

الآية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قال تعالى:

(والذين إذا أفقوا لم يسرفوا ولم يقتروا وكان بين ذلك قواما)

الفرقان : آية (66)

Dedication

to my mother, Miriam, to soul of my father, Habiballa and to all my family.

And to my colleges who support me to finish this thesis.

Finally I dedicated to those all I love.

Ibrahim Habiballa

ACKNOWLEDGMENT

I wish to express my sincere gratitude to Sudan University of Science and Technology. Further thanks are extended to the college of Graduate Studies.

I would also like to thank my supervisor, Dr. Awaad Saad for his efficient directors throughout the stages of this research , my deep thanks go to my

Colleagues for their continuous help, last, but not least my deep appreciation

Go to my family for their help and encouragement.

المستخلص

ان الدراسة القيمية علم من العلوم الحديثة التي تساعد وتتناسب مع الدول النامية وخاصةً دولة مثل بلادنا السودان والتي تشهد ظروف اقتصادية حرجه . فالهندسة القيمية تهتم بتوفير وايجاد بدائل مناسبة ، وتقليل التكاليف ، والتركيز علي الوظائف الاساسية مع المحافظة علي الجودة للمشاريع .

لذلك قامت هذه الدراسة وسعت في محاولة للاجابة علي اسئلة، ما مدي المعرفة بالهندسة القيمية وتطبيق اساليب ومفاهيم هذه الدراسات في قطاع صناعة التشييد في السودان .

قامت الدراسة بأعداد استبيان يشمل فرضيات يريد الباحث الاجابة عليها وتم توزيع الاستبيان علي

(مائة) من المبحوثين واستعادة (اربعة وثمانون) من الاستبيانات ، الصالح منها (تسع وسبعون) وهي الاستبيانات التي تم تحليلها وعرضت النتائج بواسطة مخططات توضيحية وتم التحليل بواسطة برنامج احصائي (اس . بي . اس . ا).

استهدفت دراسته مؤسسات التشييد في القطاعين الحكومي و الخاص والجامعات السودانية من المهندسين سواء كان ذلك الاستشاري او المقاول او المالك.

ركزت الدراسة علي الادارات العليا لتلك المؤسسات لاهمية عامل الخبرة في الدراسات القيمية .

وجدت الدراسة ان المهندسين في قطاع التشييد علي دراية كبيرة بالهندسة القيمية واهميتها الا ان تطبيق الهندسة القيمية في المؤسسات العاملة في قطاع التشيد لا تطبق هذه الدراسات القيمية.

وجدت الدراسة ان العينة المستهدفة تستخدم بعض اساليب وتقنيات الهندسة القيمية بصورة فردية نتيجة للخبرات التراكمية والمهارات الفردية .

توصل البحث الي ان مؤسسات قطاع التشييد لا يهتم بانشاء ادارة للهندسة القيمية .

وجدت الدراسة ان التدريب هو واحد من العوائق المهمة التي تواجه تطبيق الهندسة القيمية .

كما وجدت . الدراسة ايضا اكثر من (ثمانون%) من المستهدفين بالدراسة ان انسب وقت للدراسات القيمية هي مرحلتي دراسة الجدوي ومرحلة التصميم .

The Abstract

The value Engineering is a modern sciences which is suitable for the developing countries especially like , Sudan, which witnesses critical crucial economic situations, value engineering is concerned with providing and finding suitable alternatives, minimizing the costs, focusing on the main features and preserving the quality of the projects.

The study used a questionnaire for the collection of the data. The sample included a hundred participants. The data was analyzed by means of SPS.

The study found out that, the engineers in the construction sector have good knowledgeable of value engineering in the organizations of construction but They don't apply this value engineering in their organizations.

The study found out that the targeted sample, uses, same of the methods and techniques of value engineering individually, based on their cumulative experiences and individual skills.

The research concluded that the construction sector organizations were not interested in establishing value engineering management .

