teams, top management are committed and involved, sufficient resources are made available for the continual improvement, of quality, education and training are provided to ensure that employees at all levels have the knowledge and skills needed to continuously improve quality, reward and promotion system are based on contributions to quality continual improvement, fellow employees are viewed as internal customers and suppliers are treated as partners. Management should recognize the importance of culture and its influence in transplanting what an employee worked in a different cultural set up without reviewing its compatibility or incompatibility with different cultures; for example, work ethics may differ in different cultures (Triandis, 1994).

" Triandis (2002-b) cited that top management in an organization makes a mistake when it implements organizational changes through radical restructuring by ignoring the effort required to change skills and behaviors, resulting in surprise when the

exercises need to be repeated a few years later. Thus there are two cultural requirements for successful TQM implementation: TQM prefers collectivistic culture and empowering and participative style of management.

However, collectivistic society tends to be more hierarchical i.e. high on power distance that does not support empowering and participative style of management and thus is not conducive for TQM implementation. The importance of an appropriate quality culture is recognised by most prominent quality experts, e g. Deming (1986), Juran (1974, 1986, 1988 and 1989) and Crosby (1979, 1992 and 1996). Their works identify a number of cultural elements that must undergo change in order that a continuous quality improvement philosophy can be sustained. So, culture is the key factor underpinning success interims of developing the necessary commitment to any form of change. Another cultural dimension that mediates positively in TQM implementation is collectivism (Kumar 2006). The barriers are forcing any organization to review and change four areas, culture, mission, structure and process (Kamensky 1996). The need, for change has driven initiatives in the public sector as pressure to improve performance has increased.

Bureaucratic, highly controlled work environment can give employees 'willingness of participate in their organizations' success. Maximize their contribution of the success of their organization's (Dobbs, 1993). The implementation of a total quality management (TQM) culture, with its implicit orientation towards the customer , is a complex matter and requires a long-term approach. Consequently, the firms that try to change from a bureaucratic culture to one oriented towards quality will have to design an appropriate strategy in order to succeed. (Ciaver et.al 2001) TQM had the most effect on process management, focus on customers and leadership and management and less effect on focus on suppliers, performance results, strategic planning and focus on material resources. Human resource problems, performance appraisal and strategic problems were the most important obstacles to TQM success respectively.

Brown (1995) suggests that organizational culture can be a powerful tool for improving performance and the key to effective leadership and organizational development. However, it is important that effective leadership and workable organization design. and development programmers must be based on sensitivity to, and understanding of culture. Therefore, understanding the cultural environment is vital to TQM implementation and by extension to the success of the prospective change. But there is the fear that the focus on procedures will develop new quality

bureaucracies (Vouzas and Gotzamani, 2004). Halt (1998) indicated a culture high in power distance such as Japanese and Chinese cultures, most their people at the lower levels would accept their subordinate status, and respect formal hierarchical authority. These people seldom violate chains of command or openly question decisions by their superiors. On the other hand, people who live in a low hierarchical society such as Americans and Canadians have less power distance between each levels. In an American company, higher managers normally will be more willing to share their authorities to subordinates in decision making, and to leave certain latitude for disagreement (Halt, 1998, p. 347). American cultures look up to personal achievement, innovation, autonomy, and individual heroes. The individual achievement is highly valued, and any individual with a great ability will gain the best profit in a company. Being progressive and creative will be appreciated by this culture. In contrast, Chinese cultures in Hong Kong would emphasize more on group Sanderson (1992) quoted Passmore (1990) who defines resistance to change as "human reaction.

Resistance may come of interest, misunderstanding, and different assessment of the need or desirability of the change and in some cases due to low tolerance for change in the individual". lt is what employees do, when they try to change organizational culture. Resistance to change is a quality barrier to effective TQM implementation and maintenance in Singapore organizations (Low and Ling Pan, 2004) the resistance to change happened by middle managers when they are feeling to lose influence over decision-making and employees in general when new tasks and responsibilities are given to them. Another insight is given by Lipovatzet. a/ (1999) that change of mentality, the avoidance of new tasks and responsibilities and the mistrust are causing resistance to change as a barrier in TQM implementation in organizations.

2.5.6 Lack of Motivation System and Reward:

Schonberger (1994) stated that total quality management removes the traditional career ladder because of the flat flexible structure within the organization. TQM sets, on the other hand, the cross functional experience as a reward. According to Ellecker (1998) said the motivation system is divided into tangible and intangible techniques. Tangible means to show the levels of recognition for work contribution made, about behavior that is valued by the top management and about the organizations' attitude to individual performance and achievement and the key element in the cycle is that of

rewards in order to retain and motivate the staff, especially in work areas facing major competition. According to Storey (1992) stated the staff might presume that they would increase their wages owing to their increased liability, and that they would also receive a part of the financial gain thus created. Inconsistent reward systems and lack of recognition are other obstacles in implementing TQM in many organizations they increase the difficulty of consolidating the implementation of the new managerial approach and associated quality practices (Macedo-Soares and Lucas 1996, Ngai and Cheng 1997). In similarity, Low and Pan (2004) outlined that little recognition, respect and reward for a good job done to achieve quality performance is a barrier to effective ISO 9001 -2000 implementation and maintenance in organizations.

2.6 Evaluating TQM Approaches:

It important to gets feedback on success, and should be given recognition as a result of his/her contribution to the improvement process in the encompassed many of the essential features of TQM that are demanded for improving the Total Quality Management of Organizations, and clearly these are relevant to initial idea are used in this research. Kanji and Asher (1993) suggested that the process of implementing TQM can be carried out in four stages as followings:

2.6.1 Identification and Preparation:

At this stage the organization identifies and collects information about the prime areas where improvement will have most impact on performance, and it prepares the detailed basic work for the improvement of all the organizations activities. The information collected at this stage should include the costs of quality such as the total cost of waste, error correction, failure, appraisal and prevention to identify the potential areas for improvement and to direct the improvement efforts towards the areas they are most needed. It also should include the opinions of customers, suppliers; managers and employees to get different views about the problems and the necessary actions that are required for tackling these problems. In general, the aim of collecting information is to ensure that management has correct and accurate information to make its decisions.

2.6.2 Management Understanding and Commitment:

The aim at this stage is to make sure that management understands the objective and methodology of TQM and is prepared to adopt them all the time. To achieve this, it is necessary to educate management in the TQM approach so that it can take appropriate actions and demonstrate its total commitment and take the leading role in the quality improvement process.

2.6.3Scheme for Improvement:

At this stage it is necessary to develop a scheme for improvement, which should include appropriate training programs for employees. The scheme should be developed after the realization of some of the organizational critical aspects, such as customer supplier relationships, meeting customer needs, main causes of the problems, best solutions to these problems, prevention of recurring problems, priorities for improving efficiency, etc.

2.6.4Critical Analysis:

At this stage it is necessary to obtain information about successes. This will help to review the achievements and to understand the future requirements for continuous quality improvement, it also important that everyone gets feedback on success and given recognition as a result of contribution to the improvement process.

However, Kanji (1996) suggested Darning's **Plan-Do-Check-Act** for modelling the stage of implementation. To achieve this, it is necessary to educate management in the TQM approach so that it can take appropriate actions and demonstrate its total commitment and take the leading role in the quality improvement process. It is necessary to obtain information about successes. This will help to review the achievements and to understand the future requirements for continuous quality improvement. Also the lack of understanding the PDCA process was a barrier affecting successful implementation of the new standard organizations.

Stoner (1989) stated that clearly, such a role distinction among leaders demands that each levels of management possess differing skills because the responsibility with which each is charged differs. Deming considered quality responsibility is of the top management. Atkinson (1990) points out that 80 percent of TQM failures are mainly attributed to a lack of requisite commitment of top management. Such concerns raise doubts as to the suitability of model for providing a practical link between TQM theory and the implementation requirements of Sudan construction project company (A&B).

At the **Plan** stage of the model, there is need for creating awareness for TQM amongst the personnel of an organization. lt is imperative to create awareness of TQM in an organization before its introduction, as this will assist the personnel to understand the approach's concepts and principles. At this stage it is also imperative to communicate the need and intention for TQM implementation. The need and purpose for TQM implementation need to be communicated horizontally and vertically across all functional lines and areas of an, organization to win support for TQM implementation. Once these objectives have been attained, it is necessary to develop a case for action or a program for improvement so that the goals and objectives of improvement can be manifested. To enable the personnel to take the corrective actions required for improving the case or program, training programs on TQM tools and techniques need to be undergone by the workforce.

At the **Do** stage, it is essential to establish and define process improvement teams. Management must lead the team. The next step at stage is to identify the area for improvement so that improvement efforts are concentrated on that area and process. Once an area for improvement has been identified, the most critical processes that need to be improved should be identified. It is also imperative to identify the causes of the problems and the inhibiting barriers to quality improvement in the selected area.

At the **Check** stage involves setting up standards against identified needs including professionally determined needs. The stage also involves establishing measures to ensure compliance to identified needs. At the **Act**ion stage the organization should be able to deliver that which will satisfy its customers, namely, which are quality services or products**.**

Haigh and Morris (1995) may have offered a more comprehensive model for transforming the principles of TQM into practice. The model offered encompasses a set of elements, concepts, and principles. Haigh and Morris(1995) referred to as the macro or contextual elements of TQM imperative, according to Morris and Haigh (1996), to interconnect the macro or contextual elements of the model with its micro elements or principles, through a number of operational concepts in order to provide the basis for day-to-day Activities that make TQM manifest within an organization.

The listed in the operational concepts of which is relevant to the researcher are:

1. Internal and External Customers.
2. Teamwork.
3. Quality through People.
4. Management Commitment.

The first concept **(Internal and External customers**) emphasizes that the organization and its management must recognize the importance of both internal and external customers, and must work towards satisfying those customers. In practice, according to this concept, it is imperative to satisfy the employees and treat them as internal customers in order to attain external customer satisfaction, as without internal customer satisfaction it would be hard to deliver what satisfy the external customer. The concept is based on giving employees the same status as is accorded to external customer in terms of meeting their needs and requirements. According to Riley et.al (2004, p. 427), signaling the relevance for considering multiple influences in any system, both internal and external.

The second concept **(Teamwork)** is based on the idea that the quality improvement can be achieved through teamwork. Morris and Haigh (1996) advocated that it is the activities of teams which facilitate an organization moving from a traditional work system to a high performance work system. Morris and Haigh added that the source of a team's power in an organizational context, in which the objective is the enhanced quality of the product or service which the organization offers to its external and internal customers , must emanate from management. In addition, emphasis must be upon the capability of the team to resolve problems of poor quality (Morris and Haigh1995 and 1996, Kanji 1994), which requires that the team has possession of the necessary skills and abilities to analyze symptoms; establish causes; generate remedies; test the chosen remedy under operating conditions; monitor the chosen remedy; and report on the quality gains made and held.

The team, according Morris and Haigh (1996), need to be trained in the techniques of quality decision-making and possess the skills demanded of that possess. According to David and Murat (1997) stated that Teamwork is necessary to allow each person to get the assistance required to be successful individually, and collectively as a team. The whole construction project is project oriented, so improved quality performance must be project-related and must include the whole project team. Manufacturer, subcontractors, main contractor, vendors, professional designers, project managers

and above all, the owner must be involved in the process. Partnering arrangements between these parties will enhance total quality.

The third concept of **(Quality through People)** emphasizes the role of organizations' people in the quality improvement process. It is essential according to this concept to believe in the fact that an organizations systems and procedures could not produce quality without the effective participation and involvement of its human resource in the quality improvement processes. Therefore, the people of an organization must be given a prominent role in the improvement processes, and must be qualified to conduct improvement tasks. The concept of quality on All Agendas requires that quality barriers and their related issues must be on management's agendas at all the time in order to attain quality improvement. It is imperative that management should consider quality matters as part of its daily routine work so that quality becomes part of an organizations' culture and is included in every aspect of work undertaken. The concept of all work is process suggests that work should be considered as a process that has inputs and outputs, and thus, it requires appropriate inputs to gain appropriate outputs. As a result, it is necessary to have appropriate and defined inputs to a quality improvement process in order to attain improved and quality outputs.

The four concept of **(Management Commitment**) emphasizes management's role in the quality improvement process. It requires that management show visible, serious and personal commitment to the quality improvement process, as without those commitments from management, the personnel at the lower levels would not themselves show appropriate and serious commitment to the improvement processes. It is imperative that management shows commitment to the improvement processes by listening to the suggestions of those involved in the improvement processes; regularly reviewing and auditing the progress of the improvement processes; taking corrective and prompt actions when necessary; recognizing and rewarding the achievements of those contributing to the improvement processes. Balzarova at (2002) cited that lack of identifying a clear mission as a measurement tool of performance of an organization is a barrier in successful implementation in some firms. According to David and Mural (1997) stated that Management commitment to quality and to continuous quality improvement is very important in each phase of the building process. Management must participate in the implementation process and be fully committed to it if TQM is to succeed.

Deming's Plan-Do-Check- Act Cycle

Can be adopted as a systemic approach for implementing and auditing the principle of continuous improvement, which is clearly these cycle are relevant to initial idea are used in discussion. Another technique that can be adopted for measuring and ensuring continuous improvement is benchmarking. An organization could measure its continuous improvement efforts by benchmarking or comparing the process of improvement with competitors' processes, or with its own processes in other areas that seems to be more improved than the process that it attempt to improve. Also Curry and Kadasah (2002) in an Arabic study revealed that top management commitment was high except some managers did not review the quality progress of their departments.

