Impact of Customer Satisfaction on Performance

Of Sudanese Construction Companies

تأثر رضا ألبون في أداء شركات التشييد في السودان

A Thesis Submitted in Partial Fulfilment of the Requirements for
the Degree of M.Sc. in Construction Management

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إقرار

إذاً الموقع أدناه أقر بذلتني المؤلف الوحيد لرسالة الماجستير المعروضة

أليس إلا لتنوير الأفكار النتيجة البنكية في الموضوع

وهي منتج فكري أساسي و اختياري أعطي حقوق طبع ونشر هذا العمل لكلية الدراسات العليا - جامعة السودان

للعلوم والتكنولوجيا، عليه يحق للمجتمع نشر هذا العمل للأغراض العلمية.

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Dedication

This thesis is dedicated to the soul of my parents, my family, and for my wife Hameed aSalih who always there with her love, encouragement, and understands and exceptional sense of humor which made the writing of this thesis substantially easier.
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I am most grateful to Dr. Salma Yahiya Mohamed my supervisor for her valuable assistance and guidance for the entire research period, and without her valuable advices this dissertation cannot be accomplished.

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I express my profound gratitude to all my colleagues in Sudanese Thermal Power Generating Company who assist and encourage me to complete this research.

I express my sincere gratitude to my family especially my wife who relentlessly facilitated my work at home.

Finally I gratefully acknowledge sources any property material used in this dissertation including those which would have been in advertently omitted in referencing.
ABSTRACT

Construction industry of any country is the back bone of its infrastructures, though it is considered as one of the major contributor in the economy growth of the country. Construction industry is facing many challenges e.g. climate change, sustainability, issues, quality and customer satisfaction. Sudanese construction companies are striving to work in global competitive era and facing additional unique problem beside those indicated as challenges e.g. low labor productivity, absences of quality standard, lack of systematic training, limited capital.

Quality has went along journey from inspection through quality control (QC) and quality assurance(QA), total quality control up total quality management (TQM) and finally maintaining excellence in business.

Customer satisfaction is one of the main pillars to total quality management amongst other factors continuous improvement and involvement of all employees. Customer satisfaction is very crucial for any company aiming towards sustainable growth and success. Customer satisfaction was considered that it has a direct impact on enhancing quality, improving productivity and increasing companies’ profitability.

The research was conducted to assess that there is strong impact of customer’s satisfaction on enhancing companies’ productivity, profitability, competitiveness and ultimately the performance of construction companies in Sudan

In examination of the research problems and the assumptions and to survey the construction companies; a questionnaire survey was distributed as a tool for gathering data and required information and statistical program were used to analyze the data

– The research revealed that culture of quality is disseminated among construction companies high ranked managers and practitioner and this can been confirmed by the fact that substantial majority of responders are conforming the definition of the term quality as described by quality philosophers
The research showed that there is high level of awareness about customer satisfaction and its importance to company’s performance and success among construction companies.

The research suggested that direct conversation is the way most of construction companies prefer in collecting and identifying customers needs and expectations.

The research confirmed that the Quality of works of construction companies needs to be enhanced and improved and more emphasize shall be given to customers satisfaction since substantial majority of companies are receiving complains some time.

The research confirmed that customer satisfaction will radically improve company’s performance, will enhance profitability, and increase competitiveness and productivity.

Based on the conclusion drawn from the research we recommended the following:

- To improve company’s works quality all employees shall be involved, and awareness programs shall be applied to disseminate quality culture among all employees.
- Companies must adopt quality system and programs that are essential to improve quality, address customer's needs and take care of environment and safety and health of employees and the society.
- Units or department which are concerned with customer needs, claims and complains should be established in any company. These units should continuously identify, monitor, measure, meet their needs and expectation, and respond to their voices.
- Customers should be involved in all stage of creating construction facilities and their needs should be taken and addressed continuously.
بسم الله الرحمن الرحيم

ملخص البحث

تعتبر صناعة التشبيك العمود الفقري لاقتصاد أي دولة وبيئتها التجارية وذلك تعتبر من أكثر القطاعات اسهاما في نماية اقتصاده والناتج القومي. تجاوب صناعة التشبيك العديد من التحديات في ابرزها التغيير المناخي، استدامه البناء والتنمية، الارتباط بمستوى الجودة وارضاء الزيائنين. تعمل شركات التشبيك في السودان في مناخ العمل العامل وتفاجه المنافسة من الشركات الاجنبية وتعاني صناعة التشبيك في السودان من تحديات اضافية تعتمد في تبني كفاءة العملاء، غياب معايير الجودة وتدريب الممتهن للعاملين في هذه الصناعة بالإضافة إلى ضعف رأس المال العامل.

أن الجودة قد قطعت اشواط كبيرة ومرت بعدة مراحل ابتداء من مفهوم النقيض إلى ضبط الجودة وتأكيد الجودة ومن ثم انتقلت إلى مفهوم الجودة الشاملة وأخير وصلت إلى التميز في الأعمال.

يعتبر ارضاً لزوين من الأعمدة التي تقول عليها فلسفة الجودة الشاملة - من ضمن الأعمدة الاخرى مثل التحسين المستمر واشراك جميع العاملين - ويعبر بذلك من العوامل الحاسمة في نجاح أي شركة تسعى إلى استدامه النجاح والنمو ويعتقد كثير من المارسين والمؤلفين ان ارضاً لزوين تأثير مباشر على قدرة الشركة التنافسية وتحسين الجودة والانتاجية وزيادة ربحية الشركة.

نقصي هذا البحث في اثر ارضاً لزوين علي أداء شركات التشبيك في السودان في ابعادها الخاصة بالقدرة التنافسية والربحية والاتجاهية والبدء الكلي.

استخدم الاستبان كأداة لجمع المعلومات التي تعزز ما افترضه البحث كما تم استخدام برامج إحصائية لتحليل البيانات والوصول إلى معلومات تخصص الفرضيات

لقد توصلنا بعد جمع البيانات وتحليها الى النتائج الآتية:

- ان ثقافة الجودة منتشرة بصورة واسعة في اوساط العاملين في صناعة التشبيك في السودان ويتضح ذلك من خلال ان الغالبية العظمى ممن تم استبيانهم قد عرفوا الجودة بمقابلة متطلبات الزيائنين كما اشار الي ذلك فلسفة الجودة.

هناك وعي كبير باهمية ارضاً لزوين ودوره في تحسين اداء الشركات ونجاحها
وضوح البحث أن الحوار المباشر بين الزبائن وإدارة الشركات هو الأداة المفضلة لديها

اغلب الشركات لمعرفة احتياجات الزبائن ومطالبتهم

أكد البحث أن الأعمال المقدمة من الشركات تحتاج إلى تحسين وتجويد ويجب إبقاء أرضاء الزبائن أهمية أكبر حيث أن اغلب الشركات المستبِنة تتلقى شكوى عن جودة أعمالها.

أكد البحث أن ارضاء الزبائن له اثر حاسم في أداء الشركات ويزيد من الربحية والمقدرة التنافسية والانتاجية ومن ثم مجمل الأداء

بناء على نتائج البحث تتم التوصية بما يلي:

على الشركات تبني أنظمة وبرامج للجودة والتي تعتبر أساسية في تحسين مستوي الأداء والجودة وتخاطب احتياجات الزبائن وتأخذ في الاعتبار سلامة العاملين والمجتمع وتهتم بالبيئة المحيطة.

يجب تأسيس وحدات ادارية في كل شركة للعناية بمتطلبات الزبائن وحل الشكاوي التي ترد منهم. مهمة هذه الوحدات أن تقوم باستمرار بالتعرف علي احتياجات الزبائن ومقا بلتها باستمرار مع القياس الدوري لدي رضا الزبائن.

يجب اشراك الزبائن في كل مراحل تنفيذ أعمال المشرّعات وبناء المنشآت للتعرف علي احتياجاتهم وتوقعاتهم واحذها بعين الاعتبار والاستجابة لها باستمرار.

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CHAPTER ONE

Introduction
CHAPTER ONE

Introduction

1.1 General

The construction industry of any country is the backbone of its infrastructure and economy. Though it is a major contributor to the economy of any country, it faces the problems of high fragmentation, instability, low productivity, poor quality and lack of standard. AbdMajed and McCaffer (1998) further stressed the fact that most countries are dealing with the same common problems despite the difference in their economies. Due to the above mentioned quality problems, construction clients are not satisfied with the performance achieved on many of their projects. Kometa&Olomolaiye(1997) confirmed that and, stated that despite many efforts, apart from time and cost overruns, unsatisfied clients and other difficulties continue to plague the industry. Thus the reputation of the construction industry is ill suited for meeting the competitive challenges of today's fast changing market (Torbica& Stroh 1999), where the competitive edge is with those who manage their resources most effectively and offer a timely response to the demands of the market.

1.2 Research Problem

Customer satisfaction has become an important factor alongside traditional parameters such as quality, schedule and costs. It can be seen as part of the TQM philosophy and recently, it has become a significant part of the Key Performance Indicators (KPIs) of the industry Takim, Roshana, A. Akintoye, and J. Kelly(2003).
Customer satisfaction has become one of the key issues for companies in their efforts to improve quality in the competitive marketplace. It is considered as either a goal of or a measurement tool in the development of construction quality. Customer satisfaction is thought to have effect on customer retention and, therefore, profitability and competitiveness (Anderson and Sullivan 1993). According to Jones and Sasser (1995), complete customer satisfaction is the key to securing customer loyalty and generating superior long-term financial performance. It is also apparent that high customer satisfaction leads to the strengthening of the relationship between a customer and accompany, and this deep sense of collaboration has been found to be profitable (Storbacka et al. 1994).

Attainment of acceptable levels of quality in the construction industry has long been a problem. Great expenditures of time, money and resources, both human and material, are wasted each year because of inefficient or nonexistent quality management procedures. The manufacturing industry has developed total quality management (TQM) concepts, first applied in Japan and in recent years used in the United States, which have increased productivity, decreased product cost and improved product re-liability. These concepts are also applicable to the construction industry.

The research argue that there is strong impact of customers satisfaction on enhancing companies productivity, profitability, competitiveness and ultimately the performance of construction companies in Sudan and will gather and analyze data to support this argument.
1.3 Research Objectives

This research aims to:

- To assess the extent of quality philosophy dissemination amongst construction companies and other practitioners.
- To identify the measures taken and the tools used to or to measure their customers satisfaction.
- Measuring opinions about the impact of customer satisfaction on the companies’ performance, profitability and competitiveness.

1.4 Research hypotheses

The research hypotheses that:

a. There is a lack in awareness of the importance of quality among construction companies.
b. There is no systematic approach in construction companies to identify, measure and response to customer needs.
c. Customer satisfaction is a major critical success factor and has strong impact on companies’ performance.

1.5 Research Methodology

In examination of the research problem and the hypotheses and to survey the construction companies; a survey was conducted using questionnaire as a tool for gathering data and required information.

Questionnaire was selected due to its following advantages:-

- More objective than other tool like interview.
- It is a quicker way to gather information.
- The responses are gathered in standardized way.
- Potentially information can be collected from large group and the rate of the return is always low.
- The responders have more freedom in answering questions without external influences and have sufficient time to think about question.
  There is available software to analyze and getting information
CHAPTER TWO

Literature Review
CHAPTER TWO

Literature Review

2.1 Construction Industry

In this section the research will provide background and historical perspective for the evolution of the construction industry, and will shed light on different aspects of construction including the type of construction, delivery methods and types of contracts used in addition to the characteristic of this industry and the challenges facing it specially which are related to customers satisfaction aspects.

2.1.1 Historical Perspective:

Construction and ability of building things is one of the most ancient human skills. In prehistory time human struggled to survive and sought shelter from the element and the hostile environment that surrounded them by building protective structures using natural materials such earth, stone, wood and animal skins. Human were able to build and fabricate housing that provides both shelter and degree of protection.

As society became more organized the ability to build things became more sophisticated than that of ancient civilization. The arc logy of the ancient works reflect and outstanding ability not to build only structure for shelter but monuments of gigantic scales. The pyramids and Greek temples are interesting testimony to build the skills of the civilization antiquity many structures of the ancient time is impressive even by modern standards. The great church of Hagia Sophia in Stanpole constructed during the sixth century was the greatest domed structure in the world for nine centuries. It is an impressive example of ingenuity of
the boulders of that time and their mastery of how forces can be carried to the ground using arches in one and three dimensions as domes.