The study made a questionnaire include of hypotheses which the researcher wants to answer, and the sample distribution in the research field (hundred)samples and restoring of (eighty four) the valuable/valid questionnaire (seventy nine) the questionnaire which analyzes, and the showing of the results has been made by diagrams or charts (then the analysis by statistical program/software (spss)

The study aimed to the constructions organizations in both sectors governmental and private, the Sudanese universities (Engineers whether consultant, contractor and clients) .

The study focuses on the top management for those organizations for the importance of the experience factor in the value engineering.

The study found out that, the engineers in the construction sector has a Highly knowledgeable of value engineering in the organizations of construction which doesn't apply this value engineering in their organizations

The study also found out that the targeted sample, use some of methods and techniques of the value engineering individually, accordingly to the cumulative experiences and individuality skills.

The research concluded the construction's sector organizations were not interested in establishing value engineering management.

The research found out that the training is one of difficulties that face to apply value engineering.

The research found out that more than (eighty eight %) the most important time to make value studies is feasibility study and design stages.

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CHAPTER ONE
GENERAL INTRODUCTION

Chapter 1

1.1 General Introductions:

At present, the value engineering of important and necessary things is used to ensure equitable distribution of resources. The broad concept of value engineering, does not mean that engineering machinery of a ruler, schemes, standards and forms but functional means any re-engineering study of the performance and function of the facility and to play its role better or at a lower cost, value engineering study has certain goals such as reducing costs, extravagance and waste. For example, looking at the houses we note how many empty buildings are unnecessarily built.

How many rooms are excessive many windows and doors are there, Value Engineering is a comprehensive revolution to reduce extravagant as long as the job performed flawlessly.

It is worth mentioning that the Value Engineering aims to reduce the costs of products or services with an emphasis on quality, trust and other requirements to the customer's specifications, and through examination of all possible ideas to reduce costs at the stages of research and development, engineering design and planning for new products, here is clear that the focus is on reducing costs without compromising the quality and trust and the other functions of the requirements and specifications.

1.2 The research problem

Competition has become evident in the global market as a result of the presence of large contacts between global markets. On the domestic market in Sudan, especially after great openness that took place in Sudan during the last years of

entry of many products and diverse and from different international origins, which led to the emergence of the problem faced by local Sudan Products the characteristics of the product down the high cost. This product manufacturing which affects the value of the product the consumer's perspective, led to the lack of economic unity competitive with Other economic units and inability to achieving high profits.

1.3 The importance of research:

The need to study the possibilities for the purpose of reducing the cost of existing products and will doing statement the primary and secondary functions of the product. Economic Unity research sample, as well as interpretation for structural design which leads to raise the level of competitive products and the need for economic unity. Discrimination between costs based on the reduction Cancel Parts of the project and impair the basic functions and between Value Engineering or who managed the unit value analysis economic stay at the top and maintain .The gap between it and its competitors.

1.4 The objective of the research:

This research aims to the following:

1. At a theoretical framework for value engineering to clarify concept, objectives and benefits, elements and steps.
2. To identify the method of using value engineering through the product segmentation of its functions to the primary and secondary and try to correct or modify the values is appropriate in product and the possibility of change in the design of the product and therefore increase the value or performance of the function of the product.

1.5 Research Hypothesis:

This research relies on two assumptions pillars:

- I. The application of Value Engineering (value) analysis leads to reduce costs and product development.
- II. There is the possibility to apply the style of Value Engineering in construction industry in Sudan.

CHAPTER TWO
THE THEORETICAL FORMWORK OF THE
VALUE ENGINEERING

Chapter 2

The theoretical framework of the value engineering

2.1 Introduction:

In this section is addressed to the emergence of and the concept of value engineering, objectives and elements the steps and their benefits and their relationship to the methods of development other, as follows:

2.2 Genesis and the concept of value engineering

It began to apply the values of the engineering company during the period before World War II because of the resulting lack of war and scarcity in skilled labor and raw materials, tools and other backup (Harry) (Lawrence Miles) searching for (GE) in Company acceptable alternatives, has noticed that these alternatives often lead to lower costs or improve product or all of them. There are several positions urgent to make value engineering as a process regularly, as this technique was adopted by other companies in the form of various other programs related to total quality management. (TQM)

this concept has received several other names, some of them called the value analysis and others are calls administration and others Value Engineering Calendar but common ones are labeled Value Engineering the Researcher agrees with this label because it is more indicative and harmony with the origin and essence of the concept and objectives and requirements and finally Value Engineering has spread widely in the different sectors of government, especially in the areas of defense, or transportation, housing and health care sectors. As for the concept of value engineering, a close relationship with the price they are a relative value

commensurate with the price of anything that is called by some Calendar engineering and that this relationship.