Love et.al. (1998) suggest that TQM can be used to create an organization where change is considered the norm, rather than a reactionary response to environmental pressures. Political, Economic, Socio-cultural and Technological **(PEST**). Government In public sector: comprise typically the function and role of government, government policies and programs, legal and regulatory environment, public sector interfaces, taxation issues, and the rule of law, among others. Economic/technological: comprise the markets, macroeconomic frameworks, global linkages information and communications technology, and development assistance. of particular note are rapid advances in information and communications technology that are forcing profound changes (and need for change) at not just the entity and individual levels, but at the broader systems levels as well. Socio-cultural includes the social barriers include traditions, values, societal trends, consumer psychology, and a society's expectations of business (Wright et.a/1992).

The social and cultural influences on business vary from country to country. It is very important that such factors are considered. According to (Wright. et.al., 1992:p:22) stated that the social barriers include traditions, values, societal trends, consumer psychology, and a society's expectations of business. Next part (Socio-economic influences) will explain deep about the Socio-cultural. Jobber (2001) suggests that "a major technological change which is affecting quality is development in information technology. The Internet is revolutionizing have companies conduct business". Moreover technology has a significant effect on the business success, it is participated in enhancing the relationship between the company and its customer. They increased the rate of seal because of purchase and it offered change to companies compete with their advanced competitors. Moreover, the company can collect useful information

about its customer and exploit it to understand the market and provide the services according to the customer needs. Sudan is developing country and has relatively limited communication facilities, for example, The Internet and World Wide Web have been launched in Sudan few years ago. The majority of Sudanese are still trying to improve their capabilities in dealing with such new technology).

Curry and Kadasah (2002) quoted Mersha (1997) who suggests that governments in developing countries should provide an appropriate environment with reasonable infrastructure for project as a whole. Insufficient technology is a barrier to implement TQM in India, China and Mexico (Zhao eta/., 1995). Awan and Bhatti (2003), Lipovatz et.al (1999), Fuentes et.al. (2000) and Maser and Bailey (1997) cited that lack of calibration agencies is a barrier inhibiting implementation of TQM in many organizations. In addition to that, Yahya and Goh (2001) quoted Ouinlan (1996) who highlights that improper calibration of tools and gauges is a barrier which causes failure of organizations in certification audit. During the 1990s, the Sudan authorities worked to improve the business environment and make it more attractive for overseas investors. In 2000, The Sudan Government invited local and foreign investors to take a part in the five year plan to help privatize its industries, local authorities have been marketing investment opportunities to foreign companies and instituting reforms to make the business environment more attractive According to Wilson, (2000), said the nature of change that are currently happening in the economic environment is recognized as, a raise in real income growth; continuing inflationary force, changing in the savings, concern over levels of third world liability and diverse consumer expenditure patterns and the non-oil industrialized and construction sectors.

2.6.5 Benchmarking:

The objectives and process for construction project management create a good environment for the effective use of benchmarking for measuring and improving performance said Gotzamani (2004). Kumar, (2006) cited that benchmarking is a core component of continuous improvement programs, underpinned by quality system, maintained by internal quality audits and management reviews and incorporating feedback from quality-training programs. Gotzamani (2004) added that analysis of these, including any defect or shortfall in performance, would provide valuable information for use in improving the systems and products, where it is required. Moreover (Deming, 1986) said teams are essential for maintaining constancy of

purpose; for breaking down barriers between departments and for driving out fear, and team leaders must have the ability to motivate team members in ways to meet these objectives.

Ahire et.al (1996) have also developed measures for constructs commonly associated with TQM by the **Baldrige Award,** including top management commitment, teamwork ,customer focus, employee involvement, employee empowerment, employee training, and others. The most famous set of prescriptions to emerge from Deming's work were the Fourteen Points (Deming 1981, 1982 and 1986). The emphasis of these points is essentially about the attitudes that should exist and the nature of the relationships among people in successful organizations. From the Fourteen Points, a number of researchers began to develop concepts and theoretical relationships between them that specify the relationship between TQM to different sector.

Deming (1993. P.105) said in the late 1970s and early 1980s, previously unchallenged American industries lost substantial market share in both US and world markets. To regain the competitive edge, companies began to adopt productivity improvement programs which had proven themselves particularly successful in Japan. One of these "improvement programs" was the total quality management (TQM) system. The researcher needs to be done to examine cultural attitudes among construction workers in Sudan with the goal of predicting potential obstacles to the adoption the principles throughout the construction sector.

2.7 The Need for A framework:

The survey of TQM literature revealed that TQM implementation is perceived as a complex process and as an arduous task and reveals that the quality provided only guidelines or prescriptions and did not offer a specific model or framework for implementing the concepts and principles of TQM. Morris and Haigh (1996), to interconnect the macro or contextual elements of his model with its micro elements or principles, through a number of operational concepts in order to provide the basis for day-to-day Activities that make TQM manifest within an organization. Moreover Smith et.al (1993) states that one of the common reasons for the failure of TQM is the cultural position of the company.

The Egan Report on Rethinking Construction (Egan, 1998) stresses the need for the project to make substantial changes in its culture and structure, as a driver for

improvements inefficiency, quality and safety. However, addressing culture change has not been easy since most people are unclear about exactly what this means and how it should be approached.

This research is carried out in one developing country, and then it is important to take 'it into consideration in line with other external barriers. Moreover Cameron and Ouinn (1999) states that to implement the TQM effectively in any organization, an investigation and assessment of the existing organizational culture and management approach appeared very important barriers and should be taken in consideration in any organization. External audit is used to monitor or scan the wealth of strategic published information, this process of collecting and analyzing external research information is sometimes called environmental scanning. Johnson and Scholes (1997) agree stating that a strategy can be seen as matching the activities and needs .the organizational culture barriers are the most important barriers to overcome to make an organization successful in implementing TQM in the organization within the changing environment in which it operates.

Gallear(1997) stated that the organizational barriers, which include the lack of understanding the benefits of TQM, awareness of TQM standards, lack of top management commitment. leadership and involvement, and lack of employees' involvement and empowerment. The researcher benefited from these different classifications in developing the conceptual framework for this research as below, affecting the implementation of TQM in their studies into different groups and this project has drawn upon this research in developing the conceptual framework for this model. The review of TQM literature showed that TQM culture could be considered one of the main barriers preventing Sudan organizations from adopting TQM in their construction management practice. Accordingly, it is recommended that an organization intending to adopt TQM should search for an appropriate framework or model that could guide and assist it to make these principles operational. The following presents and proposes a conceptual framework for TQM implementation in Sudan construction companies.

2.8 The Key of The Conceptual Framework:

The benefits or the idea from the western sources uses them to interrogate Sudan culture and cross the line from western to Sudan culture. In the 1940s, Japanese products were perceived as cheap, shoddy imitations. Japanese industrial leaders

recognized this problem and aimed to produce innovative high quality products. They invited a few quality gurus, such as Deming, Juran, and Feigenbaum to learn how to achieve this aim.

2.8.1 Quality Control and Management:

It developed quickly and became a main theme of Japanese management. The idea of quality did not stop at the management levels. Quality circles started in the early 60s. A quality circle is volunteer group of workers who meet and discuss issues to improve any aspects of workplace, and make presentations to management with their ideas The term 'total quality' was used for the first time in a paper by Feigen Baum at the first international conference on quality control in Tokyo in 1969. The term referred to wider issues within an organization. lshikawa also discussed 'total quality control' in Japan, which is different from the western idea of total quality.

According to his explanation, it means 'company-wide quality control' that involves all employees, from top management to the workers, in quality control in this research to find out the theory to cross the line from western to Sudanese culture. Samson (1997) the other hand, stated: "Many organizations had previously attempted quality circles, as in parts of Europe and the USA, because these had been interpreted as being the answer to rising levels of manufacturing competitiveness in Japanese companies. History has told us that the majority of these initiatives either did not work at all or fell away after achieving some successes. One of the reasons for this is the lack of appropriate human resource and cultural policies and encouragement."

2.8.2The Conceptual Framework:

It displays the dynamic relationships of the four types of barriers to improvement possibilities and four types or factors in TQM called the pest analyses which is good relations to the public sector organization to find out the cover for TQM and culture barriers. Moreover TQM can be a major change in the culture of an organization. Indeed, it is not free (with due respect to Crosby). The costs are in the form of these barriers, and developing an attitude of life-long learning. Also the justification of difference in categorization, The external and internal barriers are those affecting the company from inside and outside organizations such as policies and legislations of the country's authorities, and from external customers and internal side to the company.

2.8.3 The Organizational Barriers:

It was created from the company's management itself such as weakness in leadership and top management commitment towards the implementation of the system that comes up from management and employee behaviors and attitudes toward the system's implementation. Moreover management culture in questionnaire can give organizations an assessment of their current position and a clear picture of what changes are needed to support a total quality approach. Also according to Atkinson (1990) further states that effective cultural change is the key to successfully implementing TQM.

2.8.4 The Technical and Non-Technical:

It was represented the difficulty that have been found by management and employees in understanding the TQM requirements. From this grouping, it appears that there was a lack in grouping them in just one, two and three categories. Finally, the implementation of TQM includes many issues or barriers that need to be understood and implemented with careful planning and not merely linked to cultural issues. Therefore, the framework is felt to be more suitable, as a vehicle through which to assess the feasibility of introducing TQM into Sudan construction and many of the essential features of TQM that are demanded for improving the Total Quality of case study (A&B) .

2.9 Previous Studies:

Worldwide, much research has been conducted in the field of TQM implementation. After a review of the relevant TQM research , it has been found that different researchers adopted different TQM definitions and frameworks based on their own understanding of TQM and research problems Previous study.

2.9.1 Application of TQM in the CAA by 2008 by Magda Mohamed Salih

The objective of this study:-

To get introduced to the concept of quality and total quality management as tool to improve organization performance.

To conducts (swot) analysis for the civil (CAA) of Sudan as the study problem that it lack of optimum organization structure, no coordination and lack of top management committee.

The result that not satisfies of current plans, strategies, top management and, involved employees and understands customer requirements. She recommends that training, education continuous adopt TQM by top management and continues improvement.

2.9.2 The Level of Application of Total Quality Management and Measurement of their impact on Sudanese Construction Companies (2006) by Alzain

And under study to build a systematic and practical model can be used in the construction Sudanese organizations in particular and business organizations to improve overall performance and integration between the total quality and practical application of theory to practice and obstacles were as follows:

-Do Clarity of objectives for most departments

-Sours In the concept of the study population to the level of quality performance

-Lack of knowledge in organizations of total quality management

Results:

-The application of TQM to achieve performance levels of the organization

-The leadership is the center of decision-not find this leadership effective and supported concepts and methods of total quality management

Recommendations:

The obligation to provide for the application of total quality materials

2.9. 3Lotfe (2003):

The purpose of his study to the selection of a form commensurate with the nature of the construction companies to tend to apply the style of ran its overall quality has not provided a new model and concluded that the palaces of companies towards the implementation of the foundations and the concepts of total quality and either the findings concept wrong to customers about the level of quality and the lack of attention from the administration A'eaugod resistanceKberhmn intermediate departments and rely on a single manager in decision-making

2.9.4 D.Suleiman(2001):

The purpose of his study to build a model commensurate with the nature of the construction companies Awitkon of 10 element (design -contract constructors- partnership with Mordan- and quality operations Mordan- schedule - and the project team work) and results quality was not matching the specifications of reality Tautomer materials and the lack of communication between the parties to the project and not Mutably operations technical specifications to overcome these obstacles that weekly meetings are held to discuss business planning and proper training for quality and Greg project work and the commitment of the administration to provide financial resources for the conduct of training