In modern times the Brooklyn Bridge in USA and Panama Canal and other great structures like Twin Tower in Malaysia stand as legendary feats of engineering achievement. They are also testimonies to the fact that realization construction projects involve solving many problems which are not technical. In the two mentioned projects people problems requiring great innovation and leadership were just as formidable as the technical problems encountered. To solve them the engineers involved accomplished heroic feats, Daniel W.Halpin (2005)

2.1.2 Major Types of Construction

The wide spectrum of constructed facilities may be classified into four major activities as follow:

2.1.2.1 Residential Housing Construction:

Residential housing construction includes single family house, multi family dwelling, and high rise apartments. During development and construction of such projects, the developers or sponsor where is familiar with the construction industry serve as surrogate owners and the take charge and make the necessary contractual agreement for the design, construction and arranging the financing and scale of completed facility. Residential housing design are usually performed by architects and engineers and the construction will be executed by builder who hires services from different disciplines (electrical, mechanical, HAVC ..... etc).

The residential housing market is affected by general economic condition, law, investment climate and financing and monetary policies
of the government. Often a slight increase in total demand cause substantial investment in construction, since many housing projects can be started at different locations by different developers at the same time. Because of relative ease of entry, at test of the lower and of the market many new rebuilders and companies are attracted to this type of construction, hence this market is subject to high degree of competition with potentially high risk as well as high rewards W.Halpin (2005)

2.1.2.2 Institutional and commercial buildings construction:

Institutional and commercial building encompasses a great variety of buildings types and sizes, such as schools and diversities, medical clinics and hospitals, recreational facilities and sports, shopping centers etc.

The owners of such buildings may or not be familiar with the construction industry practices, but they are usually able to select competent professional consultant and arrange the finance of the construction themselves. Specialty architects and engineering are often designing a specific type of building, while the builders of such type of project may also be specialized in only that type of building.

Because of the higher costs and sophistication of institutional and commercial building in comparison with residential housings, this market segment is shared by fewer competitors. Since the constructions of these buildings require long process which when started will take some time to proceed until completion, the demand is less sensitive to general economic condition than that for residential building.
2.1. 2.3 Specialized Industries Construction:

This type of construction usually involve very large scale projects with high degree of technological complexity, such as oil refineries, steel mills, chemical processing plants, power plants, factories … est. The owner is deeply involved in the development of the project and prefers to work with designer; in such builds the total time of completion of the project will need long time for completion. Although the initiation of such projects is also affected by the state of economy, long range demand for casting is the most important factor since such projects are capital intensive and require considerable amount of planning and construction time. Governmental regulation in environmental and safety and civilized society are affecting and influencing such projects.

2.1.2.4 Infrastructure and Heavy Construction:

This type of construction includes high ways, harbors, tunnels, piper lines, drainage and sewage treatment plants … est. Most of these projects are governmental owned projects and financed through taxes and bonds. This category of construction is characterized by high degree of mechanization which replaces some labor intensive operations. The engineers and builders engaged in infrastructure construction are usually highly specialized since this segment of market requires special skill.

2.1.3 Construction Versus Manufacturing Processes:

Construction industry is the largest product based (as opposed to services oriental) industry in U.S the dollar volume of the industry is on the order of one trillion (1.000 billion) dollars annually. The process of realizing a construction facility such as roads, bridges, or building however is quite different from that involved in manufacturing an automobile or television set.
Manufactured products are typically designed and produced without designated purchaser. In other words products (T.V, automobiles) are produced and then presented for sale for any potential purchaser design and production are done prior to sale. In order to attract possible buyers, advertising is required and it is an important cost centre.

Many variables exists in this undertaking and the manufacture (at risk) of failing to recover the money invested once decisions made and the design and the production proceeded to the end, the market may not respond to the price offered, units may remain unsold or to sell at or below the cost of production without profit. The price of manufactured unit shall cover all cost including general and administrative cost. Finally unless enterprise is non-profitable the desire of the manufacturer is to optimize and increase the value of the firm. Therefore profit should be added for other type of cost.

Manufacturer sells their product indirectly through wholesaler or agent and, these sales networks approach has develop as frame work for moving products directly to the end user.

In construction, projects are sold to the client in different way. The process of purchase begins with the client who has the need for the facility. The purchaser approaches a design professional to more specifically define the nature of the project, this leads to the conceptual definition of the scope of work required to build the desired facility. Prior to mass production the purchaser can see the plan for the required product and this product is not available for inspection. In most cases when starting a project the client would be already known except for real estate project when flats are constructed and then the developers seek for purchaser. The risk for the purchaser of a product (e.g. T.V set) is
whether this T.V will perform as advertised or not, and for the manufacturer whether he can produce the product unit in competitive price, in contrast in construction, since the item purchased is to be produced (rather than being finished state) there are many complex issues which can lead to failure to complete the project in functional and timely manner. The number of stakeholders issues must be dealt with prior to project completion lead to complex level of risk for all parties involved (e.g. designers, contractors, government authorities … est.) W.Halpin (2005)

2.1.4 Characteristic of Construction Industry:

The construction industry has been referred to as the engine of driving the economics of all countries. In USA, it represents the largest economics sectors. The construction industry accounts for the largest percent of the gross domestic product (GDP) about 8% OF GPD. The estimated annual volume of construction industry is about 800 billion dollars and more than million of firms operate in the construction sector with more than 10 million employee. Construction industry characteristics differ from country to another according to many different factors:

(a) Economical development: the degree of the utilization and the extent of using modern technologies in the construction industry
(b) Population which affects adoption of technology.
(c) Availability for the regulations, standardizations and organizations of construction sector

Despite the above mentioned factors, the construction industry can be characterized with following:
2.1.4.1 Labor Intensive:

As construction is defined of one major engines of economy it contributes in employing intensive labor. According to the International Labor Organization (ILO year book of static 2000) the employment in construction industry for different region as follow.

**Table (2.1): Employment Distribution by Continent**


<table>
<thead>
<tr>
<th>Reign</th>
<th>No of countries</th>
<th>Employment low income countries</th>
<th>Employment high income countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>9</td>
<td>1867000</td>
<td>_</td>
</tr>
<tr>
<td>America</td>
<td>23</td>
<td>10917000</td>
<td>9275000</td>
</tr>
<tr>
<td>Asia</td>
<td>22</td>
<td>66727000</td>
<td>7258000</td>
</tr>
<tr>
<td>Europe</td>
<td>34</td>
<td>8978000</td>
<td>11820000</td>
</tr>
<tr>
<td>Oceania</td>
<td>2</td>
<td>_</td>
<td>686000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>111527000</td>
</tr>
</tbody>
</table>

For Africa due to unavailability of records for labors for most companies South of Sahara, the mentioned figure is very rough estimates. High-income countries are defined GNP per capita above US 9,266 in 1999 according to world development report.

From the table (3.1) we can see that the majority of construction labors are concentrated in low-middle income countries. In 1998 according to ILO report the distribution of labor is reverse of the output of construction, the high income countries (America and Europe) produce
77% per cent of global construction output with 26% percent of total employment, the rest of the world middle-low income (Asia, Africa) produce only 23% of output but has 74 percent of employment.

Due to the high wages for labor in developed countries there is high trend of replacing labor with machines. In contrast in under developed countries, from social and economical perspectives it is the benefit of the society to use intensive labor instead of machine which can provide opportunities and jobs for many people.

Construction employment is also increasing rabidly e.g.(8.4 per annum) in India it was estimated that at 14,6 million in 1995-96 and estimated to double in 2005-2006 that mean adding 1,2 million every year. It is interesting to notice that the poorer and less developed the country the greater the share of construction output and employment. In India it is estimated that 16% per cent of working population depend on construction

2.1.4.2 Diversity and Uniqueness of Construction Projects:

As mentioned in sub-chapter 1.2 major types of construction, the construction industry spread of wide spectrum of constructions ranging from single family houses to high-rise building, tunnels, refineries, air port and nuclear power stations. Each of these types has its own characteristic and each project has a unique deliverable. uniqueness is important characteristic of construction project although some project of repetitive nature like housing complex but the uniqueness is still valid because each construction differs in its own, design, location, constructor and so on
2.1.4.3 Different Construction Delivery Systems

There are many delivery systems used in construction projects we can summarize some of them in the following:

(a) Design _ bid _ build:

In this delivery system, the owner will undertake the design by his own in-house engineers or by sub-contracting the design to consultant firm. After the design is accepted the owner will advertise and call for bidding and the project will be awarded to the most qualified, responsive, low-price bidder.

(b) Negotiated contracts:

The bid will be awarded to contractor through negotiation process than competitive rigid system. This process work best in private-owned projects. In public projects this system will encounters much legislation difficulties. Some governmental projects are governed with special acts that dictate adoption of competitive system. It is envisaged that system can produced ensured better quality and lower price.

(c) Engineering Procurement Construction Contract (EPCC):

In this system the contractor will undertake the whole phases of construction from design, procurement, and building and the contractor will take the whole responsibility. According to Design Build Institute (BIA) recent studies indicates these advantages of design-bid-build:

(i) Saving in unit cost of at least 6.1%.
(ii) Construction speed at least 12% faster.
(iii) Over all projects speed at least 35.5% faster.
(iv) Cost growth at least 5.2 less.
(v) Schedule growth 11.4 less.
(vi) Quality equal or better.
(vii) Construction management at risk.

This system is going popular in USA especially in schools, where the owner in this system select construction management (CM) firm to work with designer in the design phase and acts as general contractor during construction phase. The purpose of adopting CM is to reduce risk of cost overrun and schedule creep and to expedite the construction process without compromising the quality.

(d) Job order control:

This system is used by large organization like universities and industries that owns large facility complexes. These facilities require repair on continuous basis, to accomplish the repair jobs there are two options. The first one is to hire in house team (in some organizations special department of service are available to accomplish the job). The second one is to hire contractor to do the job. The purpose of the contractor is to eliminate the need for the designer to prepare the design of each small item which results in additional cost and prolonged time. Additionally in some cases it can be a burden on management and it consumes valuable time and resources which can be dedicated to the core business of the organization.

(f) Best value procurement:

New approach is to select the contractor based on performance and price instead of only the low price which is adopted in design- bed- build system. The comparison is based on lists submitted by contractors to determine how well the contractor performed. Performance can include factors as quality of work, customer satisfaction, cost, schedule and
safety. In addition contractor submits a management plan for current project and field management personnel are interviewed by the owner.

2.1.4.4 Accident Prone Industry

Construction by its nature (using machine, intensive labor working in different locations, and different environment) is susceptible to be potentially dangerous and it affect the health and the safety of all personal working in the construction projects. 250 million work place accidents take place every year, 54 million accurse at construction sites and projects in which 18 million construction workers receive injuries through the globe. With these figures construction is high accident prone industry. In India accident rate in construction is ranged from 160 to 250 per 1000 workers employed it is a least still higher than that in manufacturing sector. Occupational hazard in this industry are many folded and the industry also suffer from higher than normal rate of accidents, even in developed countries not many undertake to uncover many problems that the industry experiences.

The major causes of construction injuries:

(a) Fall from higher elevation.
(b) Struck by falling materials equipment.
(c) Caught in between material equipment.
(d) Electric shock.
(e) Collapse in during excavation.
(f) Explosion and fires.
(g) Eye injuries from concrete work and welding.
(h) Asphyxiation due to toxic gases.
Table (2.2): The Distribution among Different Causes of Fatal Accidents (10)

<table>
<thead>
<tr>
<th>Cause</th>
<th>Death</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall from / through roof</td>
<td>66</td>
<td>10.6</td>
</tr>
<tr>
<td>Fall from / with structure (other than roof)</td>
<td>64</td>
<td>10.2</td>
</tr>
<tr>
<td>Electric shock by equipment contacting power source</td>
<td>58</td>
<td>9.3</td>
</tr>
<tr>
<td>Crushed / run over non-operator by construction operating equipment</td>
<td>53</td>
<td>8.5</td>
</tr>
<tr>
<td>Electrical shock by equipment installation or tool use</td>
<td>45</td>
<td>7.2</td>
</tr>
<tr>
<td>Stuck by falling object</td>
<td>29</td>
<td>4.6</td>
</tr>
<tr>
<td>Lifting operation</td>
<td>27</td>
<td>4.3</td>
</tr>
<tr>
<td>fall from / with ladder</td>
<td>27</td>
<td>4.3</td>
</tr>
<tr>
<td>Crouched / trapped operator by operating construction equipment</td>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>Trench collapse</td>
<td>24</td>
<td>3.8</td>
</tr>
<tr>
<td>Crushed / ran over high way vehicle</td>
<td>22</td>
<td>3.5</td>
</tr>
</tbody>
</table>

2.1.4.5 Challenges Facing Construction Industry

The challenges facing construction industry is differing from country to another according to their economical development and growth. The status quo of the construction industry for each country may generate certain types of challenges which cannot be faced in another country, therefore the challenges are varying from lacking of standards and regulation in African countries to productivity and quality enhancement in Asian countries to climatic change and sustainable construction and customer satisfaction in developed countries, in this
context we will address three major challenges to the construction industry:

(i) Sustainability of construction
(ii) Global climatic changes
(iii) Customer satisfaction

(i) Sustainable construction:

Sustainable construction is a part of the sustainable development which aims to deliver building assets that enhance quality of life and offer customer satisfaction, flexibility and the potential to cater for user changes in the future, provides and support desirable natural and social environment and efficient use of resources (Raynsford 2000). Another definition is adopted by (Chen And Chambers 1999) defines sustainable construction as: (Creating a healthy built environment using resources efficiently, ecologically based principles)

It is noted that from the mentioned definitions if it were attained, construction operation would continue to have environment impact although at reduced rate. Sustainable construction is concerned with three important issues, environmental, social and economical. Environmental is very important because construction industry represents major contributor to climate change, resource depletion and pollution at global level (Addis and Talbot 2001). Construction needs to consider its effect on society due to the fact that any construction facility will be built effect the local community. Construction should promote healthy living and responds to any social expectation.