Output style engineering quality of the relationship that rely mainly on good engineering and specifications such as endurance, strength and quality of the material, as known as Value Engineering (regular evaluation of all aspects of the functions of the value chain operations to reduce costs while maintaining the fulfillment of the customer) requirements. This underlines the definition of the role of value engineering to reduce costs while maintaining the quality requirements, functions, specifications and other product from the customer's point of view, and there are those who know the value of engineering as (organized collective effort for the functions of the project analysis and compliance with the objectives and requirements of the owner and the beneficiary and then devise alternatives to perform those functions and achieve goals at the lowest possible cost without prejudice to quality basic functions)

This definition is consistent with the previous definition that the role of value engineering is to reduce costs without prejudice to quality basic functions requirements, so the value engineering is a method of organization to improve the value of services through the use of tests, as the value increases either by post or reduction to improve the cost and quality under the value Engineering are not affected as a result of achieving value improvements.

Others believe that (Blocher) Value Engineering used in target costs of reducing the cost of the product (Target Costing) through the various functions of the product analysis, and basic step in the completion of Value Engineering is the analysis during the design phase of the new or modified product from the consumer's perspective this analysis diagnose basic consumer preferences and

value engineering can lead to analysis improvements in product designs or changes in the specifications of materials or modifications in the manufacturing methods lead to a reduction can be achieved for the product to become equal to the cost or close to the target cost and as usual, carried out by Value Engineering

Value engineering includes An integrated team and this team includes members from outside the organization or company, for example, members of the marketing of institutions and processors of raw materials and others. and that the goal of this review is to look for every opportunity to reduce costs without influence a quality, because the eruption is strongly against competing products and in every part of the operation, and that the Value Engineering result in improvements in the design product specifications and change in the materials and methods of transgene in the process, and are also used in comparison to the reference-based and cost (Benchmarking) in (Activity - Based Costing) activity exclude costs that do not add value. And finally, that team will determine a specific strategy for the purpose of cost savings that are on the way or planned target through the previous review, the researcher suggested the following:

- I. There is a great value engineering role in reducing costs at the same time are maintained quality requirements and specifications and basic functions.
- II. The Value Engineering is a systematic evaluation of each aspect or aspects of the value chain.
- III. The cost reduction in the value chain by focusing on the primary functions of this series is called the target cost.
- IV. The Value Engineering require re-design of products and Improvement significant radical for the time, cost and quality.

Accordingly Value Engineering:

(Radical re-design of products for the purpose of achieving fundamental improvements in the measurement of job performance as a reduction of cost and improve product quality and speed at the time of achievement and achieve customer satisfaction with products and services for economic unity standards).

2.3 The goals of Value Engineering:

- i. Achieve a radical change in performance or product by changing the style and working tools and results, as well as allow workers to design products according to customers' needs and goals of unity economic.
- ii. Customer Focus: This method is intended to guide the economic unit to focus on customers by identifying their needs and work to achieve their desires, so that the rebuilding of products or processes to achieve this purpose..
- iii. Speed: This method is designed to enable the economic union to do its work at high speed through the provision of information needed to make decisions and to facilitate the process of obtaining them.
Quality: This technique aims to improve the quality of products or services in order to fit the needs and desires of customers.
- v. Cost reduction: Value Engineering method aims to reduce costs through the elimination or exclusion of unnecessary processes and focus on the processes that add value.