Chapter3

TQM in the Construction Projects

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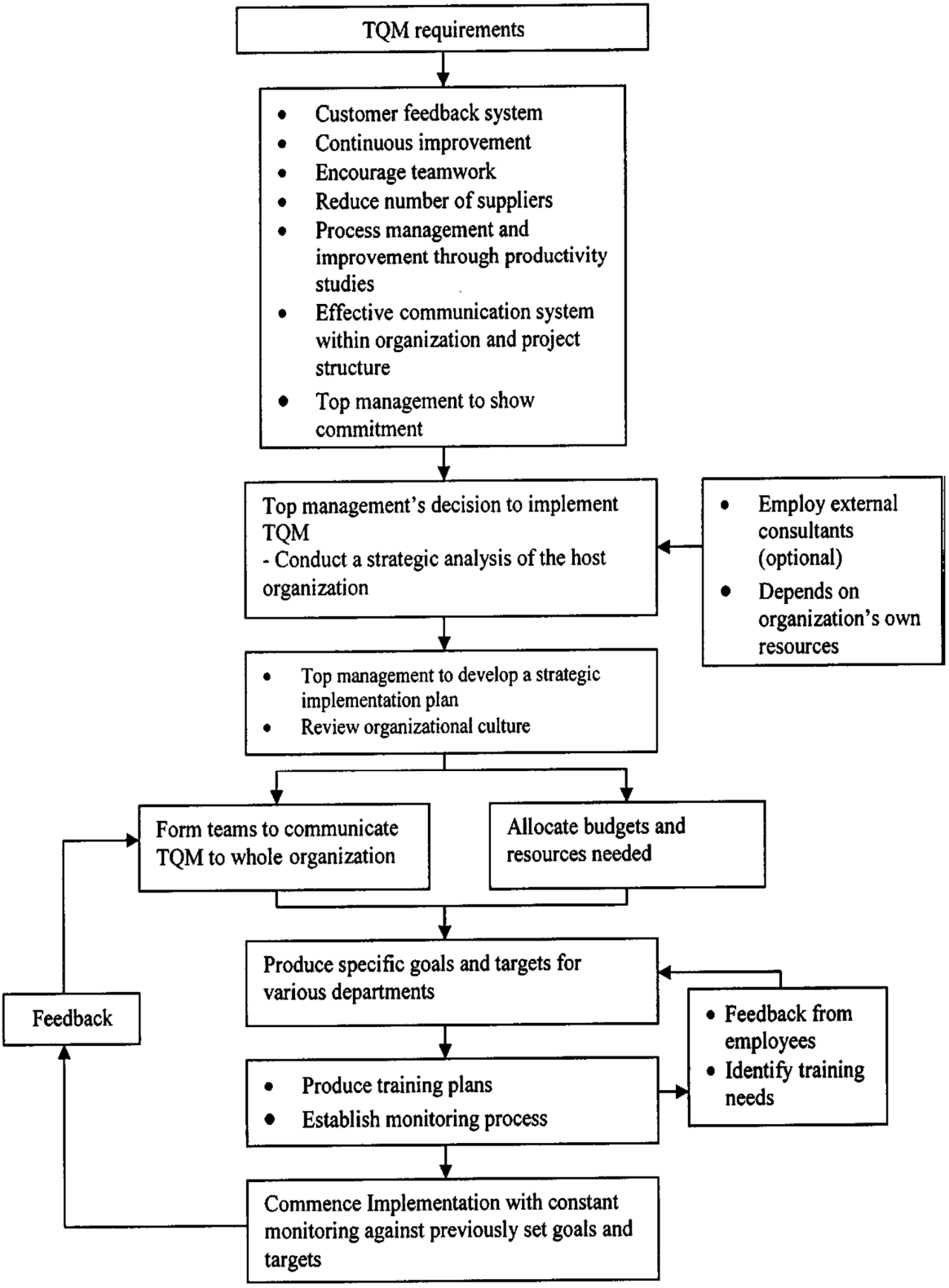
3.1 General:

TQM is the way of managing for the future, and is far wider in its application than just assuring product or service quality – it is a way of managing people and business processes to ensure complete customer satisfaction at every stage, internally and externally. TQM combined with effective leadership, results in an organization doing the right things right, first time.The Everyone has had experiences of poor quality when dealing with business organizations The experience of poor quality is exacerbated when employees of the company either are not empowered to correct quality inadequacies or don't seem willing to do so .We have all encountered service employees who do not seem to care. The consequences of such an attitude are lost customers and opportunities for competitors to take advantage of the market need.Successful companies understand the powerful impact customer-defined quality can have on business. For this reason many competitive firms continually increase their quality standards. For example, both the Ford Motor Company and the Honda Motor Company have recently announced that they are making customer satisfaction their number one priority. The slow economy of 2003 impacted sales in the auto industry. Both firms believe that the way to rebound is through improvements in quality, and each has outlined specific changes to their operations. Ford is focusing on tightening already strict standards in their production process and implementing a quality program called Six-Sigma. Honda, on the other hand, is focused on improving customer-driven product design. Although both firms have been leaders in implementing high quality standards, they believe that customer satisfaction is still what matters most.we will learn that making quality a priority means putting customer needs first. It means meeting and exceeding customer expectations by involving everyone in the organization through an integrated effort. Total quality management (TQM) is an integrated organizational effort designed to improve quality at every level.we will know about the philosophy of TQM, its impact on organizations, and its impact on your life, that TQM is about meeting quality expectations as defined by the customer; this is called customer-defined quality. However, defining quality is not as easy as it may seem, because people are different**.**



Figure(1) Framework for implementing total quality management

3.2 Definitions of TQM:

The definition of quality depends on the role of the people defining it. Mostconsumers have a difficult time defining quality, but they know it when they see it. It would probably be difficult for you to define your quality standard in precise terms. The difficulty in defining quality exists regardless of product, and this is true for both manufacturing and service organizations. Think about how difficult it may be to define quality for products or services. Further complicating the issue is that the meaning of quality has changed over time.Today; there is no single universal definition of quality. quality is the ability of a product or service to consistently meet or exceed customer expectations. "**The degree of excellence of a thing** "The totality of features and characteristics that satisfy needs" (American Society for Quality Control – ASQ) **Fitness for consumer use** – meets or exceeds customer expectations." There are some of the more common definitions of quality. TQM may be defined as managing the entire organization so that it excels on all dimensions of products and services that are important to the customer.

- Marketing, sales, R&D
- Engineering
- Purchasing
- Personnel
- Management
- Packing, storing, shipping
- Customer service

TQM is a broad concept rooted in the Deming philosophy.

3.2.1Conformance to Specifications:

A product or service meets the targets and tolerances determined by its designers. Measures how well the product or service meets the targets and tolerances determined by its designers. Measurable, though it may not be directly related to the consumer's idea of quality.

3.2.2 Fitness for Use:

Focuses on how well the product performs its intended function or use However, if the definition becomes more specific and assumes that the intended use is for transportation on mountain roads. You can also see that fitness for use is a user based definition in that it is intended to meet the needs of a specific user group.

3.2.3 Value for Price Paid:

Is a definition of quality that consumers often use for product or service usefulness this is the only definition that combines economics with consumer criteria; it assumes that the definition of quality is price sensitive.For example, suppose that you wish to sign up for a personal finance seminar and discover that the same class is being taught at two different colleges at significantly different tuition rates. If you take the less expensive seminar, you will feel that you have received greater value for the price.

3.2.4 Support Services:

Provided are often how the quality of a product or service is judged. Quality does not apply only to the product or service itself; it also applies to the people, processes, and organizational environment associated with it.For example, the quality of a university is judged not only by the quality of staff and course offerings, but also by the efficiency and accuracy of processing paperwork.

3.2.5 Psychological Criteria:

A subjective definition that focuses on the judgmental evaluation of what constitutes product or service quality. Different factors contribute to the evaluation, such as the atmosphere of the environment or the perceived prestige of the product.

3.3 Origins and Evolution of TQM:

The concept of quality has existed for many years, though its meaning has changed and evolved over time. In the early twentieth century, quality management meant inspecting products to ensure that they met specifications. Quality became more statistical in nature. Statistical sampling techniques were used to evaluate quality, and quality control charts were used to monitor the production process. Quality began to be viewed as something that encompassed the entire organization, not only the production process. Since all functions were responsible for product quality and all shared the costs of poor quality, quality was seen as a concept that affected the entire organization. Before then quality was still viewed as something that needed to be inspected and corrected. However, in the 1970s and 1980s many U.S. industries lost market share to foreign competition. These foreign competitors were producing lower-priced products with considerably higher quality. To survive, companies had to make major changes in their quality programs. Many hired consultants and instituted quality training programs for their employees. A new concept of quality was emerging. One result is that quality began to have a strategic meaning. Today,

successful companies understand that quality provides a competitive advantage. They put the customer first and define quality as meeting or exceeding customer expectations. Competition based on quality has grown in importance and has generated tremendous interest, concern, and enthusiasm. Companies in every line of business are focusing on improving quality in order to be more competitive.

Companies that do not meet this standard simply will not survive. the importance of quality is demonstrated by national quality awards and quality certifications that are coveted by businesses. The term used for today's new concept of quality is TQM. a timeline of the old and new concepts of quality. You can see that the old concept is reactive, designed to correct quality problems after they occur. The new concept is proactive, designed to build quality into the product and process design.

3.4 Quality Management Methods and Monitoring:

There are four levels to provide quality management and control methods are reviewed in the following:

-Examination or inspection.

-quality control.

-Quality assurance.

-Total Quality Management.

3.4.1Examination or Inspection:

It all activities related to the measurement and test and determine the features and characteristics of the product or Service and comparing them with the requirements and is this activity in construction projects in Inspection and testing of materials and the work carried out and compared with the specifications set out in the eventMismatches are replaced with materials and re-implementation of the non-conforming

3.4.2Quality Control:

It is the activities and practical techniques used to achieve the quality requirement.]The quality in construction projects set includes the following:

- The development of specific standards for implementation (of the construction process) through schemes and technical specifications and conditions that describe each part of the construction process.
- Fur that measure for ensuring during implementation of matching construction work Drawings, specifications and technical conditions.

- Corrective action for fur negative that to decrease the minimum allowable limits and accepted and which do not affect the safety and durability and functionality of the good aspects of the work Construction implemented.
- Planning to improve standards and to increase conformity with it and taking advantage of the negatives and errors that appear in the stage of implementation to be avoided in subsequent stages of implementation and other construction projects.

3.4.3Quality Assurance:

It is all methodology and planned activities necessary to achieve sufficient confidence that,the quality assurance process, product or service will satisfy the quality requirements. Construction projects have a broader meaning of the application of standards and procedures which ensure that the product will achieve the required specifications if apply steps which it includes in this following:

3.4.3.1 Approval or Third-Party Certification:

This requires the participation of a third party (other than the owner And designer) the audited level of work carried out and evaluated in each phase of the construction project (for example, "the study must be audited by a third party") and then approval them, amended or rejected.

3.4.3.2 Check System:

This ensuring its ability to achieve the required quality level and extent compatibility with construction work conditions and with the possibilities available.Advanced planning for requirements an efficient management experience and specialized frameworks quality of the construction work develops executive programs and the practical steps to be performed during the phases of the construction project in order to reach the required quality level.

3.4.3.3 A Comprehensive Manuals on Quality:

This explains the importance of achieving quality of construction work and concepts and related activities.

3.4.3.4 The Use of Quality Costs:

The expenses spent on activities account and Business (audit, the development of plans and specifications) related to quality assurance and compare economically with the results in the event of failure, and that each phase of the construction project.

3.4.3.5 The Involvement of non-Production Operations:

The interest supporting the work of the implementation processmaterials, equipment and calculation of costs and the development of plans.

3.4.3.6 Failure to Adopt the Modeling and Analysis Method:

Are methods study the circumstances surrounding any failure occurs in the construction work to determine its causes and its effects in order to be at work make the necessary correction and avoid it in other works.

3.4.3.7 Adjust the Use of Statistical Operations:

Conducting tests in the course of doing the work to determine the amount of distractions that occur in every phase of the construction project so early treatment before being defects that exceed the allowable limits. And that quality is a key part of the construction process to ensure through all the stages.

3.5 Cost of Quality:

The reason quality has gained such prominence is that organizations have gained an understanding of the high cost of poor quality. Quality affects all aspects of the organization and has dramatic cost implications. The most obvious consequence occurs when poor quality creates dissatisfied customers and eventually leads to loss of business. However, quality has many other costs, which can be divided into two categories. The first category consists of costs necessary for achieving high quality, which are called quality control costs. These are of two types: prevention costs and appraisal costs. The second category consists of the cost consequences of poor quality, which are called quality failure costs. These include external failure costs and internal failure costs. These costs of quality are The first two costs are incurred in the hope of preventing the second two.

3.5.1 Prevention Costs:

All costs incurred in the process of preventing poor quality from occurring. they include quality planning costs, such as the costs of developing and implementing a quality plan. Also included are the costs of product and process design, from collecting customer information to designing processes that achieve conformance to specifications. Employee training in quality measurement is included as part of this cost, as well as the costs of maintaining records of information and data related to quality.

3.5.2 Appraisal Costs:

All incurred in the process of uncovering defects. They include the cost of quality inspections, product testing, and performing audits to make sure that quality standards are being met. Also included in this category are the costs of worker time spent measuring quality and the cost of equipment used for quality appraisal.

3.5.3 Internal Failure Costs:

Are associated with discovering poor product quality before the product reaches the customer site. One type of internal failure cost is rework, which is the cost of correcting the defective item. Sometimes the item is so defective that it cannot be corrected and must be thrown away. This is called scrap,and its costs include all the material, labor, and machine cost spent in producing the defective product. Other types of internal failure costs include the cost of machine downtime due to failures in the process and the costs of discounting defective items for salvage value.

3.5.4 External Failure Costs:

Are associated with quality problems that occur at the customer site. These costs can be particularly damaging because customer faith and loyalty can be difficult to regain. They include everything from customer complaints, product returns, and repairs, to warranty claims, recalls, and even litigation costs resulting from product liability issues. A final component of this cost is lost sales and lost customers. For example, manufacturers of lunch meats and hot dogs whose products have been recalled due to bacterial contamination have had to struggle to regain consumer confidence. Other examples include auto manufacturers whose products have been recalled due to major malfunctions such as problematic braking systems and airlines that have experienced a crash with many fatalities. External failure can sometimes put a company out of business almost overnight. Companies that consider quality important invest heavily in prevention and appraisal costs in order to prevent internal and external failure costs. The earlier defects are found, the less costly they are to correct. For example, detecting and correcting defects during product design and product production is considerably less expensive than when the defects are found at the customer sit.

3.6 The special nature of construction projects:

3.6.1 Definition TQM with Construction Projects:

In spite of the construction projects had arrived late to TQM. In defining TQM for construction projects, we could choose the definition: TQM means keeping the

company running smoothly with continuous input from our owners/customers. In choosing this definition, we accept that the idea is owner-driven and that owners want a new deal from the construction projects. In addition, the further goal is to make each project or job better than its predecessor TQM is a philosophy with a system science point of view that focuses on continuous improvement within the organization so as to providesuperior value to customers. The current generation of TQM concepts isbased on the quality theory and approaches.