Economy can be seen from two prospective. Sustainable construction will stimulate growth in industry which will increase the percentage of gross domestic product and provide more jobs
opportunities (Addis and Talbot 2001) and increase investment return (WS Atkins, 2001).

If sustainable construction is accepted and successfully adopted in developing construction projects, the participant will gain its benefit in term of cost savings, project schedule compliance, reducing environment risk and uncertainty, ensuring legislative compliance, improving relations with regulators, improving public image, enhancing employee production and improving market opportunity. Good construction practice offers both environmental and sustainable benefits, reduces health and safety impacts on staff and local community, and reduces liability costs in connection with disposal, less remedial works and reduced construction delay. There are also many advantages to the contractor for demonstrating environmental responsibility, improved opportunity to tender, less money wasted in fines, less money restoring environmental damage, less money loss through wasted resources and improved environmental profile (Cole 2000).

To achieve sustainable construction there should be change in thinking, behaving, producing and consuming. (Ofori 1998) (Miytake 1996) suggest that in order to achieve sustainability the industry must change the process of creating the built environment from linear to cyclic process which will bring increased use of recycled, renewed and reused resource, decrease in use of energy and other natural resource. The responsibility of attaining sustainable construction is placed on all practitioners and they must be committed to change their behavior, adopt new product, ideas and practices, integrated environment system with normal work process, involve close co-operation of all project participants, start early as possible and be invisible throughout the buildings life cycle.
(ii) Global climatic change:

There is no doubt that global warming will initiate changes that will fundamentally change the building design and construction practice. It is anticipated that global warming will lead to greater frequency and intensity of storms, hurricanes, and floods. As heat is built up within the bio-sphere, more energy is released that results in extreme climatic change. Structural engineers must be prepared to design buildings which are subject to progressively increasing wind loads and higher intensity of buffeting. Another consequence is the extreme heat waves which will affect HVAC systems designed now. Rainfall and drought patterns will change across the world, this will increase the demand for water conservation, harvesting of all rain and gray water, influence the properties of soil and hence the design of foundations and substructures. Increased sea levels will cause flooding and will necessitate the construction of flood-resistant buildings. Buildings in use or under construction are the greatest single indirect source of carbon emissions, accounting for 50% of total emissions, the future of the built environment depends on the methods and techniques used by the engineers in collaboration with architects to design sustainable, intelligent buildings.

(iii) Customer satisfaction:

Rabid competition is the way of world economy and customers are more selective in buying products and services. Customers have more and more options, they became increasingly discriminating and demanding added value. This makes keeping old customers and getting new ones more important than ever. The table below shows the differences in consideration between today’s world and yesterday’s issues which affect the customer.
Customer satisfaction is the focus of all competing organizations; the organization that can answer constantly changing customer demand will succeed in the new environment of rabid competition. Uncertainty is now always a concern. With rabidly changing world certainly no organization is safe from this sort of distress. Economical pressure also is a fact that makes cost is a major factor, it is no longer enough to strive for reasonable cost because customers need the lowest-possible price.

Rabidly changing Technology make stability is impossible and failing to cope with latest technology can bring obsolescence within short period and hence losing customer satisfaction. With many nations competing for few resources coupled with concern of environment wastes and loss are every organization enemies .Customer-driven quality is critical to long-term growth. Since customers define quality by their
satisfaction, the supplier forcing deliverable on a customer does not foster customer satisfaction. Today’s world is controlled by internet, Telecommunication and information, the organization that can speed the right information to right place at right time is more responsive to customers and they can foster their satisfaction.

2.2 Construction Companies in Sudan

2.2.1 Historical Perspective

As other nations the needs of shelter from changing weather rain, winds...) and from wild animal was the direct drive for human beings to discover needs for buildings to accommodate them. The existence of pyramids in the north of Sudan is the sign of civilization and early concern with construction activities. Up to colonization campaigning in 1898 the evolution of construction industry was very slow and no significant progress was documented. Kitchener campaigning in 1998 is considered to represent a turning point in construction in Sudan. since the campaign was associated with starting of first heavy construction activities by building the first railway from Halafa to Khartoum and the first 4 bridges at Atbara, Blue Nile, Kosti, Sinar where built in same course of time.\(^\text{14}\)

The colonization period 1998-1956 also has witness the construction of the major irrigation projects. Due to the needs of the raw materials the British established Elgazira Scheme in 1922, and to secure an easy and cheap source of irrigation Sinar Dam was constructed in 1925 and many major canals were constructed.

After independence in 1956 and up to now the construction industry had experienced many leaps and many heavy constructions were executed e.g. high ways, sugar factories, textile and spinning industries.
Recently with the exploration and exporting of oil which itself one of the major heavy industries, the construction industry is booming and many mega project has been constructed e.g. Khartoum Refinery, power plants, Merowe Dam and extensive transmission lines to supply power for most estates of Sudan. Bridges and high way also has got a considerable importance. The prosperity of construction industry has stimulated and encouraged many construction companies to be established and take their part in construction sector.

2.2.2 Recent Situation of Construction Companies:

The first construction company in Sudan was established in 1928 according to company’s law 1925. In the twentieth up to the sixties many other companies where established mainly by foreign people Greek, Roman and Egyptian. Most of Sudanese companies were owned by non– engineers persons most (merchant), normal works like mosques and houses were carried out by skilled labors who gained extensive experience (brick layers, carpenters, etc). In the successive three decades numerous construction firms have taken part in the industry which encouraged these companies to establish the contractor union in 25/7/1978.

The number of registered companies in Sudanese Contractors Union (which is representing less than 30% of construction companies as estimated by deputy under Secretary EngWalid Mustafa(2015) are about 2606 companies according to the last classification in 2015. There no official record for the distribution of these companies across the country but the overwhelming majority more than 75% is estimated to be established in Khartoum State a \(^{15}\). The construction companies have wide variety of activities, and the distribution of these companies
according to their activities is difficult due to the fact that most of companies can perform more than one activity the following classification can be adopted as per Sudanese Contractors Union records.

**Table 2-3: distribution in company specialty**

<table>
<thead>
<tr>
<th>Activity</th>
<th>No of companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building construction</td>
<td>845</td>
</tr>
<tr>
<td>infrastructure</td>
<td>342</td>
</tr>
<tr>
<td>Electro – mechanical</td>
<td>164</td>
</tr>
<tr>
<td>others</td>
<td>244</td>
</tr>
</tbody>
</table>

**2.2.3 Characteristics of the Sudanese Construction Companies:**

In addition to the general characteristics of the construction industry mentioned in chapter (2.1.4), the construction companies in Sudan have the following characteristics:

(a) The age of most of construction companies are less than twenty years especially in the private sector due to the turbulent economics, policies of the government. Many companies get bankrupted and disappeared and other new companies have been established. For the government companies and after adopting privatization of the economy most of the construction companies were sold or downsized e.g. (Sudanese Company for Building and Construction). This turbulent environment and discontinuing of activities of companies have resulted in absence of accumulation of experience. Most companies start their job from scratch without learning from their lessons and hence repeating the same mistakes.
(b) The cost of construction and construction materials are very high compared to other countries specially for the basic material cement, reinforcement...etc. their price are also escalating in unpredictable way (e.g. ton of cement arrive to port Sudan 70 USD but in the local market price is more than 150usd).additional to that many taxes and custom fees are duplicated on material which affect material prices. In addition to that cost of workmanship compared to material price also are escalating (e.g. plastering, painters, sanitary works) all these factors triggers disability and the growth of this sector.

2.2.4 Limited Capital

Most of construction companies have a very limited capital and many of them are owned by newly graduate engineers or families, for example one of the largest construction companies in Sudan is Danffodio for roads and construction. It has working capital of only 32 million SDG after emerging with Saudi investor. This capital (32 million) is very limited if we want to compete globally or even locally with foreign companies that have very large capital and hence the large share of construction market. It will be wise to merge many construction companies to increase their financial capital and enhance their capability to compete in a global world. Other problems arising from limited capital is that low contribution of construction industry in the Gross Domestic Product (GDP) compared with other sector. Building and construction which are categorized as a part of industry sector contributes only with 4.1% in both 2005, and 2006 with growth rate of 5% and 10% respectively. International contribution of construction is more than 10% in developed countries and more than 7% in Asian and 2nd world countries.
2.2.5 Poor Quality and Productivity:

Quality and productivity are vital to build sustainable construction that is capable to compete with global players. Quality definitions were given in the previous sections. The problems facing quality in construction companies can be attributed to the following reason.

(a) Most of the local labors (about 218211 people according to Arab labor organization) which represent 3.55% from the total work force are unskilled labors and the majority of these labors have not studied any systematic education and they learn the trade by simulation from their order supervisors. The diminishing of vocational institutes and the deterioration of the technical education has also contributed to declination of work performance. Adding to this, the construction companies has minor contribution in the training of their employee since the majority of these labors are working as temporary not permanent staff. In the last decades it can be noticed that on level of engineers employers attempt to provide training for engineers but still not satisfactory. All factors mentioned result in poor output and productivity.

(b) Absence of Sudanese Standard:

Up to this moment there is no special Sudanese standard to control construction industry in Sudan. The government adopts international standard for large project and contract. This very obvious in small houses and buildings since there is no standard to indentify the level of quality of work standard, combined with poor preparation of contract document (general condition, particular condition, contract form and agreement) resulting in viscous circle of dispute about quality and the right of different parties.
(c) Delays In Construction Contracts:

Timely completion in construction contract is very crucial in construction projects, but due to poor planning from contractors combined with mismanagement, mixed with delay of payment in some cases always resulting in time slippage of the project which lead to dissatisfaction of customer.

(d) Lack of awareness about the Importance of Quality ISO 9001 Certification:

There is no accurate statistics about the number of companies those adopt ISO 9001 but it is estimated to represent the minority compared to other sectors like manufacturing ,while ISO 9001 address quality in process ,a hard job is waiting both contractors and customer to raise their awareness of quality and improve the entire processes of construction.

2.2.6 Challenges Facing Sudanese Construction Companies:

As we have described in the previous section construction industry the major challenges which are facing the industry like sustainability, global climate change, quality and customer satisfaction. In addition to all these global challenges there are special challenges which are facing the Sudanese construction industry and the companies working in this field. Since construction industry is still far behind their peers in developed countries the following challenges which were already overcome are still facing the industry here we, can mentioned some principal challenges.

(i) Absence of regulating laws:

Prior 1982 the ministry of public work was responsible of training of the labor in construction sector representing the government in establishing all tender documents and tending process, After the
cancellation of the ministry of public works in 1982 no other authorities is established to play the same roll and thus construction industry has suffered from many weaknesses which can be summarized as follow:

(ii) A contradiction in responsibilities between organizations:

There are many organizations influencing and contributing in formulation of policies and regulation which are governing the construction companies e.g. Engineering Council, Sudanese Engineering Society, Ministry Of Infrastructure And Urban Planning and sometimes there contradiction and overlapping between these bodies resulting in confusing decisions.

As result of this situation there are:

- No Sudanese standard or standardization organization is available to address the local needs and methodologies that suit the local environment.
- Many unqualified persons and contractors are working in the field of construction without meeting the minimal required qualification set by Sudanese Engineering Council and there is no power full means to supervise and control the marketplace, most of these companies are not registered and paying no taxes or fee resulting in distortion of competition.