2.4 Components value engineering:

- i. Identifying the concepts and definitions of value engineering can select the items that share by value engineering, including:

1. fundamental change: This method raises fundamental questions not only include the methods and techniques used, but to go beyond the business itself, and the assumptions underlying the business, for example, why we work that we do? Why follow this style at work? Questions such as these develop basic assumptions upon which the business in question and paid workers to reconsider these assumptions.

- ii. to be a radical change: It must be required that Value Engineering radical change has meaning and value, and not a superficial change is to improve the development of what is in the restoration of the current situation, it has to be a radical change through the uprooting of existing roots and re-building products or processes commensurate with the current targets and economic union requirements.
- iii. That the results are significant and huge: this technique requires substantial and achieve huge results not limited to any relative improvement and development and formal in products, performance.
- iv. The change in operations: This method focuses on the analysis and re-building operations and not only on the organizational and functional structures and responsibilities that any operations are considered herself the focus of research and focus and not the people and departments.
- v. Change to rely on information technology: This method relies on investment in information technology and the use of this technique effectively, so that it is employed for the radical change that creates a way creatively and methods of implementation of the action and not aimed mechanization to save time.
- vi. be change on the basis of inductive thinking, not deductive: This method is based on extrapolation and objective in the search for development

opportunities and change before the emergence of problems call for change and development, and rejects this style deductive thinking and of wait for the emergence of the problem and then work on the analysis and the search for appropriate solutions.

2.5 The stages or steps of Value Engineering:

There are several stages to conduct value engineering depending on the angle at which the style is seen some of them are determined by four or five steps or more, but we can identify the key steps to value engineering thus:

- i. **Information Gathering:** This requires knowing the requirements of this goal, if the function analysis is an important method in the Value Engineering, which is usually done in this basic point, which is trying to determine the functional characteristics or significant performance characteristics put it requires the following questions: What is the thing that we do? And what should you do? What will work? And what can we do? What should not we?
- ii. **Creating alternatives:** At this stage value engineers want to know what are the different alternative ways to meet the needs and requirements. What are the other methods that achieve the same desired these jobs?
- iii. **Evaluation:** At this stage, we fine the assessment and valuation of all the available alternatives by evaluating how to accomplish the required functions and how to increase savings in cost.
- iv. **Presentation:** this stage is to identify and choose the best alternative to be offered to customers for the purpose of making the final decision.

2.6 The benefits of Value engineering:

This method achieves a series of important results in performance metrics such as the quality of the product or service, reduce costs and speed completion of work and reduce the period of time for work and a large improvement in performance can be the benefits of the application of Value Engineering:

- i. completion of the integrated operations and is not a small addition to the speed of completion of work.
- ii. Narrowing the time difference between the action steps.
- iii. Using accurate and more objective standards to measure performance and improve the quality of the product and find new ways of performance.
- iv. Coordination between the different activities speed.
- v. Sense of the importance of employees as a result of the diversity of skills and ability of individuals to perform various actions.
- vi. Demand to contribute new ideas to work.
- vii. Improve the collective performance of the spread of cooperation.
- viii. Reward and motivate creative and talented workers and spread the spirit of challenge and the desire to excel.
- ix. .Improve controls.
- x. Improve the information systems and the development of a client decision-making.
- xi. Approach is fast and substantial improvement in the performance aspects of the stages and by reducing the time and cost of operations or products and increase the added value with determining competitive prices based on the cost structure of acceptable and rational.

2.7 The value engineering and other methods development:

Not value engineering method is the only method used in lower costs, there are several other methods used to reduce costs such as based management activity and the cost of kaizen, etc., there are also (ABM) methods related to value engineering such as target cost, which will be to clarify these methods and also follows:

- i. Activity –Based Management:** This method (ABM) known as (administration of activities to improve the value obtained by the consumer and increase the profit earned from the provision of this value). While (Hilon) describing method (ABM) that he (the use of cost information (ABM) for the purpose of improving (ABC) based on business processes and delete the costs that do not add value) and under this style is activity analysis, and that the various economic activities of the unit analysis process provides a great opportunity administration to distinguish between the two types of activities from the point of view of the customer are:
 - a. Value added activities:** Those activities that distinguish them as a customer adds to the value of goods or services purchased, such as the purchase of the initial activity and the activity of checking the quality and other materials.
 - b. Non Value added activities**