The central theme of TQM stresses three principles, i.e. customer satisfaction, employee involvement, and process improvement. The rationale for conducting this research is the need to examine the effect of TQM in construction project and make TQM process to use it to improve construction project (product-service) in Sudan.

A number of empirical studies reported the positive effects of applying the TQM paradigm in construction firms. Some researchers have examined the implementation of total quality management (TQM) and its positive impacts on organization. Equally, many empirical studies examine the effect of TQM in construction firms.

What is the TQM process needed to improve construction project (product-service) quality? So far there is no published research that answers this question. This study investigates this issue using data from construction firms in Sudan. Using empirical data collected from Sudanese construction firms; this study aims to examine the effect of TQM on the better product, service of the construction project. It seeks to assist contractors in identifying the positive effects for the implementation of TQM and presenting aspects of TQM. More attention will be given to investigate the following:

(1) To propose an effect framework (model) for TQM on construction project (product-service).

(2) To examine possible steps for restructuring an organization for TQM.

Total Quality Management (TQM) is an approach to improving the effectiveness and flexibility of business as a whole. It is essentially a way of organizing and involving the whole organization; every department, every activity, every single person at every level.TQM is regarded as an integration of various processes characterizing the behavioral dynamics of an organization. For this, an organization is referred to as a total system, where all the activities carried out are geared towards meeting the requirements of customers with efficiency and effectiveness have propounded this viewpoint by Stating. TQM is the combination of the process towards doing the right

things (externally), everything right (internally) first time and all the time, with economic viability considered at each stage of each process.

TQM has been based on the quest for progress and continual improvement in the areas of cost, reliability, quality, innovative efficiency and business effectiveness. TQM is an approach for continuously improving the quality of products and services delivered through the participation of all levels and functions of the organization. Tobin views TQM as the totally integrated effort for gaining competitive advantage by continuously improving every facet of organizational quality. Deming provides an operational definition of TQM which gives a motivational meaning to the concept. TQM can be successful only if the operational definition is translated into strategies by the leadership of the organization and which are crystallized into actions and communicated to all the people with conviction and clarity. However, TQM may also be viewed functionally as an integration of two basic functions. total quality control and quality management. Quality has been defined in a variety of ways such as "**fitness for use**"; "**conformance to requirements**"; "the amounts of unpriced attributes contained in each unit of priced attributes", among many others. Total quality control is a long-term success strategy for organizations. Customer satisfaction, employee satisfaction, product quality assurance in all its stages, and continuous improvement and innovation, are the main ingredients of total quality control; whereas quality management is a way of planning, organizing and directing that will facilitate and integrate the capabilities of all employees for continuous improvement of anything and everything in an organization to attain excellence. Thus, TQM in an organization brings all the people together to ensure and improve product-process quality, the work environment and working culture. depicts TQM as a pyramid representing five distinct components – management commitment, customer-supplier chain**,** quality systems, Statistical Process Control (SPC) tools and teamwork. The customer-supplier chain forms the top of the Oakland pyramid. It reflects process ownership, process management and process improvement, propelled throughout the customer-supplier chain. have explained that the continuous improvement in quality has to come from an integrated approach of controlling quality via action plans in different operations of the business cycle. They have identified five elements such as customer focus, management commitment, total participation, statistical quality control and systematic problem solving. has mentioned that TQM can be formulated in terms of the three important aspects of continuous improvement, value-added

management and employee involvement. price has identified three dimensions of TQM. They are:

(1) **The product and service dimension**:

The degree to which the customer was satisfied with the product or service supplied.

(2) **The people dimension:**

The degree to which the customer was satisfied with the relationship with the people in the supplying organizations.

(3) **The process dimension**:

The degree to which the supplier was satisfied with the internal work processes, which are used to develop the products and services supplied to the customers.

According to an increasingly competitive world quality is no longer an optional extra; it is an essential business strategy for survival. TQM the evolution outlines.

The evolution of quality concepts and points out that they have evolved from two extremes:

- From control driven to culturally driven.
- From controlling-in to managing-in quality.

It was identified two notable milestones in the evolution:

- The transition from one-off manufacture to mass production or the differential piece-rate system (Taylorism).
- The transition to the communication-oriented industrial society (civil data processing).

The evolution of TQM is the outcome of four major eras of development, as outlined by Garvin. He illustrates the evolutionary process where quality has moved from an initial stage of inspecting, sorting and correcting standards to an area of developing quality manuals and controlling process performance. The third stage was to develop systems for third-party certification, more comprehensive manuals including areas of organization other than production, and to use standard techniques such as SPC. The present and fourth area of TQM is primarily strategic in nature and is based on continuous improvement as the driving force.

Sink identifies the primary factors behind the need for TQM as: the global economy; complex and dynamic technology; complex and dynamic resources; customer orientation and expectations; complex and dynamic task environment; and a shrinking feasible solution space for many critical problems, issues and opportunities. TQM is a fundamental shift away from traditional thinking. The systematic analysis,

preplanning and blueprinting of operations remain essential, but the focus switches from a process driven by external controls through procedure-compliance and basement to a process of habitual improvement, where control is embedded in and driven through the culture of the organization. According to TQM has evolved out of **these five checkpoints**:

(1) Selection and management of upstream systems.

(2) Incoming quality assurance.

(3) Process quality management and assurance.

(4) Outgoing quality assurance.

(5) The proactive assurance that the organizational system is meeting or exceeding customers' needs, specifications, requirements, worth, desires and expectations.

He further states that if an organizational system successfully manages each of these five checkpoints, it will manage quality totally. Nessa L'Abbe emphasizes integrity, methodology and humanity as the essential evolutionary features of TQM. according to him, integrity relates to a management philosophy that focuses on quality with emphasis on both vertical and horizontal integrity. Methodology requires the universal application of scientific methods for the processing of data; and humanity implies that all people are made creative participants through teamwork and quality control circles.

According to Oakland, the task of implementing TQM can be daunting. The first decision is where to begin. This can be so difficult that many organizations never get started; this has been called TQP (Total Quality Paralysis).

Oakland proposes 13 steps to TQM:

1) Understanding of quality.
2) Commitment to quality.
3) Policy on quality.
4) Organization for quality.
5) Measurement cost of quality.
6) Planning for quality.
7) Design for quality.
8) System for quality.
9) Control of quality.
10) Teamwork for quality.

11) Capability for quality.
12) Training for quality.
13) Implementation of TQM.

More proposes a four-stage model to help organizations understand their TQM posture **for the Malcolm Baldrige National Quality Award criteria and the TQM improvement process as:**

Stage 1: current organizational environment assessment.

Stage 2: development of quality improvement strategy.

Stage 3: assessment of education and training needs.

Stage 4: implementation of quality strategy.

However, implementation of TQM is not an easy task as it requires a total change in organizational culture, shifting of responsibility to management, and continuous participation of all in the quality improvement process.

The point out the roadblocks in implementation of TQM as:

- Lack of participation of managers.
- Overlapping of responsibilities of leadership.
- Limited resources.
- Fear of change.
- Work overloads.

3.6.2 Stages of The Construction Project:

The construction project is going through a series of stages usually are:

3.6.2.1 DecisionStage

At this stage, the employer studying the need for the project and sets Requirements related to the project and chooses advisers to assist him in the completion of a preliminary assessment of the project and study the economic feasibility of the project and the extent of the effect of his presence in respects economic, social, and should be on the owner of the project at this stage do several the most important arrangements to identify a project manager commissioner of him with a special work team to the project, and also the completion of the project description in terms of function and link.

3.6.2.2 Study and design phasestage:

It is transforming the aspirations of the employer and his ideas and requirements related to the project to specific proposals through:

- Do the completion of a preliminary design for the project defines the legal and regulatory requirements it related to the project (such as building foundations and regulations) as well as the specifications and conditions of materials construction methods used and the key depending on the function and nature of the project.
- The cost of preparing a plan by the quantities engineer in coordination with the design team.
- The completion of the final design: it is to start after the completion of the initial design and plan costs which resembles the initial design, but not more detailed e y through which all putplans and specifications and conditions for how to guide the port implementation.

3.6.2.3 Contracting or Choose ContractorStage

It means the method or the way they are through choosing the contractor who will carry out the project

Preferably the appointment of the main contractor after the completion of the preliminary design and cost plan for it

Whenever early appointment of the contractor was his contribution with regard to the quality of the project more effective

3.6.2.4 Implementation of The ProjectStage

A production phase of the project, in which the Contractor receives the site to complete the project work Planned in the previous stages.

This includes the area of work have three main components, namely:

(1) **Preparation** of information and documentation control to be relied upon in the course of implementation.

(2) **Materials** used in the completion of the project work and compliance with the specifications.

(3) **Comply** with the special requirements which include:

- Made quality (quality of work of the project).
- Program time: He who believes in the coordination of project activities and work and helps control the completion of these actions is the right time in order to complete the project on time.
- Cost: must be cost control in accordance with the requirements of the employer and compared with plan cost so that the total cost of the project remains controlled.

3.6.2.5 Practical Completion and ReceiptStage:

A stage at which the project is the work of the contractor which is enough to allow the owner acknowledge to the project.

The project owner to conduct a preview of the work of the project and the issuance of the list of defects In which the contractor must repair order to receive a certificate of practical completion(Provisional acceptance) which determine the start of the period of liability for defects (Guarantee), which amounts to Usually a year or six months, depending on what is contained in the contract. And during which the Contractor is not responsible for all defects that appear repair and then gets the repair these defects certificate. and ending responsibility for project.

3.6.2.6 Operating, Investing and Project Management Stage:

After receipt of the contractor of the project owner must outfitted to become not just around the run and investment in order to achieve the economic objective of it and become full legal responsibility And financial responsibility for the safety of the building occupants and the responsibility of the owner and that he must It provides security and safety procedures on an ongoing basis and to provide the correct usage instructions And believes in continuous control for the entire project to detect defects that appear during. Direct investment and make the necessary maintenance as soon as possible.

3.7 Differences between Construction Projects and Manufacturing Projects:

The major development in the quality assurance systems in recent years, which is focused event Applied in manufacturing, but these systems and their applications are still new in the field of With the construction that can be compared to the build process of the manufacturing process, there remain points Many differences between construction projects And manufacturing projects in terms of quality and the application of systems and these differences are:

- **A construction project** is the product in the construction industry and that's when it becomes under investment The majority of construction projects to be a single, non-recurring, and the product at the manufacturing projects is a particular commodity produces a large number of them in a short time and frequently. Construction work site - manufactory reach of both raw materials turning it into a product but the site Construction equips each project from the beginning that any

particular each project while factory Materials come to him and he is always the same place.

- **Each project** in the construction industry has a special working group and movement happens sometimes for some Staff of the draft elements to another, which reduces the potential benefit of these elements in the process of improving quality in the long run. In the factory View Work is always the same and the same place continuously in the production process itself frequently It Tm benefit from previous lessons in the process of improving the quality.
- **In the construction** industry there is a long period of time after the end of the study and design in order to be Construction process and that the project be active until a resolution is not investment for it is often the study is the implementing agency which makes the design team of the defect or deficiency, which benefit May appear in the course of construction or investment in manufacturing far while the Tests The effectiveness of the design process and corrective actions can be quickly applied and that Asama The plant itself, which is the design and production.
- **A special characteristic** of the construction project lead to administrative difficulties in its implementation which requires additional efforts and achieve the performance requirements in the project including quality and the time and cost.

Chapter4

Research Methodology

&

Analyses

Chapter 4

Research methodology and analyses

4.1 General:

The study combines two methods for collected data one of the is the survey questionnaire and the other is interviews to mangers, professionals.

The questionnaire aims:

- To improving TQM process at the construction phases in the Sudanese construction companies.
- To achieve customer satisfaction by activated competition
- To adopt to do better manage for our projects and construction companies to higher quality, better value and low cost
- To design a frame for the application of the TQM according to result of SPSS analysis conducted.

Total of 100 questionnaire copies were distributed to the companies construction (road –building –watering) and servicing companies.

Example of companies (Al Dar consulter –MAN company – P.G.M company-ministry of petroleum and gas - Hamdi Consulting companies)

Five Point Likert scale (strongly agree – agree – neutral – strongly disagree – disagree). the questionnaire to identified TQM in construction project. After return the questionnaire feedback, we analyzed by using statistical program society sample (SPSS). The second method the interviews were used to understand the effect of TQM user and Showing the current performance of the Sudanese construction companies.

4.2 A Brief Description of Responding:

To Study the reality of quality in the construction projects in Sudan by preparing a survey of systems and specifications adopted in the management and quality control in Sudanese Construction Projects multiple kinds in the fundamental stages. And so by looking at the number of engineering projects and the content of the documents and papers and visit some of the projects in the pipeline and conduct interviews with

managers and engineers implement them and some contractors as well as visit some special engineering offices and some institutions and companies working in the field of construction, and inquire of the workers for the available means they have adopted in the management and quality control. In order to give an idea of these regulations and specifications have shown The following: a lack of codes that are used during the study and design stage for most types of construction projects It means of quality management and control in the contracting of a specific set of laws and decrees, as the stage is limited.