2.2.7 Productivity and Quality Enhancement:

Although there is no detailed study for the productivity in construction industry in Sudan there are concerns among practitioners that the productivity is very low compared with regional and international peers. The contribution of the industry does not exceed 4% of Gross Domestic Product GDP in the best cases. The ability to enhance
efficiency and effectiveness across the industry value chain would also have implication beyond simple GDP contribution. It will enable various sector of economy to deliver economic and social benefits to the public in more efficient and effective manner. In quest to enhancing productivity, improving and increasing competitiveness construction industry shall focus on continuously improving quality. Although cost is still an important consideration, there is an increasing consumer demand in the global environment for higher quality construction. To reach a competing edge in construction concentration shall be drawn to the following issues.

2.2.7.1 Quality Mindset

Client and customers needs to be educated more on the important of quality in construction and life cycle costing in assessing projects (energy saving, material saving) etc so that they can drive quality improvement through their demand. It is very essential to shift the client mindset from seeking for lower price to concentrate on quality and to give more emphasize on contractors technical capabilities not only the lower price.

2.2.7.2 Establishing Standards:

As has been discussed before the lack of Sudanese standard is one of major contributor to declination of quality since there is no acceptable measurement for the quality required especially apparent in small scale projects (housing project, some governmental). It the vital if we need to improve the quality of works and to satisfy industry customers to establish and emphasis on transiently applying the international standard and to start developing a Sudanese standard.
2.2.7.3 Adopting ISO 9001 Certification:

Adopting ISO 9001 shall contribute positively in improving the quality through documenting and improving processes but only few companies have adopted the certification. Unfortunately there is no accurate statistic regarding the numbers of these companies, but if we come to know that in Malaysia (although there is large difference in levels between Sudanese and Malaysian in construction), only 0.23% of the companies adopt certification in 2002.

2.2.7.4 Difficulty in securing timely and adequate financing:

One of the key challenge expressed by the construction player is the timely and adequate finance, this situation is holistic but is more sever in medium and small sized companies.

Due to the limited capital and the financial capabilities, problems in securing finance can be further analyzed by various stage of construction as shown in the table below:
### Table (2.4): Financial requirement pre-stage Construction

<table>
<thead>
<tr>
<th>Stage</th>
<th>Requirement by client</th>
<th>Problem encountered</th>
</tr>
</thead>
</table>
| Pre- bidding stage   | Letter of support from bank | - Slow processing time  
                       |                                                                                    | - Require feasibility study |
| Bidding stage        | - Tender bond  
                       | - Clearance from taxes and zakat  
                       | - Duty stamps  
                       | - Un -refundable expenses in preparation the bid  
                       | - Excessive procedure to clear taxes and zakat  
                       | - Time consuming procedures |
| Execution stage      | -10% performance bond  
                       | - Advanced payment guarantee  
                       | - Working capital  
                       | -High of securing letter of guarantee  
                       | - Advance payment very limited and requiring also guarantee with additional expenses  
                       | - Mismatch cash flow due to delay in payment  
                       | - Banks are reluctant to issue long term guarantees |

The financing problem has created additional difficulties to national companies which were reflected in the following themes:

- Many players in the industry are claiming that foreign labors and construction companies are not executing only the major infrastructure project but also share the local companies in the small projects that need not any special experience or technology like small houses and commercial buildings.
Major large construction project e.g power plants, refinery, highways, are financed by external institutions which sometimes impose using certain contractor and labor. For example, the Chinese government financing Garri 1 power plant project impose a certain contractors to complete the project while there is no any clauses in the agreements to obliged them to use local contractors as partners. Additionally there are many problems in the local labor laws that prevent those companies from employing local labors. For example the Chinese contractor employed about 600 local labors for phase (1) of Garri power plant project and no labor at phase (2) due to compensation and legitimate cases after complete phase 1.

2.2.7.5 Limited Capabilities and Experience of Local Companies

Although there is no comprehensive and accurate classification of local companies but most of them are working on building and road construction. We have no local contractor who can execute heavy construction e.g. power plant, factories est. so introducing foreign contractors is essential to execute such projects.

At the end and despite all mentioned reason we have to state and remember that we are in globalization era and no protection will be the ultimate solution of the local companies from competition since international agreements are striving to open the closed door for global competition so unless they enhance their quality and improve their capabilities we cannot survive in the business.
2.3 Quality from Inspection to Total Quality Management

2.3.1 What is quality?

Quality, that word which has different meaning to different people and its meaning is changing with evolving of quality through time from inspection to emerging total quality management.

Quality is often used to signify excellence of a product or service. In some engineering company the word may be need to include the conformance of material used with tight specification.

In service e.g. hospital it might be used to indicate some source of professionalism.

If we are to define quality in a way that is useful in management then we must recognize the need to include in assessment of quality true requirement to customer need and expectation. Quality then is simply meeting the customer requirement and that was expressed by different ways by authors.

- Fitness for purpose or use- Juron 1988.
- Conformance to requirement –Croby 1979.
- Quality should be aimed at the need of the customer present and in the future (Dr Deming).
- Total composite product and service characteristic of marketing, engineering, manufacture and maintenance through which the product and service in use will expectation by the customer –Feigenbaum.
- ISO 9000 defines quality:- is the totality of features and characteristic of a product or service that bears than its ability to satisfy quality needs.
A Classification of various definition of quality has been given by Garvin (1984). Transcendental definition: quality is neither mind nor matter but third entity independent of the two. Even though quality cannot be defined, you know what it is.

- Product base definition: difference in quality amount to difference quality of some desired integrated or attribute.
- User based definition: quality consists of the capacity to satisfy norms Manufacture based definition: quality means conformance to requirement.
- Value based definition: quality is degree of excellence at an acceptable price and control of variability at acceptable cost.

Sunil Sharma states that work by Garvin DA 1987 in his article competing on the right definition of quality in Harvard business review suggest that the most influencing dimension to determining quality levels are:

1. **Performance**: is referring to the primary operating characteristic of products.
   Features: the secondary characteristic that supplement the product basic function.
2. **Reliability**: the probability of products failing within specified period of time.
3. **Conformance**: the degree to which a product design and operating characteristic match pre-establish standards.
4. **Durability**: it is the measure of product live having both economic and technical dimensions.
5. **Serviceability**: it refers to speed, courtesy and perfection of repair.
6. **Aesthetics**: it refers to how the product looks, sound, feels, etc.
Perceive quality: it refers to assessment of standard relying on indirect measures when comparing products brands

2.3.2 Customer Related Definitions:

There is growing support of quality to be associated with customer demands and needs; there are some of customer related definitions. The quality except rejects the traditional notation of quality as being the degree of conformance to standard or measurement of workmanship, the Japanese concept of quality links the product fitness for use with the degree of customer satisfaction derived from using that product. In other words the customer who determines whether or not the quality has been achieved not the supplier.

Quality is achieving and exceeding customer expectations in order to provide business for the future. The goal is to achieve continues quality improvement quality effort that evolve every process, every product and every services in the organization to satisfy the customer either internal or external is buyer and use of the product.

Quality is the capability of the product or service to satisfy preconceived composite wants of the customer that is intelligibly to characteristic of performance or appearance. After we have given different definition of quality we will try to illustrate the evolution pattern of quality from quality control (QC) to statistical quality control (SQC) total quality control (TQC) quality Assurance (QA) total quality management (TQM).

2.3.3 Quality Control (QC):

ISO 4602: 1986 quality vocabulary and BSI U.K define is quality control as: operation technologies and activities aimed both at monitoring
process and eliminating cause of unsatisfactory performed at deferent stages of quality loop in order to result in economic effectiveness.

2.3.4 **American Society of Quality Control (ASQC) Defines QC:**

The operational technology and activities which sustain the quality of product or sieves that will satisfy the given need.

The PMBOK Project Management Body of Knowledge third edition (2004) define QC involve monitoring specific project result to determine whether they comply with quality standard and identify ways to eliminate unsatisfactory result.

QC is characterized normally and traditionally with special department called QC department or similarly titled department. QC department team should have working knowledge of satisfied quality control, especially sampling and probability which are important mean of selecting and sizing the samples and in evaluating QC outputs. **The stages of QC are based on the following famous statements:**

- Set standard of product prior start up manufacture
- Record any defect
- Analysis all defect to know the cause
- Quick feedback and tack corrective action based on analysis
  
  - No manufacturing without standard
  - No measurement without record
  - No record without analysis
  - No analysis without feedback and correction action
In the context of QC we have to distinguish between the following pair of terms:

Prevention is (keeping error out of the process) and inspection is keeping errors out of the customers.

Attribute sampling (the result conform or it does not) and variable sampling (the result is rated on continuous scale that measure the degree of conformity.

Special cause (un-usual event) and common cause (normal process variation) and result from system.

Tolerance (the result is acceptable falls within the range specified)

2.3.5 QC Tool and Technology:

Here are many tools and technologies used to control the quality of product or service, the first 7-tools are known as the seven basic tool of quality.

(a) Cause and effect diagram:

Also called Ishikawa or fish bone diagram. Illustrate how various factors might be linked to potential problem or affect (1-2) is an example:

![Cause and Effect Diagram]

Fig (2-1) show cause and Infect Diagram
(B) Control chart:

Is graphical display of the interaction of process variables on the process. It aims to determine whether or not the process is stable or has predictable performance. It also serve as data gathering tool showing whether the process is subject to special cause variation which create and out of control condition. Control chart also illustrate how process behave over time.

When a process is within acceptable limit no adjustment or corrective action is needed and when process is out of these limits adjustment is required. Upper and lower control limits are usually set as ±35 (standard deviation):

![Diagram of control chart]

Fig (2-2) show example of controls chart

(c) Flow charting:

Graphical representation of process showing activities, decision point and the order of process it helps in anticipating what and where quality problems may occur and thus can help in developing approach for dealing with them.

(d) Histogram:

A Bar chart showing the distribution of variable, each column represent and attribute or characteristic of problem. The height of each
column represent the frequency it helps in indentified the cause of problems with the shape and width of the distribution.

(e) Pareto chart:

Are special types of histogram ordered by frequency of occurrence, which show, how many defects were generating by type or category of identified cause. Pareto chart is mainly used to identify and evaluate Nonconformities and it safes 80% of defect and problem due to 20% of causes.

(f) Scatter diagrams:

Show the pattern of relationship between two variables, dependent variables virus independent variable are plotted the closer the points are to diagonal line the more closely they are related.
(g) Inspection:

Is the examination of product to determine whether is conforming to standard, and it can be conduct to any level e.g. the result of single activity or the final product can both be inspected. Inspection are called also reviews, audit, walkthroughs. Inspection is also used to validate defect repairs.
2.3.6 Quality Assurance (QA):

QA is defined as the totality of planned and systematic actions necessary to provide adequate confidence that product or service will deliver the requested quality. QA means that there is set of documentation of quality problems and encourage implementation of procedure at all stages in the process to comply with standard. QA provide an umbrella for another important quality called continuous process improvement which provides an iterative mean of improving the quality of all process. Deming’s quality improvement cycle (PDCA) is always used in planning and executive, monitoring taking corrective action to improve the process.

(a) Tool and Technology:

The already tools and technology for QC also are useful in QA additionally the following tools can be used in performing QA activities.

I - Quality Audit:

Quality audit is structure independent review to determine whether product, service, project activates comply with set polices, and procedure. The purpose of quality audit is to identify inefficient and ineffective policy, procedure. The subsequent effort to correct these deficiencies should result in reduced cost of quality and increase in the percentage of acceptance of the product or service by the customer.

II- Process analysis:

It follows the steps outlined in the process improvement plan to identify needed improvement from an organization and technical point of views, it examine problem. Experience, constrains, and non-adding activities. Proves analysis include root cause analysis to determine
underlying causes that created the problems and create prevention actions for similar problems.

2.3.7 Concept of Statistical Quality Control (SQC):

SQC used various statistical distributions to measure the chance and degree of conformance of raw material, process and products to pre-settled and agreed specification. SQC used process control chart for on-stream monitoring and acceptance sampling plans at income and outgoing stages for both variables was explained under QC.

2.3.8 Change Over Total Quality Control (TQC):

i. TQC has been described as: management frame work to ensure continuous excellence this management frame work was suggested to include the following statement for action.

ii. TQC is business philosophy which groups together manufacturing, engineering, marketing and sales, among others linked together by to two-way flow information.

iii. TQC is consider as a mind-set to approve only criteria leading to better than acceptable quality via the use of continuous improvement.

iv. TQC provides reliability and consistency in product or service as a check and balance system. The current standard presents the opportunity for achievement of new and higher target and standard.

v. TQC is a unique concept in management style that involve every member of organization from top executive to persons on the lowest rung of organizational hierarchy in solving quality cost, production problems. This concept is referring to as companywide quality control (CWQC) in Japan.
vi. TQC was described as statistical control of quality applied to the total operation of an organization including all steps of planning, design, production, service, marketing, finance and administration so as to produce dependent goods and services at low cost suited to the market e.g. Hewlett-Packard success in TQM was attributed mainly to their TQC approach.