Those activities that distinguish the customer that they do not add value to the goods or services purchased by activity such as storage materials and transport materials activities, one place to another.. It could be argued that activities which add value cannot be excluded, while their activities. Donor add of value can be eliminated without affecting the quality of goods or services provided to the customer, on the other hand there are worthless activities from the point of customers look but cannot dispense with the organization it fully, but it can be reduced in size or that it is completed efficiently, such as administrative and

activity to increase individuals and activity accounting. as a result, Experience in the study of activities and deal with it went From ?? management's attention to the activities themselves administration instead cost management, and so this technique has emerged to dealing with the financial and non-financial activities, information such as the operation and efficiency, flexibility and other time. It is noted that the idea of focusing on the functions and activities successive that add value and that it has been known by (**Horngren**) and others of the value chain.

A range of activities and functions cascading through which added value or benefit to the products or services from the beginning when they were just ideas and to finish when consumed when customers through design, production, marketing and distribution

And that the activities and functions cascading in the value chain are

- 1- **Research and development** It is intended to collect ideas and experimenting with products, services or new processes.
- 2- **Design** It is intended to develop the detailed planning and engineering of products or services or new processes.
- 3- **Production** means the physical transfer of ideas and designs into reality process in the form of tangible products or services provided to customers.
- 4- **Marketing** it intended to contact individuals and groups in order to introduce them to the characteristics of new products or services offered by the company, as well as to encouraging them to buy products or services.
- 5- **Distribution** means the mechanism by which the delivery of products and services through various distribution channels.

6- Customer service:

What are the additional services provided by the company to the customer after-sales service, such as security, repair and maintenance, and free calls to inquire about how to operate and others?

Management accounting and information provided play a large role in helping managers in strategic decision-making in addition to information that will help:

- Manage and operation of activities within each function of jobs in the value chain.

- To coordinate the activities of these functions within the framework of the organization as a whole.

- Development and improvement of performance in every function of jobs in the value chain, here, need to shed light on both sides of the value chain where you find before the start of the value chain (suppliers), and we find after the end of the value chain (clients), There is no doubt that suppliers and customers are considered essential parts in the comprehensive analysis of the value chain, for example, the company is working with its suppliers to reduce costs and the receipt are over raw materials and take responsibility for checking these substances as for the company that also works with its customers, leading to better planning and scheduling, to production processes in the company and delivery to customers. Thus clear role in determining the style and the exclusion of costs (ABM) and activities that do not add value through the report on these activities and subsequent step become re-engineering processes for the purpose of cancellation of these activities for the purpose of improving the organization's operations and reduce costs.

2- The target costing:

Known as the target cost (methods of planning cost which are used during the stage of research and development, engineering design at the beginning of the value chain of the total product life cycle this activity aims to reduce costs while maintaining quality and specifications and other requirements).

Looking at the functions of the value chain, we find two-way to them optimization operations out of the output stage. The first tendency is towards the completion of the series to finish through the functions of marketing, distribution and after-sales service, the second trend towards the start of the series shall be towards R & D and engineering design of the products and both directions of the two direct results, but a general trend tended most of the global industrial companies, especially Japanese companies towards the second direction ,Because they have learned as a result of the application of the production system at the time that 98% of the etiology (JITP) set to be (Cost Drivers) Basic costs in the early stages of development and design of the product has been shown that as soon as the beginning of production becomes more than 90% of the product are not costs to control where any it fixed, and the improvement and development at the beginning of the series can lead to the presence of other opportunities to reduce costs in the last series, for example, can achieve a reduction marked in maintenance and guarantees the costs of after-sales in the last series through improved engineering design of the product in the first series, then the trend in the focus of production to focus on the stages at the beginning of the series is considered a treasure of opportunities to reduce costs.