In the implementation of basic references quality management and control of the stage is the technical conditions book for each project as well as a book of general conditions and specifications issued by the party that the project is in its favor. Moreover questionnaire was developed for quality management in construction projects in Sudan {text questionnaire extension} inquiries about some of the issues and issues related to quality management in construction projects, has been distributed to a number of workers in the industry and from different categories (engineers - contractors –managers .....) in order to know their views on the issues raised in the questionnaire and in every phase of the construction project and after obtaining the answers participants were discharged in the tables. After it has been conducting a study and analysis of these answers in order to benefit in an idea of the reality of quality management in construction projects in Sudan, it was to identify some of the flaws and deficiencies and provide some suggestions and recommendations which will help to avoid some of the barriers to quality management and improvement in construction projects.

According to the information that taken from the Sudanese contractors union about the number of registered and unregistered factors the researcher set the number of target contractors for the contractors for the questionnaire .the registered factors as 2000 contractor at the whole Sudan registered and about from that number we toke random sample of contractors to exceed of this study from the contractors list that given from the Sudanese contractors union(see appendices) this study is limited to Khartoum companies. that most contractors concern in it and most large project implementing in it . so that the researcher targeted approximate **5%** of contactors the number of the random sample will be **100** contractors.

The researcher takes the field data by distributed questionnaires and designs it to three parts (general information, effective factors in construction projects and the employs notice). The researcher distributes 100 copies of questionnaire for random companies but only 92 questionnaires are feedback. A lot of contactors not complete there questioner because they not have time.

4.3 Analysis the Factors of Total Quality Management Affectingon the Construction Projects:

Assist contractors to identifying the positive effects for the TQM on Sudanese construction projects. Top management commitment and leadership, empowerment & involvement, participation, recognition & reward, education & training, and change design has positive effect on employee satisfaction and top management commitment, employee participation and teamwork does not have positive effect on construction project. Supplier quality management has positive effect on client satisfaction. Design of construction project and client focus has positive effects on quality of construction project. This result specified the type of TQM model effect on Sudan construction firms.

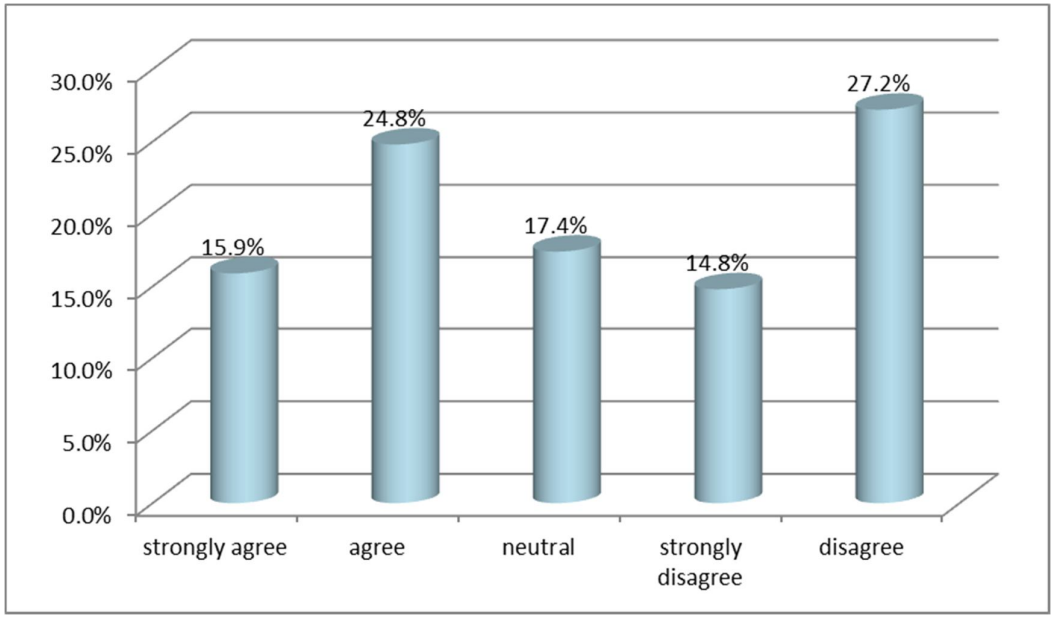
Data analysis show that, top management does not learn most of TQM concepts, low salary, incentives and training almost non-existent, poor quality of imported materials. These results assist author to identifying TQM process needed to improve construction project.

The more finding of this research are; project teamwork satisfaction has positive effects on client satisfaction and on construction project and does not have positive effects on quality of construction project implementation has positive effects on client satisfaction, Client satisfaction does not have positive effect on construction project Finally, validity and reliability of instruments measuring total quality management and its effect in this study that can be used by other researchers to measure the impact of the application of total quality management in construction projects.

4.3.1 Leadership:

Table No. (1) Leadership

Leadership	Strongly Agree	Agree	Neutral	Strongly Disagree	Disagree
1. lead the company to have a clear vision of quality requirements	20	27	17	6	22
2-leadership of the company is always working to find the best ways to reduce the cost	32	41	10	3	6
3-leadership encourages staff to propose solutions to problems and choosing the best ways to solve them	8	16	21	13	34
4. leadership focuses on the work of regular meetings with various team	7	13	9	22	41
5-leadership is developing a budget for the implementation of projects	6	17	23	24	22



.Figure No. (2)Leadership

Has negative effect on employee satisfaction the mean response for the questionnaire survey that means the top management lacks the knowledge of the concept of TQM. The reason for this in the flowing: - most of construction firm are private company and the top management is Owner Company and there is not a great deal of learning and does not have any experience. Also the results show that **(27.2%)** disagree the top management has great effect on employee satisfaction. According to the results of interviews, leadership is the one most important factor affecting employee satisfaction.

4.3.2.Quality Management:

Table No. (2) Quality Management

Quality Management	Strongly Agree	Agree	Neutral	Strongly Disagree	Disagree
1-quality means comply with the specifications and conditions agreed	23	30	-	17	22
2-quality means matching use	17	63	-	4	8
3-mean quality flawless product	18	29	12	22	11
4. Setting the quality of the product depends on the experience of your company in the implementation of the work	10	40	3	27	12
5-to adjust the quality of the product depends on the company inspection and laboratory tests	18	62	2	3	7
6-be realized quality of the product after the completion of stages and when running	19	33	13	8	19
7-institution apply quality assurance and quality assessment system	12	46	10	16	8

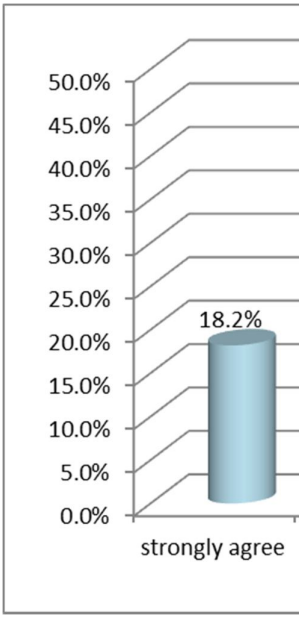


Figure No. (3)Quality Management

The questionnaire finding revealed that quality management has negative effect on quality of project implementation 47% that agree of not quality .The mean response for the questionnaire that Means Company not paid much attention to produce quality design, and that comes through reviewing project design before construction at side and make preliminary project design. The most common important component for producing quality project is the coordination and participation among the various departments in project development. This gives an indication that must company focuses on client, and trying to produce quality project

4.3.3 Human Resources Management:

Table No. (3) Human Resources Management

Human Resource Management	Strongly Agree	Agree	Neutral	Strongly Disagree	Disagree
1-are interested administration understand the problems of workers and work to resolve them	20	39	5	16	12
2-We have a system of user satisfaction	5	17	29	19	22
3-quality objectives are clear to users	33	28	14	7	10
4-define the functions of the users according to their skills and abilities	25	32	10	11	14
5-stimulates the administration staff to improve the quality of the product	12	17	9	25	29
6-stimulate administration employees to reduce the cost of production	15	13	11	22	31
7-involve employees in the decision-making essential part company	2	5	12	31	42
8-are interested administration to people with experience and competence to increase competition	39	32	8	3	10

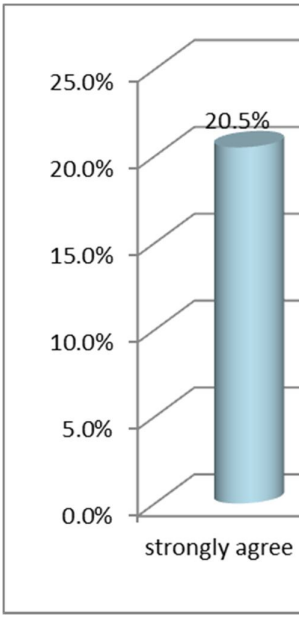


Figure No. (4) Human Resources Management

Have a positive effect on employee satisfaction. The following points explain that:

The employee participation in their respective firms was actually "forceful" and not based on the free will of the employees, the decisions made individually by the top management only. In most companies owner of the company is its director, and Most of the employee recommendations and views are ignored. The total mean for the recognition & reward participation, the questionnaire finding revealed that recognition & reward have positive effect on employee satisfaction .In construction projects in Sudan we need to implementation the policy of recognition and reward. This policy includes for example public recognition, salary increasing, promotion, bonus, non-monetary rewards(non-material rewards). Questionnaire survey response shows that reward and recognition is absence because the following: - Focus on Individual performance, related evaluation, Reward practices.

The total mean for the empowerment & involvement was the assumed mean The questionnaire finding revealed that empowerment & involvement has positive effect on employee satisfaction.(Decisions made individually by top management only, Most of the employee recommendations and views are ignored and In most companies owner of the company is its director.

The questionnaire finding revealed that change design has negative effect on employee satisfaction .The mean(**24.9)%** response for the questionnaire that means positive effect on change of design makes effect on employee reflected in low of employee production and employee interaction with work. Some of Sudanese construction problem related to change design like project late finishing, decrease quality. It should be emphasized that special program for employee to deal with design change is very necessary.

4.3.4 Cost Management:

Table No. (4) Cost Management

Cost Management	Strongly Agree	Agree	Neutral	Strongly Disagree	Disagree
1. The cost of the study and design determined based on the size of the project	48	23	2	9	10
2. The cost of materials and equipment are determined before beginning of the project	5	60	0	23	4
3.labor cost and additional works increases or decrease depending on the work	20	49	3	7	13
4. material incentives increase the cost	2	40	5	27	18
5. cost of Re-workproduces from its failure to perform right from the start	18	60	7	3	4
6.measurement of product defects regularly expensive	10	29	5	36	12
7.measurement When the defect expensive	38	43	0	3	8
8.institution benefit from knowing the reasons for the cost increase in order to avoid falling in the next project	21	22	10	17	22

9.interested in your organization to choose a price least to reduce the cost of the project	15	33	6	25	13
10.interested in price with the quality and speed of implementation of the project	21	55	2	10	4
11.changes in currency rates affect the cost	70	15	2	2	3

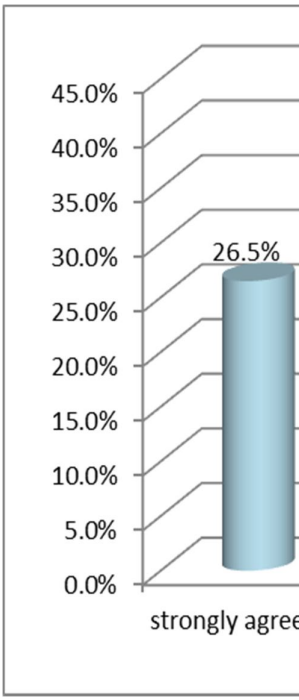


Figure No. (5) Cost Management

The questionnaire finding revealed thatcost management is (**42.4 %**) the mean cost of material and equipment, labor and additional work ,mearing defect regularly ,salary ,low quality, that mains we cannot have low cost of our projects there are more effect in it .

4.3.5 Time Management:

Table No. (5) Time Management

Time Management	Strongly Agree	Agree	Neutral	Strongly Disagree	Disagree
1-deliver the project on time goal for your organization	34	28	15	2	13
2-Track institution adjust a timetable for the project time	32	38	2	8	12
3-institution provide you with the information and orders in time	19	42	10	9	12
4-institution are interested the report of the workflow that match the timetable	26	23	19	8	16
5-Foundation is committed to financial claims in time	3	9	5	32	43
6-mutatis institution provides to fix errors to reduce wastage of time	17	35	10	14	16

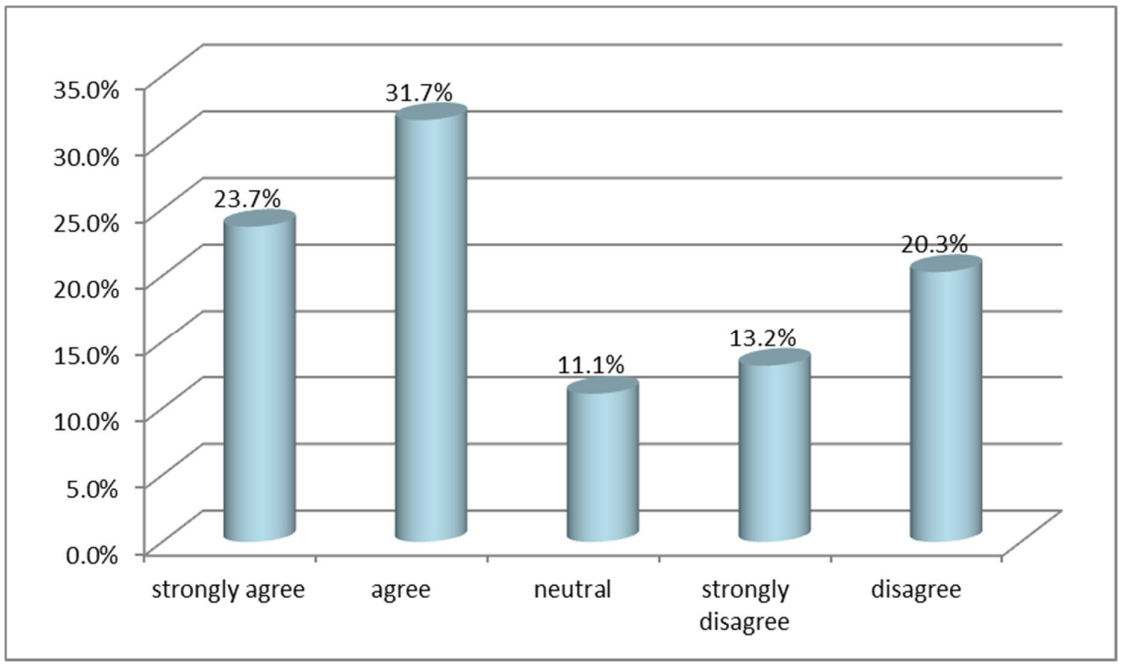


Figure No. (6) Time Management

The questionnaire finding **31.7%** agree of the total means of delivery project on time , time table .barrier away ,report, inspection, requirement financial and the recommend change.