2.3.9 Total Quality Management (TQM):

TQM is comprehensive approach to improving competitiveness, effectiveness through planning, organization and understanding each activity and involving each individual at each level and it is useful in all types of organization. It refers to company-wide quality assurance from supplier to customer (external and internal).

Using systems approach of documented sets of procedures and process variability in team spirit with top management commitment.

2.3.10 Absolutes of Total Quality Management:

Quality gurus Edward Deming's, Juran, Crosby have proposed certain absolutes about total quality management to Deming is an American statistician who has been best known of the pioneers, credited with famous quality control in Japan in the early 1950's and he is father of world famous prize (Deming prize of quality).

He was invited by the union of Japanese's scientists and engineer (JUSE) to deliver lecture on quality issues he is work was focusing technical processes and tools.

Juran another American Guru also was invited to Japan to deliver also lectures in quality. Juran focus on the managerial dimension of quality so he defines quality as fitness for use, his concept incorporates
the customer point of view and focusing on management responsibly and setting goals. He promotes a broader concept of (managing business process) a technique for executive cross functional quality improvement.

**2.3.10.1 Juran Ten Steps to Quality Improvement:**

(a) Build awareness of opportunities to improve  
(b) Set goals for improvement  
(c) Organize to reach goals.  
(d) Provide training.  
(e) Carry out project to solve problem.  
(f) Report progress.  
(g) Give recognition.  
(h) Communicate result.  
(i) Keep score  
(j) Maintain momentum by annual improvement, part of the regular system and process of the company.

**2.3.11 Deming 14 Functions of (TQM):**

Deming focus was on statistical process control (SPC) and technical processes and tools improvement. He teaches that 69% of variation has common causes (related to the system) and 4% have special cause's duo to assign ability. Deming also proposed a chain of Reaction for productivity and long term survival

| Improve quality | → | Improve productivity | → | Decrease costs  
|-----------------|---|----------------------|---|-----------------  
| Decrease price  | → | Increase market share | → | Stay in business  
| Provide job and more job s | → | Increase Roi (return of investment) |

**Fig.(2-6) Deming Chain of quality.**
Deming proposed the following 14 point as a foundation to TQM which are applicable for both manufacturing and services organizations:

1) Create consistency of purpose of plan.
2) Adopt the new philosophy of quality (as mean of survival and global competitiveness).
3) Cause dependent on most inception.
4) End practices of choosing supplier based on price rather than focusing on need for long term relationship.
5) Identify problems and work continuously to improve the system study the process and not the defect detected.
6) Adopt modern method on training on Job.
7) Change the focus from production (Quantity) to quality.
8) Drive fear from employee.
9) Break down barriers between departments through open communication.
10) Stop requesting improved quality from worker without providing sub method (management system) to achieve it.
11) Eliminate work standards that prescribe numerical quotas at the expense of quality.
12) Remove barriers to pride of workmanship.
13) Institute vigorous education and training not only on specific jobs but also for tools and technology for improvement.
14) Create structure in top management that will emphasize the proceeding thirteen points every day, by transformation in management.
2.3.12 Crosby Four Absolutes:

Crosby is another American guru he agrees that poor quality in the average firm cost about 20% revenues most of which could be avoided by adopting good quality product. He proposes four absolutes of quality as follow:

(i) Quality is defined as conformance to requirement not goodness.
(ii) The system for achieving prevention not appraisal.
(iii) Performance standard given–defect not that the cost enough.
(iv) Management of quality is the price of nonconformance not index.

In the nutshell he states that quality is free because of the small cost of prevention will be always lower than the cost of detection, correction and failure.

Feigenbaum seven characteristic of managing quality:

- Total quality is not a technical function or department but systematic process that extends throughout the company.
- TQM must be organized to recognize that while it is every body's job in the company; it will be no body's job. Unless quality process in the company is correctly structured to support both the quality of both the quality of work of individual and the quality teamwork among department.
- Improvement must take place in marketing, services as well in manufacturing.
- Quality must be perceived by the customer want and need to satisfy his requirement not the company need to satisfy it is requirement for marketing and production efficiency.
• Total quality is achieved through the help of all employees in the organization and not few specialists.

• For quality attainment the company has to establish a clear customer oriented quality management system throughout the organization which people can understand, believe in and want to part of.

We can notice that despite the difference between these gurus and scholars a number of common points arise:

• Inspection is not a solution of quality problem, prevention rather than correction is always the strategy.
• Involvement of all employee of the organization and the commitment of top reader is essential to development of quality culture.
• A program of quality requires organization wide effort across all department and all levels aided by long term commitment and necessary investment in training in tools and techniques of improvements.
• Quality always comes first and other factors are secondly.

2.3.13 Main pillars of TQM:

2.3.13.1 Leadership and top management commitment

The role of the leader in the context of TQM is to provide unquestioned leadership focus on customer result, train employee, achieve and recognize employee participation, J.S Oakland summarized the role of the leadership as follow:

• Developing and publishing clear documented corporate beliefs and objectives (mission statement).executive must express values and beliefs through clear mission statement of what they want their
company or organization to be and through objectives, what they specifically want to achieve in line with basic belief. Together they define what the company or organization is all about. Clearly define and properly communicated believe and objectives which can be summarized in front of mission statement are essential if the directors, manager and other employee are to work together winning team as and it work to spend plenty of time to realize it.

- Developing a clear effective strategy and supporting plan for achieving the mission and objectives. The achievement of the company or service objectives and plans for implementing them can be developed by senior staff. The participation of all employees is vital to create commitment to these plans.

- Identify Critical Success Factors (CSF) and critical processes the most sub goal of business or organization. Critical Success Factors (CSF) are what must be accomplished for the mission statement to be achieved. The (CSF) are following by the critical or business processes for the organization the activities must be done particularly well for CSFs to be achieved.

- Defining the corporate mission and strategies, CSFs, and critical process might make it necessary to review the organization structure. Directors, manager and other employees can be fully effective if an effective structure base on process management exists this include both definition of responsibility for the organization management and the operational procedure they will use.

- Empowerment of employee (encourage employee to participate) for effective leadership it is necessary for management to get very close to their employee effective communication all cross the organization is necessary, and communication between all supplier and customer are essential attention must be paid to the following:
- Attention must be changed to customer supplier oriented every employee must know his customer and supplier and/their need and how he can satisfy them and this start at the top of management to gain the example. Abilities every employee must be able to do what is needed and expected of him and first to know what is needed of him.

- Participation If all employees are to participate in making the customer or organization successful then they must be trained in the basic in disciplined management they must defined to:

  E- Evaluate- the situation and define their objectives.
  P- Plan – to achieve these objectives.
  D- Do implement the plan.
  C- Check – that it objective is being achieved.
  A - Amend take corrective action.

2.3.13.2 Commitment and Leadership:

For the success in implementation of TQM the commitment of leader and top management is vital their commitment must be obsession and demonstrated in deeds and not lip service, because quality start from and at the top and then spread to middle management. Middle management has a very important role to play in implementation TQM through grasping the principles and communicating them to their subordinate, obtain the recognition attention and rewards that it deserved by this the TQM principle can be spread all over the organization.
2.3.13.3 Customer-supplier relation (chain)

TQM look at the whole business cycle in two types of process:

- Internal process: these include activities and their interrelation within the company or organization e.g. operation and productive system are interrelated to each other.

- External process: which are those out of the Organization but interfaces with internal process through its output to establish customer-supplier chain. The ability to meet the customer requirement whether is internal or external is vital and through any and beyond all organization whether is manufacturing or service company there are many services of quality chains of customer-supply figure (3-?) shows. This can be broken at any point in the process by any one or equipment not meeting the requirement of the customer internally or externally. The failure at any point finds its way to the interface between the organization and its outside customer and people who operates the interface-sale people e.g.) resulting in dissatisfaction of the customer. The concept of internal and external customer/supplier for the core of total quality management

2.3.13.4 Continuous Improvement

TQM has been described as ((approach for continuously improving the quality of goods and services delivered through the participation of all level, all functions of the organization))

Another defined describe TQM as philosophy based on quest for progress and continual improvement in the area of cost, reliability, quality, innovation, efficiency and business effectiveness in preserving manner.
The main drive force of continuous improvement is belief and commitment with strategic and operational objective output.

Deming one of great gurus of TQM argues that improvement of quality in endless journey and be has very famous circle of quality improvement (PDCA) Plan → Do → Check → Act

P_ Plan to achieve goals
D_ Do implements the plant
C_ Check whether objectives are being achieved
A_ Act corrective action if any

In his (Total quality management) J.s Oakland made a modification for Deming cycle by adding at the a starting a new activity named E- Evaluate the situation and define objective and Deming cycle was transformed to endless improving helical instead of close circle

This basic approach needs to be backup with good project management techniques and problem solving methods which can be taught to all employees at all levels. The project management enables changes to be made successfully and problem solving techniques helps peoples to remove the obstacles in their ways.
2.3.13.5 Changing the culture:

TQM is not just about achieving certain standard of competitiveness or introducing new Techniques, concepts, methodology and technologies but it is about changing attitude and behavior to do business where objective of competitive requirement are set by customer or negotiated with him. The successful implementation of TQM needs the involvement of all employee on all levels for all functions in shopping the environment which most propitious for such an achievement.

Business Culture

Culture in any business can be defined as the belief that pervade the organization about how business should be conducted and how employee should behave and should be treated and is find by number of components:

- Behavior based on people interactions.
- Norms resulting from working groups.
- Dominant values adopted by the organization.
- Rules of game for getting on the climate.
Any organization need vision framework that include its guiding philosophy, core values and beliefs and a purpose. Theses should be combined into mission who provides description of what things will be like when it has been achieved.

Guiding philosophy drives the organization and is shaped by the leaders through their thought and actions and it should reflect the vision of the organization rather than that of single leader and should evolve with fine

The core values and beliefs it represent the basic principles about what is important in business, its conduct, social responsibility and its responses in changing in environment. They should be as guiding force which focus on employee, supplier, customer, society, safety and as broad stakeholders.

The purpose of the organization should be a development from core values and beliefs and should quickly and clear convey how the organization is to fulfill its role. The mission shall translate the philosophy into tangible goals that will move the organization forward and make it perform to its optimum

The three dimensions of quality and customer satisfaction.
The three dimension of quality are:

(a) Quality of design
(b) Quality of conformance
(c) Quality of performance

The chain of three dimensions consider quality as never ending improvement of firm extended process and these process start with customer and ends with customer as follow
Communication of customer needs → continuous process to convert needs in products and service → determination the performance of product or service → determination of new characteristics that can increase satisfaction and this process are repeated endlessly.

**Quality of design:** - this degree of achievement of purpose by designs itself. It starts with market research to identify customer needs, sales feedback from the customers, and analysis of feedback information and continues development of product, service that will satisfy the customer.

**Quality of conformance:** - it is the extent to which a firm its processes and its supplier are able to surpass the design specification required to serve the needs of the customer.

**Quality of performance:** - this identifies the extent to which customer needs are satisfied by performance of product or service over period of time. This takes in account customer opinion, market research input, and feedback from sales representative, use of after sale services and warranty claims .... Etc. it is the link in the extended process and information generated can be feedback to re-examine the quality of the design and quality of conformance. This process is dynamic and can be continuously improved.

Summary of comparison between Evolutionary patterns of quality.

**2.4 Customer Satisfaction**

In the previous chapter about the quality we have smoothly touch the concept of customer satisfaction in the context of definition of quality. In this section we will search in depth the notion of customer satisfaction and its relation to performance production, profitability in construction companies and let start by definition.
2.4.1 Who Is Customer?

The ability to meet the customer requirement is vital to any organization in relation with other organization or even within the same organization, which mean we have two types of customer

1- internal customer within organization

2- external customer the organization with their customer

Simply the customer is a person or organization or department who receive the product and the service whether (as explained) within or externally from the organization or the end user of these product and services. Some practitioners argue that sometimes it very complex to identify exactly your customer e.g. it not easy for a police officer to list all customers or even the main customers \(^{22}\). Fortunately in the construction companies it is to some extend easy to identify the customers whom are ranging from end user in home building or direct owner to real estate company and its clients in other case to government organizations etc.. Quality practitioner argue that there are chains of customer supplier that connect the internal customer, supplier with external supplier and customer and any breakage in any of these chains will reflect how the service or the product is supplied to the end user \(^{23}\).
Quality Chain

Failure finds its way to the interface between the organization and it’s outside customer and people who operate the interface always experience the ramifications. This principal is seen by many teams. It is fundamental to quality that everyone within the organization to have well define customer and know how to satisfy his requirements; because failure to meet any part of quality chain has a way of multiplying, and failure in any part of system create problem elsewhere leading to more failures, more problems. Continuous examination of customer requirement is vital to maximizing market share, reduced cost, improved productivity and delivery performance and the elimination of waste.