Finally, he called on the idea of the direction to focus on the existing jobs at the beginning of the value chain to achieve a reduction in the cost of targeted cost name and is thus clear that the target costs determined by the company's first use of

market research to determine the price of goods and services sold, and at the same time the company can meet the customer's requirements as well as achieve the targeted profit by the company and the engineers, managers and accounting costs others are working together on the design of goods and quality services that can be produced at a lower cost through a process known engineering value, which represents the systematic assessment of all aspects of the value chain and that the target cost applied broadly in companies many of which company (Chrysler Daimler) for the manufacture of bin Zat Almarsides and company (Chrysler Automotive Industry Corporation (Toyota) industry (Panasonic and Sharp) industry (Toshiba) Electronics Inc.

Thus, it is clear that the target cost is an administrative system determining profit and cost that the company will help to achieve the successes of market and financial through the planning of the services offered by the company and the design of products and processes and the structure of the related costs, which provides value the standpoint of customers. The target costing requires knowledge and pricing based under market conditions and the requirements of this market, as well as the conditions of competition and test relations between the price and size, and then later raised the margin required for the purpose of knowing the target cost of the Mentj.oukd Select (Horngren) and others detailed steps to implement targeted cost method.

a. Product that meets the needs of prospective customers to develop:

This step is the planning process for the development of Alterations and modifications to the designs. Studies have shown that customers can not afford the additional features or new features of the new product and the product prefer to stay only for the basic characteristics that introduced lower prices.

b. Target price:

Identifying and estimating selling price is the beginning of the activities of the targeted cost point and there are many factors to influence the selling price of the product such as the nature and characteristics of the expected target customer, market and product life cycle and the amount of expected sales and other. Also, strategies of competition must be examined carefully, The market determines the price and competitive market must therefore be that the company is almost the same competitors' prices by pricing their products, for example Japanese companies used pricing method functions and the pricing (pricing by Functions) functions on the basis that It can be divided into product price to a group of elements, as it reflects both the value of an item or job offers to the customer and thus be willing to pay for that element consisting products of a lot of jobs, for example in the automotive industry, we find there shape and comfort, operation and trust, quality and gravity and attractiveness and to model and others, It calculates the expected selling price to collect the given values for each product functions.

c. Determine the profit target:

The estimated selling price in the following steps are to be the target of the product which is the expense of profit is the amount of profit that the company would like to achieve on the product and how it can be calculated? You must determine the profit target new products linked to the planning strategic to the company's profits, and the development of these products must be in harmony and homogeneity with the strategies and goals of the company's management so we find the Japanese target cost entrance is through calculating the total profit

target based on the medium-term profit plans, which reflect the strategies the company, which covers a period of three to five years.

The total profit target is derived from the medium-term the company plans to target the profits of each product that will be in the market during this period, and in most cases return on sales target to determine the profits rather than the return on investment for the following reasons:

1. Return on sales clearly shows the profitability of the product when the company produces a large number of products.
2. From the perspective of the cost - benefit, it is often difficult if not impossible to calculate the return on investment for each product when the company produces a large number of products and small sizes.

d. Target cost is calculated for each one: and this is done by the following equation:

Target = cost expected sales in the market price _ the desired yield

And that the target cost is working to make the organization more competitive as in the comparison, which is (Benchmarking case) reference general strategy for the analysis of competition between organizations and concentration, even if a few price differences Consumers gravitate towards products with prices at least as it is in the computer software industry company as a good example for the application of the target cost,producers of this software is often sold

About competing at a specified price in market (in some cases, the company is the main or leading define and establish the price), and trying to differentiate their products quality and quantity of new features and make

the company's products with high ranking in the software industry as well as the same case for companies that manufacture cars then be realizable cost calculation (initial cost) for this new product in light of resources, activities and operations current manufacturing taking into consideration the specifications and characteristics of the basic engineering design for this new product Usually the initial cost is greater than the target cost (cost allowed) to offer this new product to the market and on this basis to start looking for opportunities to reduce the production of this new product costs without affecting the characteristics and quality of the main specifications needed by the customer called this special reducing measures cost value Engineering

e. The completion of the analysis of value engineering to achieve the target cost:

Value Engineering is defined as systematic evaluation of all aspects of the value chain in order to maintain costs with customers to meet the requirements of the reduction, and can lead to the analysis of Value Engineering improvement in the design of the product or the change in raw materials and raw materials specification or modification in the manufacturing methods and in such a way to reduce the realizable production cost (initial cost) to become equal to the target cost or close to it illustrates the steps to implement the target cost.