4.3.6Focus on Customer Satisfaction:

Table No. (6) Focus on Customer Satisfaction

Focus on Customer Satisfaction	Strongly Agree	Agree	Neutral	Strongly Disagree	Disagree
1-complete satisfaction of the customer requires knowledge of the company itself and its product and compete and its client	39	32	3	8	10
2 customer-satisfaction of the fundamental objectives of the company	19	43	14	4	12
3-viability of the company to resolve customer problems	28	39	6	9	10
4-Company derogating to all customer orders	8	22	9	16	37
5- Company is working to involve the customer in the stages of production	22	27	12	15	16
6- Companyinterested customer satisfaction internally and externally	25	36	7	14	10

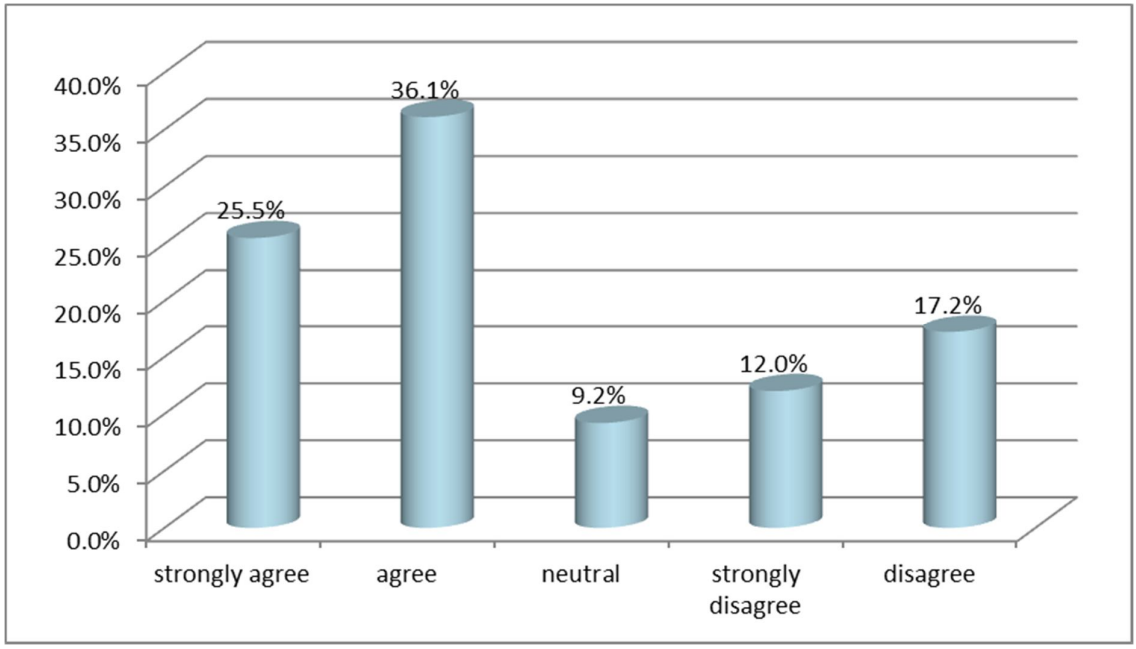


Figure No. (7) Focus on Customer Satisfaction

The questionnaire finding revealed that change design has negative effect on customer satisfaction the companies not doing that: the mean (**36.1%**) lead to uncustomary satisfaction.

4.3.7Communication Management:

Table No. (7) Communication Management

Communication management	Strongly Agree	Agree	Neutral	Strongly Disagree	Disagree
1-continuing to discuss business meetings and put forward opinions	3	10	7	25	47
2. effective communication system company	7	13	10	36	26
3-ease of access to information	11	17	19	23	22
4-easy follow-up works and the distribution of tasks	16	12	21	20	23

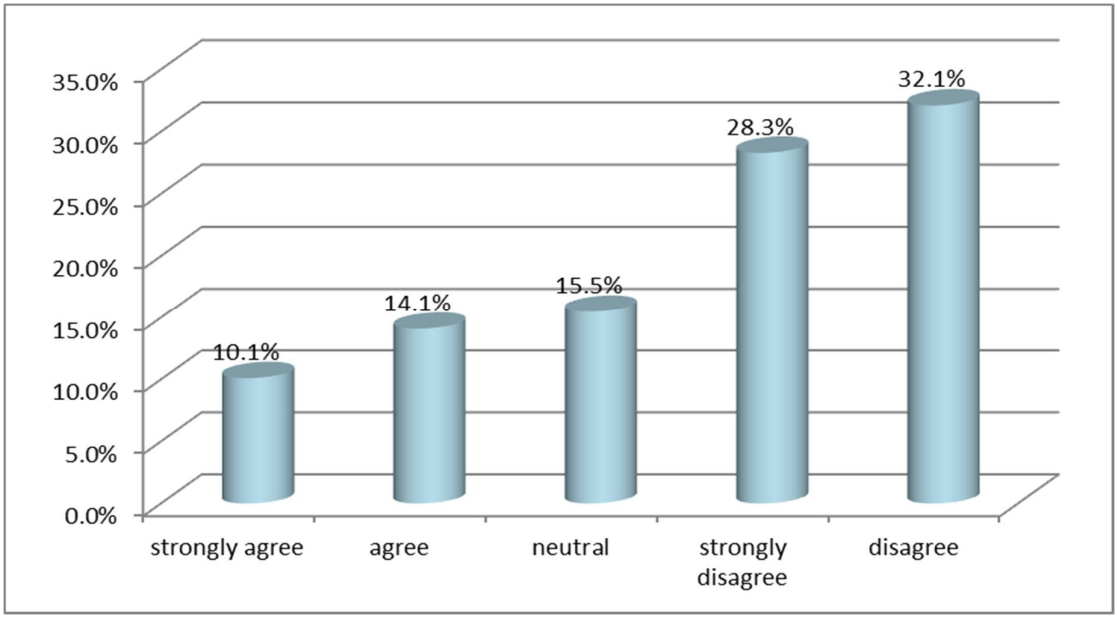


Figure No. (8) Communication Management

The questionnaire finding the communication provides the means of raising quality awareness and involvement and reinforcing the message. It is also critical as a means of Publicizing achievements and recognizing contributions to quality improvement. The means (**32.1%)** lead us to know it lake of communication.

4.3.8 Training, Education and Development Management:

Table No. (8) Training, Education and Development Management

Training, Education and development management	Strongly Agree	Agree	Neutral	Strongly Disagree	Disagree
1- self-learning from experience and from past experience	35	29	13	5	10
2-learn from the experiences and best performance of others	40	37	8	2	5
3. human resources training and new skills needed for the project and team work	12	14	5	22	39

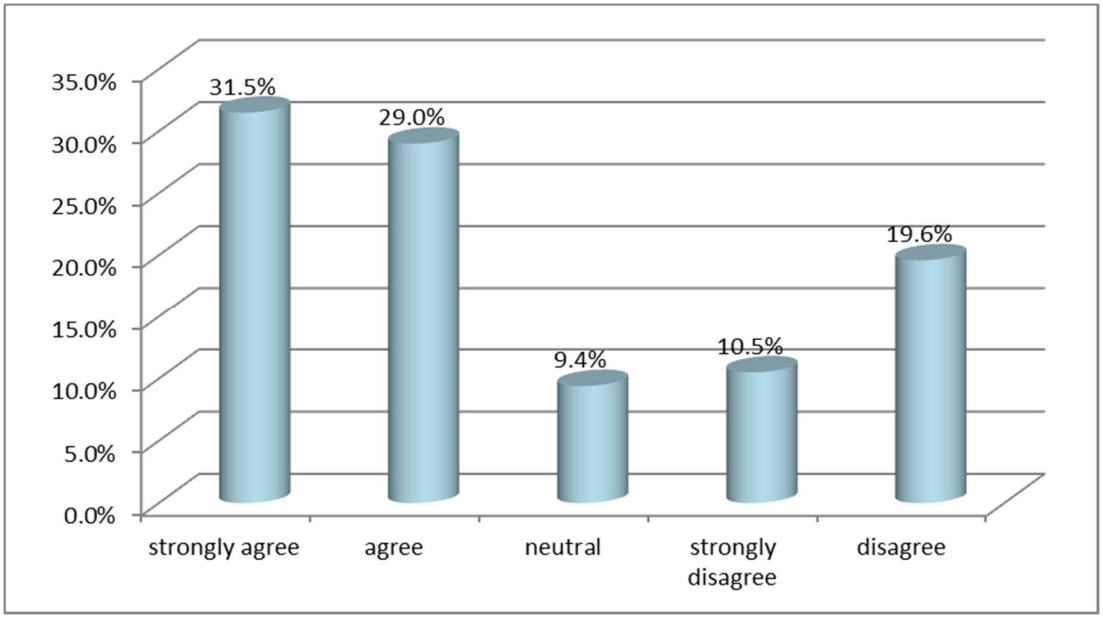


Figure No. (9) Training, Education and development management

The questionnaire finding the Training, education and development should cover all employees as part of an ongoing process, with the scope and depth tailored to suit each group's needs. The total mean of effect that (31.5) %in need it. That led to enhance continuous training and education.

4.3.9 Process Control and Improvement:

Table No. (9) Process Control and Improvement

Process Control and Improvement	Strongly Agree	Agree	Neutral	Strongly Disagree	Disagree
1- lead your work in the form of operations	8	11	1	40	32
2-you have a good plan for any process increases a profit	25	37	3	12	15
3-you have a good plan for any process reduces errors and re-works	11	16	10	25	30
4. you have a good planning of an operation	5	17	8	29	33

reduce the cost of quality					
5-you have a good plan for any process that leads to customer satisfaction	6	5	12	31	38
6-you have to know the seven operations quality measurement	7	10	9	34	32

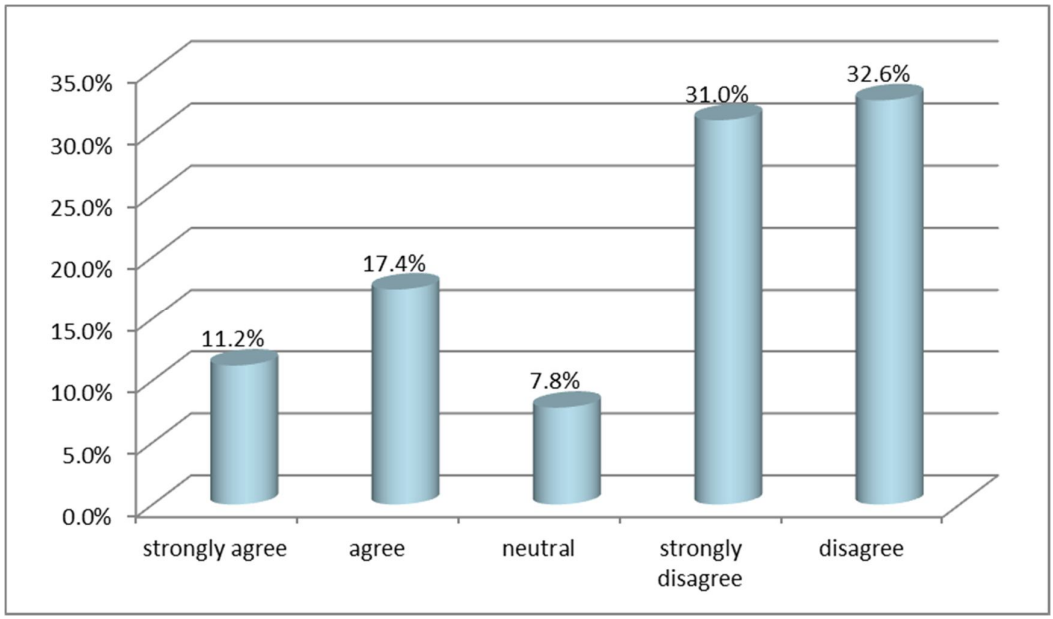


Figure No. (10) Process Control and Improvement

The questionnaire finding revealed that process control and improvement the mean of strongly disagree (32.6%) that lead non documentation to take feedback. That shows not form of operations, don't have a good plan for any process reduces errors and re-works, don't have a good planning of an operation reduce the cost of quality, don’t have a good plan for any process that leads to customer satisfaction and don’t know the seven operations quality measurement .