2.4.2 When customers are hard to define?

As we mentioned in the beginning of this section sometimes it is difficult to define the customer and hence his requirement and how to satisfy him. Dr Peter R. Schotes (1998) suggest some guide line to identify the hard customer summarized in the following steps.
1- Break down the organization work to discrete services and function or product (supply department, project etc)

2- For each separate product or service ask what is the purpose why would anyone want this product or services

3- For each separate service ask what is next in line of follow of work? who get its after this part of organization finished it

   - Who ultimately receives the product of services (end user).
   - What capabilities are required and how and when those capabilities are applied.

These questions can lead to identifying the customer, who must be the focal point of everything a system does.

As it was stressed in previous section, customers are getting more demanding due to the revolution in the information. The intensive flow of information allows them to be updated with the new products and services and their characteristics. This leads to the question of what customers needs and what they require. Before we reply satisfying these questions we will briefly define some important terms. These terms are customer needs, expectations, satisfaction and perception.

Customers need are the basic physiological and psychological requirement and desire for survival as A.H. Maslow is expressed in his famous hierarchy of human needs, starting from physiological needs, safety and ego, and self fulfillment.

Customer expectation is the anticipated characteristic of performance of the good and service. kano and Gitlow(1995) suggest that there levels of customer expectations are related to product attributes. The expected level of quality presents the minimum of (must be) be attributes. We cannot drive up satisfaction with these attributes because
they are taken for granted, but if the performances of the attributes are poor this can result in strong dissatisfaction of the customer.

The second attribute is desired level of quality or some time called unitary level in this level better performance leads to greater satisfaction but in limit of time of period usually in small increment.

In the test attributes at attractive or surprising level, better level result in delighting the customer. Discovering and understanding customer needs and expectations is necessary in defining specific product for market research and product development.

Customer satisfaction the degree to which the customer believes that his expectations are met or exceeded by benefit received by the services or the product customer, expectation has strong influence on customers satisfaction, customer dealing with famous world class company in construction will expect and anticipate, high level of quality and any minor inconvenience will result in dissatisfaction, whilst if they are dealing will normal class company and got it on time and budget will please them because of their expectation is low in this case

- Customer perception is the impression made by the product, Perception occurs after the customer selects, organizes and interprets information on the product and it is heavily based on previous experience and Scope of human needs and expectation.

In planning to collect information or customer needs we must go beyond the oblivious needs or expressed needs that are stated in contract or agreed e.g. (product specification, delivery requirement ...etc) to the more subtle one that present opportunities. The later one are called implied customer expectation these one the customer expect the supplier will meet nevertheless for example the customer will expect the services
representative who call on him or the technical who were sent to solve the problem is knowledgeable and solve the problem on spot. There are many reasons why customer’s expectations are likely to change over time, processes improvement, new technology, change in customer priorities and comparison between service competitors, the customer are always right, supplier’s job is always to meet customer requirement to his satisfaction Ashish Bhava (2002).

2.4.3 How To Discover And Identify Customer Needs and Expectations?

It is very crucial to any organization after knowing their customers to discover or uncover their needs and expectations. There are many methods used by organization, in the market, quality information includes quality alarm signal arising from declining in sales and from field failure reports, customer complaints, claims, law suits etc. These signals are a sign of poor quality and dissatisfaction, let us see some methods.

2.4.3.1 Market research in quality (voice of the customer)

market research include compilation and analysis of existing information (field failures, report customer complaints, government, report) the voice of the customer is a continuous process of collecting customers views on quality, can include customers needs, expectations, satisfaction and perception, the emphasis is on in-depth observing listening and learning to address the following main purpose.

- Determine customer needs.
- Develop new features that stemmed from customer responses.
- Measure current customer satisfaction.
- Analyze customer retention and loyalty issues.
Determination of customer needs has several facets. These include short term needs to perform survey on current product and long term needs to integrate quality into new product development. We ask customer directly what are their needs and study how customer currently use the product and then we analyze their system of use to form ideas of how to modify current product or service and to help discover opportunities for new product. Needs must be continuously evaluated because today needs become routine expectation tomorrow.

2.4.3.2 Critical incident technique (CIT):

Technique was developed by J.C Flanagan during world war to improve the performance of fighter pilots incident is an observable human activity that is sufficiently complete in itself to permit inference and predictions to be made about person performing. The act for the incident to be critical it must occur in situation where the purpose or intent of the act seems to be fairly clear to observer and where its consequences are sufficiently define to leave little doubt concerning its effect. And user (customers or potential customer) are asked to identify specific incident which they experienced personally and which had an important effect on the final outcome data from many users are collected and analyzed by collecting sufficient number such critical incidents. It is possible to build profile of the competences that are required for satisfactory performance. The CIT is open – ended methods of finding what user feel are the critical features of the product or service being studied.
2.4.3.3 Focus group:

Consist of about 8 – 14 current or potential customer who meet for about two hour to discuss the product and this method has the following feature?

1- The discussion has a focus hence the name.
2- Discussion can focus on current, proposal future products.
3- A moderator who is skilled in group’s dynamics guides the discussion.
4- The moderator has clear goal for information needed and plan for guiding.
5- Often companies personal observe and listen in an adjacent room.

Focus groups can cover many facet of product or service or can discuss only quality. The group might consist of customer from various market segments or the group can represent one customer segment it want to penetrate. Session can provide depth of information on customer needs, expectation perceptions, satisfaction, intention and reaction to new concept and ideas. One useful approach is to ask customer about the ideal product that would overcome customer frustrations and delight him a key successful focus group is qualification of the focus group moderate who must be quick learner, friendly, knowledgeable, good listener, flexible empathic, big picture thinkers, good writer and then have good memory beside these mentioned method apologies to discover need other ways are also used like questioners, interviews but its looked by practitioners as less effective Sunil Sharma(2003)

2.4.4 Measuring Customer Satisfaction:

Measuring customer satisfaction is corner stone in building quality and gaining sustainable customer loyalty, since the customer expectation
are continuously changing due to severe competition environment. Data on customer satisfaction can be collected by various methods including market surveys, interviews, focus group, mystery shopper, employee reports, call center for complaints. Establishing a feedback system to gather information on customer satisfaction, this system should include timely defining of problems encountered with product of surveys. Generally, companies want to measure:

I- Overall satisfaction.
II- Index of satisfaction.
III- Intention of purchase and repurchase.
IV- Comparative satisfaction with competitor product.
V- Satisfaction with specific product or service features.
VI- Satisfaction with key service provider (sales staff, installation staff, technical service).
VII- After sale service.
VIII- Handling and resolution of customer complaints.

2.4.4.1 Understanding customer needs:

Overall satisfaction vs index of satisfaction there is a debate between professionals whether overall satisfaction must be measured or index of satisfaction or both. In the opinion of Dr. Sunil Sharma in his reference book total engineering quality management gives different and some time contradictory pictures\textsuperscript{28}. While overall satisfaction refers to explicit measure of overall product or service offered by accompany and describes how (globally acceptable) is the product or services offered by a company a high overall satisfaction but indicate that customers are loyal to the organization.
On the other hand, a customer satisfaction index or index of satisfaction is a composite variable which is created from all different individual performance attribute ratings in a way could be simple (average of all attributes) or weighted average on the basis of important weight given by a particular segment of population or by individual customer. A composite index describes how well an organization is doing as far as improvement and development of specific attributes is concerned, it can be more statistically reliable than any single measure. It is therefore possible that may be increase of overall satisfaction measure while decrease in (index of satisfaction) with passage in time meaning that customers are loyal the company but ignore the performance attribute that have been important to the customers. It can also happen vice versa. There is increase in overall satisfaction while there is increase in satisfaction index measuring that customers may recognize additional. These customers make good audience for understanding the additional performance measures to be addressed).

2.4.5 Customer Satisfaction in Construction Companies:

In the previous paragraphs we have drawn some light on the concept of customer satisfaction in generic way, but in the coming paragraph we will concentrate on customer satisfaction especially in construction companies.

Customer orientation has become increasingly important in construction, intensified competitive pressures from the customers force companies to seek competition advantage from customer orientation. Moreover, customer satisfaction has become an important factor alongside traditional parameter such as quality, schedule and cost and recently it has become a significant part of key performance indicator.
(KIP) in the industry. As it is suggest by some practitioners customer satisfaction is considered to be one of the most competition factors for future and one of the best indicators of company future profitability. Customer satisfaction can be either a goal itself or as a measurement tool in the development of construction quality. In the west and Asian countries many companies has adopted TQM philosophy in their quality improvement efforts and customer satisfaction is the heart of this philosophy. The criteria used to judge quality are focused on customer satisfaction. According to (kano) two activities contribute to business performance improvement by TQM. The first one is reduction of costs which are connected to inconveniences to customer. And the second one contributes to activities that further improve customer satisfaction.

In construction poor quality leads to waste and rework; this has considerable implication on cost and schedule. In addition the complex nature of construction process, changes in project organization and the uniqueness of each project make it difficult to exploits past experience and customer feedback in the future. (Love et al) emphasis that the problem of implementing TQM and it main concepts requirement in the completed building or facilities, more over it is noted that in construction the services that customer receives will strongly depend on his own involvement and contact with the supplier. It is stated by some practitioners that construction companies do not activity collect customer feedback as they can seldom expect to receive honest and sincere in put. For that reason contactors focus on their own business.

Torbica and Stroh found that quality improvement effort will lead to higher product and service quality which will lead to improved customer satisfaction, their study has confirmed that the implementation of TQM is positively associated with home buyer satisfaction and also it
was found as explained for the concept of customer supplier chain that key participants need to assess each for performance on regular basis in order to continuously seek improvement in their own performance for benefit of the overall project what companies benefits from satisfying customers. As it was briefly mentioned with the context of previous paragraph there are numbers of benefits that companies can gain from satisfied customer, in the coming paragraph we will try to broaden the discussion to the cover the concept in depth.

2.4.5 .1 Benefits for Satisfying Customer Needs

We can list here some obvious benefits as follow:

(a) Enhancing Competitiveness:

In their valuable paper Dr.J.Pekkanen and Dr.L.Apilo suggest that over the past few years customer driven services offering value generation in the construction and real estate clusters have gained an importance role in the success of the companies providing construction services, aside from efficiency in production, sound customer relation contribute both to improved financial performance and the establishment of long term corporation because are more or less identical irrespective of the contractor, customer orientation is becoming an increasingly important competitive tool in construction sector. Accordingly companies engaged in the construction to improving customer relation in order to maintain and enhance their competitive in the marketplace.

(b) Improving Economic Return:

Karna and his co-authors suggest in their research that customer satisfaction is viewed as predictor for such behavioral variables as loyalty and purchase intentions, and generating long term financial performance.
Customer satisfaction also appears to have stronger and more consistent effect on purchase intention. It is also noted that high customer satisfaction lead to relationship strength and deep state of collaboration which has been found profitable \(^{32}\).

Anderson et al (1995) examine briefly the difference between customer-based measure (customer satisfaction) for firm performance and traditional account measure of economic return. Their finding emphasis that firms which achieves high customer satisfaction has many other benefits for the organization like recognition of the demand of improvement in the process and better understanding of the problems \(^{33}\).

(c) Customer satisfaction as quality evaluation tool:

According to (Torbica And Torch)(2001) quality improvement effort will lead to higher product and service quality which will lead to improved customer satisfaction, thus customer satisfaction can be used for evaluation of quality and Ultimately for assessment of the success of the company quality improvement program.

(d) Customer satisfaction as key performance indicator (KIPs)

The UK working group on key performance indicators has identified 10 parameter for benchmarking projects that lead to achieve a good response to Egan report (1998). One of these indicator beside, construction cost, time defect etc, was customer satisfaction. (Cocke and–Davies) highlights the importance of stakeholder in relation to construction project performance, this corroborates with (Pinto and Steven) (1994) argument that project is only successful to the extension that it satisfies the needs of intended user.
(e) Customer Satisfaction and Productivity:

The purpose of measuring firm level productivity is to evaluate the efficiency with which inputs are transformed into output. The most common type of productivity measure is the simple or single type of productivity measure, ratio of output to specific type input such as sales per employee. There is also intensive literature addressing the issue of how to measure productivity as a ratio of output of all types of inputs (material, labor, capital) known as total factor. Productivity are generally considered the major source of economic growth. Recently where new approaches are emerging that links productivity to customer satisfaction. Crosby 1997, Deming 1982 and Juran 1989 emphasize that firm that achieves superior level of customer satisfaction needs to devote fewer resources to handling returns, rework, warranties and complaint management thus lowering cost of improving productivity. In service context reducing defect leads to great loyalty and increased loyalty leads in turn to greater productivity via lower costs of making future transaction, favorable word of mouth, and perhaps even a price premium.