As for the major benefits achieved by the style of the target cost in the success of efforts and the development of new products or services are as follows: -

1. Definition of products and services to these customers who wish to purchase products in accordance with the planned prices.
2. Achieve the goal of getting market share.

2. Improve confidence revenues and profits achieved.
3. The existence of a strong incentive to research and development to achieve technological advances in order to manufacture new products and submit them to the market at an economic cost.

Kaizen costing

Is a technique similar to the target cost on a mission to reduce costs except that it focuses on reducing costs through production phase of the overall product life cycle, and Kaizen Japanese term used for improvements to the processes (continuous improvement as it is small and direct change and not a fundamental change, and that the goal of kaizen It considered reasonable target because of the product at the production stage characterized by difficulty in fundamental changes for the purpose of reducing costs, and this is at odds target cost is characterized by a large number of opportunities to make the change.

And kaizen associated profit planning system in the Japanese company for the automotive industry, for example, identifies each plant or production line profit annual target in the budget, and each car has a specific advance a (cost Base) the basis of the cost is equal to the actual cost of the car in the previous year, that all the cuts cost using as its basis a certain cost as its starting point, the percentage reduction target represents the percentage of the target amount (Cost Base) to discount the basis of cost and apply this percentage to all variable costs resulting from the targeted amounts discount prices for materials and parts and direct labor and indirect and other variable costs, the administration compared between the amounts actually discount, which include all variable costs are compared with the specified target reduction in advance, in case of differences, the factory will

identify deviations, and that the goal of the cost of kaizen is to ensure that the actual production costs of less than a cost specified in advance. In any case, if the cost of the application of this method in the largest of the savings achieved by the cost of production there is no need for the application of the cost of kaizen is thus clear that the style of value engineering is more sophisticated and geared towards technology and large changes but the cost of kaizen only require a long-term discipline and provides steps small change.

4) Quality costs

The relationship between cost and quality is a critical relationship, facing established two things, the first thing to ensure products of high quality and the level of the second production of these units at the lowest possible cost, and that the traditional view that all summed up the level of quality required

Level versus the cost, as the access to the highest quality requires an increase in the cost associated with them. Improving the quality of the product requires materials and machines and better working conditions, as well as to reduce defects in production requires an increase in the inspection and testing process,

At the present time Practice has been proven this error Though It turns out that the opposite is true that achieving the highest quality is through the efforts focus on operations such as a purchase by the production and quality of the materials and evaluation, engineering and others. this leads to

The achievement of the required quality level with the largest reduction in the work of examination and re-work and this leads to cost reduction, on the other hand, achieve quality during production processes through inspection and testing reducing the cost of defective and rejected

The modern outlook requires planning and programming processes and an integrated study of all the elements to ensure the achievement of cost savings, as well as achieving a reduction in the costs of the assessment and the failure to achieve this quality on the one hand, and continue to

Improve the quality of the other. we have said previously the cost of quality can be defined as: (accruing costs to prevent a weakness in the sense that the quality of these costs arising as a result of the presence of the weakness in quality).

The quality costs are classified into four main types:

- Costs of prevention (prevention).
- Evaluation costs.
- Internal failure costs
- external failure costs

It is worth noting that the cost of quality report contains all the main types of sub-quality and costs and the percentage of each type of quality main and branch sales costs. In the case of ratio of external failure of a large cost of sales, for example, you must work to reduce the costs of quality in this element and to improve relations with customers and others,

If the rest of the other elements of the quality increase there will be no problem with it.