4.4 The Impact of TQM on the Sudanese Construction Projects:

From the data collection it can be shown that the concept of TQM in most Sudanese construction firms is absence.

Data analysis for this study shows that the TOM has positive effects on construction teamwork satisfaction, quality of construction project implementation, client satisfaction and construction project implementation. So TQM can increase the performance of construction project by reduce time and cost and increase the quality of project implementation. These results assist contractors to identifying the positive effects for the implementation of TQM on construction projects. Top management commitment and leadership, empowerment& involvement, participation, recognition & reward, education & training, and change design has positive effect on employee satisfaction and top management commitment, employee participation and teamwork does not have positive effect on construction project performance. Supplier quality management has positive effect on client satisfaction. Design of construction project and client focus has positive effects on quality of construction project implementation.

Data analysis show that, top management does not learn most of TQM concepts, low salary, incentives and training almost non-existent, poor quality of imported materials. These results assist author to identifying TQM process needed to improve construction project performance. The more finding of this research are; project teamwork satisfaction has positive effects on client satisfaction and on construction project implementation and does not have positive effects on quality on construction project performance, quality of construction project implementation has positive effects on client satisfaction and construction project implementation, Client satisfaction does not have positive effect on construction project implementation.

Finally, validity and reliability of instruments measuring total quality management and performance of the project in this study that can be used by other researchers to measure the impact of the application of total quality management in construction projects.

Chapter 5

Conclusion

&

Recommendations

Chapter 5

Conclusion and Recommendations

5.1 Results

By studying the reality of quality management in the Sudanese construction projects in the state of Khartoum and research in various Its aspects and checking in on the means and methods used for quality control in industry Construction as well as the systems and procedures relating to the contractual quality management projects Construction has been shown to suffer from quality management Some deficiencies and therefore need to ensure that a new formulation to achieve a high level The quality of its projects in order to keep pace with their counterparts in developed countries, and the result of this research is During the current reality of quality management in construction projects to draw clear Bugs and shortcomings are in the following aspects:

- A lack of economic feasibility study in financial planning in many projects.
- Lack of characterization and identification of project requirements related career and his performance.
- There is a shortage in the study process e y are often begin detailed study without discussion Legal and regulatory requirements of the project and the modalities for better implementation.
- In most of the projects are not taken to check the study by a third party.
- A defect in the method of selection of the study based on more of the financial evaluation, technical evaluation.
- There is a shortage in the study, design and lack of matching study of reality accurately.
- A lack of efficiency of the contractors as a result of random access to this area of work and cause a lack of focus in the selection of contractors who have previous experience in similar acts.

- Selection of a contractor in most of the projects based on more than the technical evaluation and financial evaluation.
- Lack of full compliance with the requirements and specifications by the contractor in order to seek to achieve greater profit
- Do not secure the necessary materials and equipment for construction in a timely manner in a large section of the Projects.
- Neglect of the supervisory department of the projects in the application of good supervision and conduct All the necessary tests in the course of implementation and rely only on some tests in at the end of the implementation of receipt.
- Lack of coordination between the parties to the project (the owner - designer - contractor – supervisor) and the absence of contractual requirements include an effective format.
- The emergence of defects upon receipt cannot be fully corrected or be the cost of repair very big.
- The presence of defects don't discover on delivery as a result of a lack of inspection conducted by the owner or as a result of lack of experience or delayed as a result of its appearance.
- A lack of guidelines and procedures for the correct usage.
- A lack of control measures for the origin and detection of defects and lack of maintenance.
- Lack of experience and competence to the authorities and carried out the study and supervising.

All of it leads to our study in this research to gain access to high-quality product with less cost by using the quality management has faced a lot of obstacles that was instrumental in not achieving the desired goals.

5.2 Conclusion:

The present study provided an overview of the TQM. From, theories and philosophies of known quality were explained because they are the basis of TQM. the roots of Total Quality Management (TQM) go back to the teachings of Juran, lshikawa, Crosby, Feigenbaum and countless other people that have studied, practiced, and tried to refine the process of organizational management. TQM is a collection of principles, techniques, processes, and best practices that over time have been proven effective. Most all world-class organizations exhibit the majority of behaviors that are typically identified with TQM. line overview also reveals that Total quality management concepts have evolved throughout the history; therefore, TQM could be regarded as an extension of the previous quality management concepts and methods, An extensive review for the literature was carried out by the researcher to get a deep understanding of issues related to TQM implementation in construction project. Many important barriers should be taken in consideration by any organization's management to avoid those becoming barriers in implementation of the TQM. for example, culture, top management commitment, education and training programs related to the system, employee involvement and empowerment and effective communication. Many barriers have found to affect TQM to be implemented.

5.3 Recommendations:

Some recommendations outlined in the existing literature may have been more appropriate to applied TQM. Based on the study of the Sudan construction case, the following recommendations can be emphasized for Sudanese construction companies to improve construction project quality:

- ❖ Emphasis on the implementation of the -basic stages of the construction project properly.
- ❖ Attention to the preparation of the study for the project, whether preliminary or detailed scrutiny and the need by a third party
- ❖ Reconsider the contract in a manner which gives the largest financial assessment of the importance of the evaluation technical.

- Need to apply sufficient control by the authorities supervising during implementation and conduct of all possible tests so as to ensure a good level of implementation.
- Reliance an engineering and scientific management methods in the course of implementation, such as programming time and programming resources and costing methods and optimal investment mechanisms.
- Need to fully comply with the conditions and technical specifications for the project
- Focus on the receiving process so that the procedures and pre-set" enough to ensure a lesser extent of defects and errors
- Need for facilities and maintenance control during reinvested permanently.
- Allocating a percentage of the profits of the company's for training and education programs.
- Establishing a team from inside or outside the company for training and education of employees and to work out special programs to deal with the requirements of design changes.
- Devote at least 6 hours a month for education and training.
- Making lists graded of rewards (for bonuses and incentives).
- Give more freedom for employees to make decisions on their jobs and should be encouraged to propose solutions for problems which arise during work.
- Adopt a policy of product quality for the formation of long-term relationships with suppliers.
- Administration's choice should be done through efficient and effective mechanisms proposals.
- Organize training course for top management in TQM concepts.
- Top management must participate in quality management activities.

5.4 Further studies:

This research proposes to investigate the effectiveness of TQM in Sudanese construction project through implementing TQM methods and control to achieve excellence in to products and services to gain customer satisfaction. the researcher suggest to go further from here by investigate customer satisfaction index so that the companies will measure their quality products , services to meet that index.

Appendices

Questionnaire copy English (1)

Name of companies' questionnaire distributed for it (2)

References:

[1].Abdul-Rahman, Hamzah-**Study of Quality Management in Construction Projects**University of Malaya, Kuala Lumpur, Malaysia Chinese Business Review, ISSN 1537-1506 July 2011, Vol. 10, No. 7, 542-552

[2].Ahmed Bakhit Elballa,2006, **contractors &buildings management** , 123/2006 g-town Khartoum.

[3].Ahmed S. A. "**total quality management in construction firms**" Ph.D. Scholar, Department of Construction Management, Florida International University, Miami, Florida, USA, 2008.

[4].Ahmed S.M and Torbica Z.M. "**Use of Quality Function Deployment in Civil Engineering Capital Project Planning**" Journal of construction engineering and management/ July/August 2003.

[5].Al Sinan, "TQM and the Construction Industry ".Ph.D thesis university of King Fahd university, Saudi Arabia, 2004.

[6].Ana A. and Patrı´cia M. E Sa´ "Are **TQM principles supporting innovation**in the Portuguese footwear industry?" Elsevier Technovation 28, pp.208–22, 2008.

[7]. Anderson, J.C., et al., A path analytic model **of a theory of quality management**underlying the Deming management method: Preliminary empirical findings, Decision Sciences, Vol. 26 No. 5, pp. 637- 658, 1995.

[8]. Brati, J. L., and Oswald, T. H. ''Implementing total quality management in engineering and construction.'' J. Manage. Eng., 9(4), pp.456–470, 1993.

[9]. Burati J.L., Matthews M.F., Kalindi S.N**., Quality management in construction Industry, Journal of construction Engineering** and Management 117(2),pp.341-359, 1991.

[10]. Chini, A. and Valdez, H. ISO 9000 and the U.S. Construction Industry.Journal of Management in Engineering.ASCE. 19 (2), pp.69-77, 2003.

[11]. Chin S. Ou, Fang C. Liu, Yu C. Hung, David C. Yen. The Effects of **Total Quality Management on Business Performance**: Evidence from Taiwan Information-Related Industries, 2007.

[12]. Culp, G., Smith, A., and Abbott, J. ‘‘**Implementing total quality management in consulting engineering firm**.’’ J. Manage. Eng., 9(4), pp. 340–355, 1993.

[13]. Daniel I., Amrik S. Sohal, the relationship between organization strategy, **total quality management (TQM), and organization performance**–the mediating role of TQM. European Journal of Operational Research .168, pp.35–50, 2006.

[14]. Deming W.E., **Out of Crisis**, Massachusetts Institute of Technology Center for Advanced Engineering Study, Cambridge, MA.1996.

[15]. David A. and H Murat G., “**Total quality management in the construction process”.** International Journal of Project Management, Vol. 15, No. 4, pp. 235-243, 1997.

[16]. Feigenbaum, A.V.," **Total Quality Control", Third edition**, McGraw-Hill, Inc., New York, 1991.

[17]. Fellows, R. and Liu, A. "**Research Methods for Construction**", Wiley-Blackwell, Oxford, 2008.

[18]. Forza, C. and Filippini, R., **TQM impact on quality conformance and customer satisfaction**: A causal model, International Journal of Production Economics, Vol. 55 No. 1, pp. 1-20, 1998

[19].Frank, H and Ronald, M(2001) **Modern Construction Management**

[20]. Garvin, D.A., **Quality on the line**, Harvard Business Review, Vol. 61, pp. 64-75, 1983

[21]. Garvin, D.A., **competing on the eight dimensions of quality**, Harvard Business Review, Vol. 65 No. 6, pp. 101-109, 1987.

[22]. Goo Y. Jung, **Yong Jian Wang** "Relationship between total quality management (TQM) and continuous improvement of international project management". Elsevier Technovation, 26, pp. 716–722, 2006.

[23]. Hamed Abdallah Al-Saggaf**Measuring Quality in the Service Industry** KING FAHD UNIVERSITY OF PETROLEUM & MINERALS DHAHRAN, SAUDI ARABIAMay, 1999

[24]. Kaynak, H**." the relationship between total quality management practices and their effects on firm performance**", Journal of Operations Management, 21, pp. 405 435, 2003.

[25]. Keng, B. O., et al., **"Does TQM influence employees'job satisfaction: An empirical case analysis**"? International Journal of Quality and Reliability Management, 24(1), pp. 62–77, 2007.

.[26] Khaled F. Sherif- **Total Quality Management and Construction**

Project Management in Libya

[27]. Landin, A., ISO 9001 within the Swedish **Construction Sector.**

Construction Management and Economics 18:509–518, 2000.

[28]. Low S. P. and Jasmine A. T., ‘‘**implementation TQM in construction**

firms’’ journal of management in engineering, 10(8), vol.20,2004

[29]. Low, S. P., and Peh, K. W. ‘‘A framework for implementing total

quality management in construction.’’**The TQM Magazine**, 8(5), pp.

39–46, 1996**.**

30]. P E D LOVE and G J TRELOAR **A Framework for the Implementation of TQM in Construction Organizations** School of Architecture and Building

Deakin University, Geelong VIC 3217, Australia

[31]. Rategan, C. (1992), **Total quality management, Journal of Property**

Management, Vol. 57, pp. 32-34, 1992.

[32]. Rizwan U. F., Sarosh H. Lodi, S.F.A. Rafeeqi, K. P., “**Assessing the**

Quality Culture in Client Organizations in Pakistan Construction

Industry – A Way Forward to Total Quality Management

Implementation in Pakistan,” Fourth International Conference on

Construction in the 21st Century (CITC-IV),“Accelerating Innovation

in Engineering, Management and Technology”, July 11-13, 2007,

Karachi,, Pakistan.

[33]. R.R. Lakhe Shri RamdeobabaKamla Nehru Engineering College, Nagpur, India and R.P. Mohanty-T**otal Quality Management Concepts, Evolution and**

Acceptability in Developing Economies National Institute of Industrial Engineering, Bombay, India

[34]. Shams- Rahman ,Philip Bullock **"Soft TQM,hardTQM,and organizational performance relationships**: an empirical investigation" Elsevier Omega 33, pp. 73 – 83, 2005

[35]. Elghamrawy T. and Tomoya S. "**Total Quality Management Implementation in the Egyptian Construction Industry."** Journal of Management in Engineering, Vol. 24, No. 3, July 1, 2008.

[36]. Yusuf, Y. et al., **Implementation of TQM in China and organization performance**: an empirical investigation, Total Quality Management and Business Excellence, 14 (9), pp. 331-343, 2007.

[37]. Zhang, Z.H., **the impact of TQM implementation on overall business performance**: An exploratory study, SOM Research Report, 00A24, 2000.