2.4.6 What Constitute Customer Satisfaction in Construction?

In construction industry the customer is defined as the owner of the project and that needs the constructed facility; in simple words the customer is the buyer or user of the productions services. (Karma et al) (2000) describe the customer as body that incorporate the interest of the buyer of the construction service, perspective user and the other interest groups.

Customer in construction as anyone who have expectations and requirement that affect the outcome of the project and customers may include contracts, subcontract, venders, supply, user and in wider
perspective the society but in this research we limit the definition of the customers the owner and or the user. The following attributes may contribute customer satisfaction.

2.4.6.1 Quality of the constructed facility:

The most important attribute is quality of construction facility that meets or exceeds his expectation and in other side also which conforms to well establish standards. Quality includes the durability and the fitness for use and maintainability, beauty and other desired features.

2.4.6.2 Fulfillment of schedule requirements:

Time is crucial issue for all customers, timely completion of the contracted facility or building will lead to customer satisfaction, because time is basic requirement. Delay normally will result in losses of opportunity that result from using that facility or building, hence declination in customer satisfaction. Delay normally result in increasing the costs that is coming from additional labor hours, or machines and contractors f ries for compensate there diminished projects by sacrificing the quality of the building that will lead to the dissatisfaction of the customer.

2.4.6.3 Minimal scope changes:

It is very important to emphasis that proper and well defined scope during the design phase that reduces changes of the scope of work (change in quantities, material type or specification) will lead to increasing customer satisfaction, since changing in scope will be a source of additional cost and delay that contribute negatively to customer satisfaction.
2.4.6.4 Well established communications:

Open communication between contractors and customers are very important that starts with early stage of the construction project and that should be enhanced through the subsequent phase of project (execution up to closeout), open channels of communication can transform customer need and expectation.

It can be seen obviously that customer satisfaction has numerous benefits for construction companies that results in survival in competing market for difficult customer whom their expectation are not limited. In the coming chapter we will examine through questionnaire whether the Sudanese construction companies has the same believes on the benefits of satisfying customer or different findings is found.
CHAPTER THREE

Research Method
CHAPTER THREE

Research Method

3.1 Approach

In examination of the research problem and the hypotheses and to survey the construction companies; a survey was conducted using questionnaire as a tool for gathering data and required information.

Questionnaire was selected due to its following advantages:-

- More objective than other tool like interview.
- It is a quicker way to gather information.
- The responses are gathered in standardized way.
- Potentially information can be collected from large group and the rate of the return is always low.
- The responders have more freedom in answering questions without external influences and have sufficient time to think about question.
- There is available software to analyze and getting information accurately.

3.2 Questionnaire Design:-

As mentioned earlier the research problems focused on gauging the impact of customer satisfaction on the performance of construction companies in Sudan and questionnaire was used to gather required data.

Research concentrates exploring on the recent situation of construction companies in Khartoum capital region, because 75% to the construction companies are established in the capital and it is difficult to contact companies outside the capital.
The questions were very short, brief, clear and without complicated terminology, and it were structured in logical sequence and the layout was as follow:

**Section One**

It is general questions and gives basic data about participants such as name of company, year in business and its work area and specialty.

**Section Two**

This section is about the perception of quality and it contains three different questions concentrating on definition of quality, whether companies have developed their own definition of quality and finally to what extent the awareness is disseminated admits employees of their companies.

**Section Three**

This section is concentrating on the core concept of customer satisfaction and it contains seven questions, starting with one to identity the company customer then how often companies are measure the satisfaction of their customers, the main factor that constitute customers satisfaction and the extent of complains of customers and how the companies respond to those claims.

**Section Four**

This is the last section. It aimed to assess the impact of customer satisfaction on companies’ performance as viewed by the participants. The questions are assessing the importance of customer satisfaction and to what extent it contributes to company’s profitability productivity and competitiveness.
The designed questions were closed ended with pre-specified multiple choices to avoid long written responses.

The research sample selection depended on the data base of the Sudanese Contractors Union and its statistic to determine the population of sample. It is estimated that construction companies in Khartoum count to about 75% of the total construction companies registered in Sudanese Contractor Union (2606 companies) and the rest distributed across other states. Although the population is large but the sample size was limited the number of companies to thirty due to the difficulties faced in finding addresses and the premises of these companies due to fact that most of those companies have single owner without clear address. Thus the sample was randomly selected.
CHAPTER FOUR

Research Analysis, Discussion and Key Findings
CHAPTER FOUR

Research Analysis, Discussion and Key Findings

4.1 General

As we mentioned in the previous chapter the questionnaire was used as main tool for collecting the required information about the opinions of construction companies. 30 questionnaires were distributed to a randomly selected sample of construction companies. Only 19 responses from companies were received.

This chapter will include the results of the analysis of the collected data. in this process questionnaire questions will be considered in turn, starting with the first section basic information and ending with section four customer satisfaction impact on construction companies performance. in presenting the result of each question we follow the following approach:

Discussion of the results will be carried out and analysis and interpretation of these results and what does it indicate will be explained.

The results are presented in tables followed pie chart presentation depicting the result.

4.2 Sample Configuration

4.2.1 Basic Information Specialty of Construction Companies

The participating companies were classified according to their specialty and working areas in the construction industry. Respondent were asked to indicate their specialty given and four options, and were asked to select the choice that best describe their specialty. The results showed that about two third of responding companies(68.7%) were
working in building construction, and only one respondent (5.3%) works in electro mechanical, while the rest work in other stated areas.

**Table (4.2.1) Basic Information Specialty of Construction Companies**

<table>
<thead>
<tr>
<th>Specialization</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid building</td>
<td>13</td>
<td>68.4</td>
<td>72.2</td>
<td>72.2</td>
</tr>
<tr>
<td>construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>electromechanical</td>
<td>1</td>
<td>5.3</td>
<td>5.6</td>
<td>77.8</td>
</tr>
<tr>
<td>other</td>
<td>4</td>
<td>21.1</td>
<td>22.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>94.7</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Missing System</td>
<td>1</td>
<td>5.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure (4.2.1) Basic Information Specialty of Construction Companies**

specialization
4.2.2 Perception of Quality

4.2.2.1 Quality Definition

One of the research concerns was to evaluate the perception of responding or the industry participants of the term (Quality). The various definitions stated in the literature review were posted to respondents as options and they were asked to select the definition that best suit their understanding to the term Quality. The result as depicted in the above table shows that about 63.2% of responders view quality as customer satisfaction while about 26.3% saw it as fitness for purpose and only one respondent view it as increased profit. The result indicates that the substantial majority of responders are conforming to the definition of the term quality as described by quality philosophers.

<table>
<thead>
<tr>
<th>Table (4.2.2) Quality Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>in your view which of the following words defines quality</td>
</tr>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Valid fitness to purpose</td>
</tr>
<tr>
<td>Valid increased profit</td>
</tr>
<tr>
<td>Valid customer satisfaction</td>
</tr>
<tr>
<td>Valid team work</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
4.2.2.2 Developing Companies Own Definition of Quality

In this question respondents were asked whether or not their companies have developed their own clear definition of quality. The results shown in table (4.2.3) most of construction companies established their own definition to quality 73.7% percent while 21.05% have not developed their definition.

<table>
<thead>
<tr>
<th>Has your company developed clear definition of quality</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>yes</td>
<td>14</td>
<td>73.7</td>
<td>77.8</td>
<td>77.8</td>
</tr>
<tr>
<td>no</td>
<td>4</td>
<td>21.1</td>
<td>22.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>94.7</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System</td>
<td>1</td>
<td>5.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure (4.2.3) Has your company developed clear definition of quality?

4.2.2.3 Awareness among Employees about Quality

Involvement of all employees in quality and their awareness about its importance is believed to be very crucial for success of the companies. Respondents were asked about the degree of involvement of their employees and their awareness about quality importance. The response received showed that the majority of the companies about 52.6% have reported to have high level of awareness and involvement amongst their employee while the remaining of companies is distributed between low awareness and no awareness.

Since successful companies involving all employees’ attention should be drawn to the importance of this factor and awareness of employees should be enhanced through training.
Table (4.2.4) Awareness of Employee about Quality

<table>
<thead>
<tr>
<th>percentage of employee in your company who are aware of the importance of quality</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>0-20%</td>
<td>4</td>
<td>21.1</td>
<td>21.1</td>
</tr>
<tr>
<td></td>
<td>21-50%</td>
<td>5</td>
<td>26.3</td>
<td>26.3</td>
</tr>
<tr>
<td></td>
<td>51-75%</td>
<td>8</td>
<td>42.1</td>
<td>42.1</td>
</tr>
<tr>
<td></td>
<td>over 75%</td>
<td>2</td>
<td>10.5</td>
<td>10.5</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure (4.2.4) Percentage of employee in your company who are aware of the Importance of quality?
4.2.3 Customer Satisfaction

4.2.3.1 Who Is Your Customer?

Identification of the customer is viewed as very important to companies as it enables these companies in defining their needs and expectations, thus focusing on the customer allow companies to strive hard to meet these needs. Respondents were asked to define their customer and were given four options to select from

About 57.9% of companies has identified their major customer comprising the government, private sector and the single owners. Results confirmed that the government is more preferable (21.5%) compared to single owner (5.26%) or the private sector (15.7), we can see from the results that construction companies facing no difficulties in identification of their customers

Table (4.2.5) Identifying Customer

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid government</td>
<td>4</td>
<td>21.1</td>
<td>21.1</td>
<td>21.1</td>
</tr>
<tr>
<td>private sector</td>
<td>3</td>
<td>15.8</td>
<td>15.8</td>
<td>36.8</td>
</tr>
<tr>
<td>single owner</td>
<td>1</td>
<td>5.3</td>
<td>5.3</td>
<td>42.1</td>
</tr>
<tr>
<td>all</td>
<td>11</td>
<td>57.9</td>
<td>57.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>
4.2.3.2 Identification of Customers Needs

Exploring the needs of customer is very crucial to addressing these needs. The literature review showed that there are many ways to indentify customer needs. The investigated samples of participants were asked to give an account on how they indentify their needs and expectation and were given four options to choose from. The overwhelming majority of respondents (84.2%) confirmed that direct conversation is the way they do it, one participant mentioned the fact that they opt to market survey and another participant use questionnaires please refer to table (4.2.6)

### Table (4.2.6) Identification of Customers Needs

<table>
<thead>
<tr>
<th>How do you identify their needs and expectation</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>direct conversation</td>
<td>16</td>
<td>84.2</td>
<td>84.2</td>
<td>84.2</td>
</tr>
<tr>
<td>market surveys</td>
<td>1</td>
<td>5.3</td>
<td>5.3</td>
<td>89.5</td>
</tr>
<tr>
<td>questionnaire</td>
<td>1</td>
<td>5.3</td>
<td>5.3</td>
<td>94.7</td>
</tr>
<tr>
<td>other (telephone)</td>
<td>1</td>
<td>5.3</td>
<td>5.3</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>19</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>
4.2.3.3 Frequency of Measuring Customer Satisfaction

Literature review revealed that keeping and maintaining mutual benefit and sense of partnership with customer is essential for the profitability and success of any company, monitoring their changing needs and continuously meeting them is one of the secrets of excellence in competing environment. When responders were asked to specify the frequency of measuring their customers satisfaction, they were split to 63.2% confirming the fact that they annually measuring their customer perception and 31.6% stated that they never measured their customer satisfaction. Although the majority were caring about their customer needs still the importance of customer satisfaction importance shall be enhanced through frequent measuring and monitoring customers satisfaction.
Table (4.2.7) Frequency of Measuring Customer Satisfaction

<table>
<thead>
<tr>
<th>how often do you measure their satisfaction</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid annually</td>
<td>12</td>
<td>63.2</td>
<td>66.7</td>
<td>66.7</td>
</tr>
<tr>
<td>never</td>
<td>6</td>
<td>31.6</td>
<td>33.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>94.7</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Missing System</td>
<td>1</td>
<td>5.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

figure (4.2.7) How often do you measure their satisfaction?