[38].(http://wiki.answer .com/q/what are the characteristics-of-the-construction-industtry 17-1-2013)

[39].(http://sielearing.tafensw.edu.au/mba/9791k/businessservice/9791/9791k/continous-improvement-tools-wi-.pdf25-1-2013

جامعة السودان للعلوم والتكنولوجيا

كلية الدراسات العليا –قسم الهندسة المدنية

ماجستير ادارة تشييد

استبيان

بحث تكميلي بعنوان:

اثر ادارة الجودة الشاملة في مشاريع التشييد في السودان

هذا الاستبيان يهدف لدراسة تاثير ادارة الجودة الشاملة على مشاريع التشييد في السودان .هذه المعلومات تستخدم بغرض البحث وسوف يتم المحافظة على سريتها.

الجزء الأول : معلومات عامة.

1-الاسم:.....
2-الاختصاص :.....
3-نوع الوظيفة :مهندس(مصمم – منفذ – مشرف) - إداري - مقاول أخرى.....
4-جهة العمل.....:
5-عدد سنوات الخبرة.....:
6-العمل الحالي.....:
7-المشروع إن وجد.....:
8-نوع المؤسسة التي يعمل لديها:
☐ حكومية (وزارة☐) قطاع عام ☐ قطاع خاص

9- حجم العمل: -

☐ ☐ كبير ☐ متوسط صغير

- مجال عمل الشركة:10

☐ ☐ مباني ☐ طرق اخري

عدد المشاريع التي نفذت خلال الخمس أعوام السابقة:11-

☐ ☐1 -10 مشروع ☐10 – 20 مشروع 20 – 30 مشروع

الجزء الثاني :

فيما يلي مجموعة العوامل المؤثرة في مشاريع التشييد .من خلال خبرتك العملية يرجى إفادتنا برأيكم مع تقديرنا لتعاونكم

ادارة التكلفة	اوافق بشدة	اوافق	محايد	لا اوافق بشدة	لا اوافق
1-تحدد تكلفة الدراسة والتصميم بناء علي حجم المشروع					
2-تكلفة المواد والمعدات تحدد قبل بداية المشروع					
3-تكلفة العمالة والاعمال الاضافية تزداد او تقل حسب العمل					
4-الحوافز المادية تزيد التكلفة					
5-تكلفة اعادة الاعمال تنتج من عدم تنفيذه صحيحا منذ البدء					
6-قياس عيوب المنتج بانتظام مكلفة					
7-القياس عند ظهور العيب مكلف					
8-تستفيد المؤسسة من معرفة اسباب زيادة التكلفة لتلافي الوقوع فيها في المشروع القادم					
9-تهتم مؤسستك باختيار الاقل سعرا لتقليل تكلفة المشروع					
10-تهتم بالسعر مع الجودة وسرعة تنفيذ المشروع					
11-التغير في أسعار العملات يؤثر علي التكلفة					

ادارة الوقت	اوافق بشدة	اوافق	محايد	لا اوافق بشدةs	لا اوافق
1-تسليم المشروع في الوقت المحدد هدف لمؤسستك					
2-تتبع المؤسسة برنامج زمني لضبط زمن المشروع					
3عمل مؤسستك علي ضمان توفيرالمواد والاليات حسب مدة المشروع					
4-تهتم المؤسسة بتقرير سير العمل التي تتطابق مع البرنامج الزمني					
5-تلتزم المؤسسة بالمطالبات المالية في وقتها					
6-توفرالمؤسسة مايلزم لاصلاح الاخطاء لتقليل الفاقدمن الوقت					

ادارة الجودة	اوافق بشدة	اوافق	محايد	لااوافق بشدة	لا اوافق
1-الجودة تعني الالتزام بالمواصفات والشروط المتفق عليها					
2-الجودة تعني مطابقة الاستخدام					
3-الجودة تعني منتج خال من العيوب					
4-لظبط جودة المنتج تعتمد شركتك علي الخبرة في تنفيذ الاعمال					
5-لضبط جودة المنتج تعتمد شركتك علي الفحص والاختبارات المعملية					
6-تتحق من جودة المنتج بعد اكمال المراحل وعند التشغيل					
7-تطبق المؤسسة نظام ضمان الجوة وتقييم الجودة					

القيادة	اوافق بشدة	اوافق	محايد	لا اوفق بشدة	لا اوافق
1- قيادة الشركة لديهم رؤيا واضحة لمتطلبات الجودة					
2-قيادة الشركة دوما تعمل علي ايجاد افضل الطرق لتقليل التكلفة					
3-القيادة تشجع الموظفين علي اقتراح حلول للمشاكل واختيار افضل الطرق لحلها					
4-قيادة الشركة تتبني سياسة التحفيز علي جودة الاعمال					
5-تركز القيادة علي عمل اجتماعات منتظمة مع مختلف فريق عمل					
6-تقوم القيادة بوضع ميزانية تنفيذ المشروعات					

التركيز علي رضا الزبون	اوافق بشدة	اوافق	محايد	لا اوافق بشدة	لا اوافق
1-الرضا التام للزبون يتطلب معرفة الشركة لنفسها ومنتجها وتنافسها وزبونها					
2-رضا الزبون من الاهداف الاساسية للشركة					
3-قابلية الشركة لحل مشاكل الزبون					
4-تنقيد الشركة فقط باوامر الزبون					
5-تعمل الشركة علي اشراك الزبون في مراحل الانتاج					
6-تهتم الشركة بارضاء الزبون داخليا وخارجيا					

ادارة الموارد البشرية	اوافق بشدة	اوافق	محايد	لا اوافق بشدة	لا اوافق
تهتم الادارة بتفهم مشاكل العاملين والعمل علي حلها|1-					
2-لدينا نظام لرضا المستخدمين					
3-اهداف الجودة واضحة للمستخدمين					
4-تحدد وظائف المستخدمين وفق مهاراتهم وقدراتهم					
5-تحفز الادارة العاملين علي تحسين جودة المنتج					
6-تحفز الادارة العاملين علي تقليل تكلفة الانتاج					
7-اشراك الموظفين في صناعة القرارات جزء اساسي بالشركة					
8-تهتم الادارة بلاشخاص ذو الخبرة والكفاءة لزيادة التنافس					
9-شعور الموظفين بالانتماء للعمل وتحسين بيئة العمل					

ادارة التواصل	اوافق بشدة	اوافق	محايد	لا اوافق بشدة	لا اوافق
1-الاجتماعات المستمرة لمناقشة الاعمال وطرح الاراء					
2- نظام اتصال فعال بالشركة					
3-سهولة الحصول علي المعلومة					
4-سهولة متابعة الاعمال وتوزيع المهام					

ادارة التدريب ورفع القدرات والتطوير	اوافق بشدة	اوافق	محايد	لا اوافق بشدة	لا اوافق
1-التعلم من الخبرة الذاتية ومن الخبرة السابقة					
2-التعلم من الأداء الأفضل والخبرات لدى الآخرين					
3- تدريب الموارد البشرية بالمهارات الجديدة واللازمة للمشروع العمل الجماعي					

ضبط العمليات وتحسينها	اوافق بشدة	اوافق	محايد	لا اوافق بشدة	لا اوفق
1- تؤدي عملك في شكل عمليات					
2-لديك خطة جيدة لاي عملية تزيد الربح					
3-لديك خطة جيدة لاي عملية تقلل الاخطاء واعادة الاعمال					
4- لديك تخطيط جيد لاي عملية تقلل تكلفة الجودة					
5-لديك تخطيط جيد لاي عملية تقود لرضا الزبون					
6-لديك معرفة بعمليات قياس الجودة السبع					

الجزء1 الثالث: وجهة نظرك في موضوع الجودة واثرها في مشروعات التشييد في السودان:

ما المشكلة الأكثر أهمية في تدني جودة مشروعات التشييد في السودان ؟

-.....

-.....

مامقترحاتك من اجل تقليل التكلفة في مشروعات التشييد في السودان؟

-.....

-.....

ما ملاحظاتك ومقترحاتك من أجل تحسين مستوى الجودة في مشروعات التشييد في السودان ؟

-.....

.....

ملحوظة: ضع علامة( )امام الاجابة التي تراها مناسبة

نشكركم علي وقتكم وجهدكم وحسن تعاونكم

Sudan University for Science and Technology

College of Graduate Studies - Department of Civil Engineering

Master in Management Construction

Questionnaire

Research titled:

The impact of total quality management in construction projects in Sudan

of construction projects in This questionnaire is aimed to study the effect on the TQM Sudan. This information is used for the purpose of research will be maintaining their .confidentiality

.**The first part**: General Information

1. Name: .....
2. Jurisdiction.....
3. Job Type: Engineer(designer - Implementation - Supervisor)- administrative – contractor other .....
4. Affiliation: .....
5. Years of Experience:.....
6. Current work:..... .....
7. The project if available: ....
8. Company type

☐ Government (Ministry) ☐ public sector ☐Private sector

9. Volume of work

☐Large ☐ Medium ☐Small

10. Field of Company

☐Buildings ☐ways ☐other

11. The number of projects carried out during the previous five years

☐1 -10 Project ☐10-20 Project ☐20-30 Project

The second part:

The following are several factors affecting the construction projects. Through your work experience, please let us know your opinion with our appreciation for your cooperation

Cost Management	**Strongly agree**	**agree**	**neutral**	**Strongly Disagree**	**disagree**
1- The cost of the study and design determined based on the size of the project					
2- The cost of materials and equipment are determined before beginning of the project					
3-labor cost and additional works increases or decrease depending on the work					
4- material incentives increase the cost					
produces from its failure to perform cost of Re-work-5 right from the start					
6-measurement of product defects regularly expensive					
7-measurement When the defect expensive					
8-institution benefit from knowing the reasons for the cost increase in order to avoid falling in the next project					
9-interested in your organization to choose a price least to reduce the cost of the project					
10-interested in price with the quality and speed of implementation of the project					
11-changes in currency rates affect the cost					

time management	**Strongly agree**	**agree**	**neutral**	**Strongly Disagree**	**disagree**
1-deliver the project on time goal for your organization					
2-Track institution adjust a timetable for the project time					
3-institution provide you with the information and orders in time					
4-institution are interested the report of the workflow that match the timetable					
5-Foundation is committed to financial claims in time					
6-mutatis institution provides to fix errors to reduce wastage of time					

Quality Management	**Strongly agree**	**agree**	**neutral**	**Strongly Disagree**	**disagree**
1-quality means comply with the specifications and conditions agreed					
2-quality means matching use					
3-mean quality flawless product					
4. Setting the quality of the product depends on the experience of your company in the implementation of the					

work					
5-to adjust the quality of the product depends on the company inspection and laboratory tests					
6-be realized quality of the product after the completion of stages and when running					
7-institution apply quality assurance and quality assessment system					

Leadership	**Strongly agree**	**agree**	**neutral**	**Strongly Disagree**	**disagree**
1- lead the company to have a clear vision of quality requirements					
2-leadership of the company is always working to find the best ways to reduce the cost					
3-leadership encourages staff to propose solutions to problems and choosing the best ways to solve them					
4-lead the company adopts a policy of stimulus quality works					
5. leadership focuses on the work of regular meetings with various team					
6-leadership is developing a budget for the implementation of projects					

Focus on customer satisfaction	**Strongly agree**	**agree**	**neutral**	**Strongly Disagree**	**disagree**
1-complete satisfaction of the customer requires knowledge of the company itself and its product and compete and its client					
2 customer-satisfaction of the fundamental objectives of the company					
3-viability of the company to resolve customer problems					
4-Company adhere to all customer orders					
5-company is working to involve the customer in the stages of production					
interested customer satisfaction internally 6- company and externally.					

Human Resource Management	**Strongly agree**	**agree**	**neutral**	**Strongly Disagree**	**disagree**
1-are interested administration understand the problems of workers and work to resolve them					
2-We have a system of user satisfaction					
3-quality objectives are clear to users					
4-define the functions of the users according to their skills and abilities					
5-stimulates the administration staff to improve the					

quality of the product					
6-stimulate administration employees to reduce the cost of production					
7-involve employees in the decision-making essential part company					
8-are interested administration to people with experience and competence to increase competition					
9-staff feeling of belonging to work and improve the working environment					

Communication management	**Strongly agree**	**agree**	**neutral**	**Strongly Disagree**	**disagree**
1-continuing to discuss business meetings and put forward opinions					
2. effective communication system company					
3-ease of access to information					
4-easy follow-up works and the distribution of tasks					

Training and capacity building and development management	**Strongly agree**	**agree**	**neutral**	**Strongly Disagree**	**disagree**
1 self-learning from experience and from past experience					
2-learn from the experiences and best performance of others					
3. human resources training and new skills needed for the project group work					

control and improve operations	**Strongly agree**	**agree**	**neutral**	**Strongly Disagree**	**disagree**
1. lead your work in the form of operations					
2-you have a good plan for any process increases a profit					
3-you have a good plan for any process reduces errors and re-works					
4. you have a good planning of an operation reduce the cost of quality					
5-you have a good plan for any process that leads to customer satisfaction					
6-you have to know the seven operations quality measurement of Seven					

The third part:

Your point of view on the subject of quality and its impact on construction projects in Sudan

What are the most important in the poor quality of construction projects in the Sudan problem?

....

....

What suggestions in order to reduce the cost in construction projects in Sudan?

....-

....-

What your feedback and suggestions to improve the level of quality in construction projects in Sudan?

....-

....

Note: Put ( ) in front of the answer as it deems appropriate

We thank you for your time and your effort and your cooperation