4.2.3.4 Tools Used to Measure Customer Satisfaction

The review of the literature revealed that there are many tools to collect information and measure customer’s satisfactions. The investigated sample of participants were asked to specify the tools they normally use in measuring customer satisfaction, the participants were given four options to choose from. The shown in table(2.4.8) that substantial majority of respondents (89.5%) confirmed that direct conversation is the way they do it, three participants mentioned the fact they opt to use questionnaire and two participants were using claim analysis.
Table (4.2.8) Tools Used to Measure Customer Satisfaction

<table>
<thead>
<tr>
<th>What are the tools you use to measure their satisfaction</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid questionnaire</td>
<td>3</td>
<td>15.8</td>
<td>15.8</td>
<td>15.8</td>
</tr>
<tr>
<td>direct customer contact</td>
<td>14</td>
<td>73.7</td>
<td>73.7</td>
<td>89.5</td>
</tr>
<tr>
<td>claims analysis</td>
<td>2</td>
<td>10.5</td>
<td>10.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure (4.2.8)
what are the tools you use to measure their satisfaction

4.2.3.5 Factors That Constitute Customer Satisfaction

The review of the literature showed that there are many factors that contribute to customer satisfaction example which were given as durability, low price, freedom of defects, fitting to purpose and. The respondents of this question were asked about what they consider as main factor in customer satisfaction. They were provided with six sets of factors to choose from. The collected answers showed that about 2/3 of respondents as shown in (table2.4.9) agreed that all factors mentioned
are important factors for customer satisfaction, whilst low price as mentioned by 15.8% was the next more important single factor contributes to customer satisfaction.

Table (4.2.9) Factors That Constitute Customer Satisfaction

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>low price</td>
<td>3</td>
<td>15.8%</td>
</tr>
<tr>
<td>Durability</td>
<td>1</td>
<td>5.3%</td>
</tr>
<tr>
<td>All</td>
<td>13</td>
<td>68.4%</td>
</tr>
<tr>
<td>freedom of defect</td>
<td>1</td>
<td>5.3%</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>94.7%</td>
</tr>
<tr>
<td>Missing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System</td>
<td>1</td>
<td>5.3%</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Figure (4.2.9) what is in your view constitutes the main factor of customer satisfaction?
4.2.3.6 Response to Customer Complains

Responding to customer complaints was one of the significant signs for caring about customers. When respondents were asked about how fast they response to customer claims, the vast majority (63.3%) respond within one week, 21% within one day and the rest within more than one week. This result indicates that companies are keen not to ignore customer’s claim though responding time should be improved.

Table (4.2.10) Response to Customer Complains

<table>
<thead>
<tr>
<th>how do you respond to the claims of your customers</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>within one day</td>
<td>4</td>
<td>21.1</td>
<td>21.1</td>
<td>21.1</td>
</tr>
<tr>
<td>within one week</td>
<td>12</td>
<td>63.2</td>
<td>63.2</td>
<td>84.2</td>
</tr>
<tr>
<td>more than one week</td>
<td>3</td>
<td>15.8</td>
<td>15.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure (4.2.10) How do you response to the claims of your customers?
4.2.3.7 Frequency of the Customers Complaints

Repeated customer complaints regarding any products or services are viewed as a very serious sign for low quality. It indicates problems in the quality as general and it must be investigated and analyzed to pinpoint the root causes of the problem and take the required action to rectify and solve it. To view and gauge the frequency of complaints placed by their customers about company’s products and services respondents were directly asked and were accordingly given three options to choose from, *always*, *sometimes* and *never*. An overwhelming majority of companies (89.7%) as depicted in the table (4.2.11) below, confirmed that they have received complaints some time, while only one company stated that they never received any complaint and another company stated that they are always receiving complaints. It gives sign that their customers are unsatisfied, hence quality should be improved to reduce and eliminate customer complaints.

**Table (4.2.11) Frequency of the Customers Complaints**

<table>
<thead>
<tr>
<th>how often do your customers complain about your products</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>always</td>
<td>1</td>
<td>5.3</td>
<td>5.3</td>
<td>5.3</td>
</tr>
<tr>
<td>sometime</td>
<td>17</td>
<td>89.5</td>
<td>89.5</td>
<td>94.7</td>
</tr>
<tr>
<td>never</td>
<td>1</td>
<td>5.3</td>
<td>5.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>
4.2.4 Customer Satisfaction Impact

4.2.4.1 Importance of Customer Satisfaction

As confirmed via literature review that customer satisfaction is very important for the growth of any company to and its survival in the competing market and eventually to their success. Respondent were asked to express their opinion on how customer satisfaction is important to their companies. They were given two options whether it is important or very important. The responses showed that (as depicted in the below table) all participants agreed that it is important however, overwhelming majority (89.5%) rate customer satisfaction as very important. This indicates that among those participated there is high level of awareness about the importance of customer satisfaction to company’s performance and success.
Table (4.2.12) Importance of Customer Satisfaction

<table>
<thead>
<tr>
<th>Importance of Customer Satisfaction to Your Company</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid very important</td>
<td>17</td>
<td>89.5</td>
<td>89.5</td>
<td>89.5</td>
</tr>
<tr>
<td>important</td>
<td>2</td>
<td>10.5</td>
<td>10.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure (4.2.12) How important customer satisfaction to your company?

4.2.4.2 Customer Satisfaction and Profitability

Profit is a key factor for the growth of any company’s and its survival. It was surprising that as per the result depicted in table (2.4.13) below only 10.53% saw that customer satisfaction is highly contributing to the profitability of the company while a majority 68% see its contribution as very high while the rest see that there is no relation between customer satisfaction and profitability or with only low effect on that.
Table (4.2.13) Customer Satisfaction and Profitability

<table>
<thead>
<tr>
<th>in your point of view to what extend customer satisfaction contribute to the profitability of your company</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>very high</td>
<td>2</td>
<td>10.5</td>
<td>10.5</td>
<td>10.5</td>
</tr>
<tr>
<td>high</td>
<td>13</td>
<td>68.4</td>
<td>68.4</td>
<td>78.9</td>
</tr>
<tr>
<td>low</td>
<td>2</td>
<td>10.5</td>
<td>10.5</td>
<td>89.5</td>
</tr>
<tr>
<td>no effect</td>
<td>2</td>
<td>10.5</td>
<td>10.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure (4.2.13) In your point of view to what extend customer satisfaction contribute to the Profitability of your company?
4.2.4.3 Customer Satisfaction and Productivity

The review of literature illustrated that customer satisfaction has direct relation in improving Productivity of companies. Productivity levels differ from one company and another due to different factors the most important of which is managerial system adopted in the companies. Respondents were asked to express their opinion on to the extent of the contribution that customer satisfaction is has on its productivity, and they were given a range from very high to no effect to record their response. The responses as depicted in table (2.4.14) showed that a substantial majority about (78.9%) agreed that customer satisfaction has at least a high effect on company’s productivity.

**Table (4.2.14) Customer Satisfaction and Productivity**

<table>
<thead>
<tr>
<th>In your point of view to what extend customer satisfaction contribute to improve your company productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>Valid</td>
</tr>
<tr>
<td>very high</td>
</tr>
<tr>
<td>high</td>
</tr>
<tr>
<td>low</td>
</tr>
<tr>
<td>no effect</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
4.2.4.4 Customer Satisfaction and Competitiveness

There are many factors that boost Company’s competitiveness in the market and the most critical among which is the quality of service and products of the company and the extent of satisfaction of customer with these products. Respondents were asked about their opinion on the extent customer satisfaction contribution on the competitiveness’ of the company in the market, and were provided with four options to rate their opinion rated from high effect to no effect. The responses as depicted in the table (2.4.15) showed that (78%) agreed that customer satisfaction has at least high effect on company’s competitiveness.
Table (4.2.15) Customer Satisfaction and Competitiveness

<table>
<thead>
<tr>
<th>Valid</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>very high</td>
<td>4</td>
<td>21.1</td>
<td>21.1</td>
<td>21.1</td>
</tr>
<tr>
<td>high</td>
<td>11</td>
<td>57.9</td>
<td>57.9</td>
<td>78.9</td>
</tr>
<tr>
<td>low</td>
<td>3</td>
<td>15.8</td>
<td>15.8</td>
<td>94.7</td>
</tr>
<tr>
<td>no effect</td>
<td>1</td>
<td>5.3</td>
<td>5.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure (4.2.15) Customer Satisfaction and Competitiveness

in your point of view to what extend customer satisfaction contribute to the competitiveness of your company
CHAPTER FIVE
CONCLUSION
AND
RECOMMENDATIONS
CHAPTER FIVE
CONCLUSION AND RECOMMENDATIONS

5.1 Conclusions:

In the light of the results of the results obtained from the analyzed data of the questionnaire the following conclusions can be drawn:

- The research reveals that quality culture is disseminated among construction companies high ranked managers and practitioner and this can been confirmed by the fact that a substantial majority of respondents are conforming the definition of the term quality as described by quality philosophers.
- The research showed that there is high level of awareness about customer satisfaction and a vivid recognition of its importance to company’s performance and success among construction companies.
- The research revealed that direct conversation is the way most of construction companies prefer in collecting and identifying customers needs and expectations.
- The research confirmed that the Quality of works of construction companies needs to be enhanced and improved and more emphasize should be given to customers satisfaction since substantial majority of companies are receiving complains some time.

The research confirmed that there is almost agreement that customer satisfaction have a direct positive impact on improving company’s performance, enhancing profitability, and increasing competitiveness and productivity.
5.2 RECOMMENDATIONS

1. To improve company's quality all employees shall be involved, and awareness programs shall be applied to disseminate quality culture amongst all employees.

2. Companies must adopt quality system and programs that are essential to improve quality, address customer's needs and take care of environment and safety and health of employees and the society.

3. Units or department which are concerned with customer needs, claims and complains should be established in any company. These units should continuously identify, monitor, measure, meet their needs and expectation, and respond to their voices and reducing time required to respond to their claims.

4. Customers should be involved in all stage of creating construction facilities and their needs should be taken and addressed continuously.

5. Elements that constitute companies performances, profitability and competitiveness need to be investigated in depth in order to measure the impacts of each of these elements on customer satisfaction.
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Appendix

The Questionnaire
Impact of Customer Satisfaction on Performance
Of Sudanese Construction Companies

تأثير رضا الزبائن في أداء شركات التشييد في السودان

A Thesis Submitted in Partial Fulfilment of the Requirements for
the Degree of M.Sc. in Construction Management

The Research Questionnaire
Customer Satisfaction Questionnaire

Thank you very much for the time you have taken for completing this questionnaire. The questionnaire aims to assess to what extent construction companies are aware of the importance of customer satisfaction to their growth and profitability and if so what are the indicators that prove that.

We do assure you complete confidentiality about your company and your information and responses in the questionnaire.

**Section One: Basic Information**

1. Name of the company:
   ……………………………………………………………………………………………

2. Years in business: ………………………………………………………………

3. Specialization:
   ☐ Building Construction ☐ Electromechanical
   ☐ Sanitary ☐ others (Road construction, finishing …ECT)

**Section Two: Perception of Quality:**

1. In your view which of the following words defines quality:
   ☐ Fitness to Purpose ☐ customer Satisfaction
   ☐ Value of Money ☐ Team Work
   ☐ Increased Profit ☐ Expensive
   ☐ Appearance

2. Has your company developed clear definition of quality?
   ☐ Yes ☐ No
3. Percentage of employee in your company who are aware of the importance of Quality?

□ 0-20% □ 20%-50% □ 50%-75% □ Over 75%

Section Three: Customer Satisfaction:

1. Who is your customer?

□ Government □ private Sector □ Single owner □ All

2. How do you identify their needs and expectation?

□ Direct Conversation □ Questionnaire
□ Market Surveys □ Other (telephone, emails …ECT)

3. How often do you measure their satisfaction

□ Annually □ Each (5) years □ Never

4. What are the tools you use to measure their satisfaction?

□ Questionnaire □ Direct customer contact □ Claims analysis

5. What is in your view constitute the main factor of customer satisfaction?

□ Low Price □ Appearance □ Freedom of Defect
□ Durability □ Time □ Communication
□ All

6. How do you response to the claims of your customers?

□ Within on day □ within one week □ more than one week

7. How often do your customers complain about your products?

□ Always □ Sometime □ Never
Section Four: Customer Satisfaction Impact on Company Performance

1. How important customer satisfaction to your company?
   - [ ] Very Important    - [ ] Important    - [ ] Not Important

2. In your point of view to what extend customer satisfaction contribute to the profitability of your company?
   - [ ] Very High    - [ ] High    - [ ] Low    - [ ] No Effect

3. In your point of view to what extend customer satisfaction contribute to improve your company productivity?
   - [ ] Very High    - [ ] High    - [ ] Low    - [ ] No Effect

4. In your point of view to what extend customer satisfaction contribute to the competitiveness of your company?
   - [ ] Very High    - [ ] High    - [ ] Low    - [ ] No Effect