5) Benchmarking

There are three methods to adopt and learn modern management methods of accounting by organizations as determined by (Atkinson) and others as follows:

1. Bring advisers from outside the economic unit to carry out a certain way and external advisers are competent but they are assigned to a grandfather.
2. the members of the organization to develop their own systems of internal organization and without the help of external consultants or they give a little help, but even though this method is acceptable and satisfactory but it is very costly and time-consuming

Especially in organizations that are trying to change its ways and applied for the first time.

3. The third method is defined as compared to the reference, which requires members of the (Benchmarking) first organization to understand their operations are ongoing and their ways for the purpose of directing work, then later throw external look at other organizations as a guide or mentor applications for improvements and enhancements.

Therefore, benchmarking is (the implementation of the best way that often used by other similar organizations)(), and that the comparison of reference include choosing Economic Unity best partner in the field in which it operates, so the benchmarking application will be the economic unit of conditioning all operations them to be more efficient without having to waste time in modulating and changing and reducing process of all its operations and individually, while the value of engineering requires the organization to do

Redesigned and conditioning of ware products or processes and follow-up work after that, so the benchmarking application implies the application of value engineering, which is one of the processes that are accomplished through the application of the style of benchmarking, and the style of Value Engineering is resorted to if it was not possible to apply the style Benchmarking because of high

costs or that the best partner is difficult to reach him because of the partner's desire to cooperate with the economic union or because of the geographical distance or other.

It is worth mentioning that the basic function of accounting cost in a reference comparisons is to look for improvement of products and services in the economic union by obtaining information current cost, and be prepared to deal with the base. (Data Base) data that the other important is the cost accountant collects information obtained from other companies targeted, and that is a reference comparison with them, as well as working on a comparison of internal and external information for each project and to highlight the differences or deviations and validated recently become a cost accountant as a major financial analyst within the benchmarking team which works on compilation and review key information used by the team for the purpose of access to the list of recommendations can be proposed improvements and enhancements

To say that he can through benchmarking discrimination

Among the activities that add value and activities that do not...

2-8 Causes of unnecessary costs and the role of value engineering in reduction

This section addressed to the factors that contribute to high costs and poor quality, value and methods of traditional and modern reduction costs and comparison as in the section also addressed to the key success factors (cost, quality, time and innovation) clarified the strategy of cost leadership and how to reduce costs through value engineering:

There are a lot of mistakes that have occurred and are located in most of the projects at all stages of production, especially in the first stage, these errors result in excessive and unnecessary costs, and there are still many factors that help Poor value, and that these factors are obstacles in the way of getting the best value and the best way to overcome these obstacles is to use the method used by teamwork in the value of multi-disciplinary engineering by a working group composed of all related parties, the best use of resources is the demand of an increasing need day after day because most if not all inexhaustible and steadily increasing demand for them, and for this application becomes a value engineering approach to product services and other urgent requirement to stay under the intense global competition, especially if we know that there are many factors that contribute to the increase of unnecessary costs and poor quality and value together, including:

1. The absence of local specifications.
2. The lack of information on the objectives, requirements and costs.
3. Exaggerate the foundations of design standards.
4. Exaggerate the safety factors.
5. Lack of access to modern technologies.

6. Weakness relations and coordination between agencies of the relevant decision-making.
7. Lack of appreciation and determine the cost from the beginning
8. Rely on assumptions without facts.
9. Focus on the initial cost and not the total cost.
10. The limited time available for the studies and designs.

It is noted by the researcher from the lack of access to modern methods and techniques to value engineering and cost kaizen and other factor is a major cause of increase in unnecessary costs, so the value engineering approach came in the most developed countries of the world. The focus is initially on the analysis function or functions to be achieved and setting goals and needs, requirements and desires and then looking at the efficiency by identifying quality that makes the product more palatable, and finally trying to get it the most economical standards possible costs, and costs here means the total cost of the product life cycle and not just the initial costs, note the figure shows the relationship between the function, quality, cost... Therefore the role of the tools cost management, methods and methodologies associated with product design through manufacturing stages, assembly, inspection and testing and modeling and standards came and finally the Job Analysis or Value analysis, these methods and methodologies include instructions and routers, databases, training, procedures and analytical tools.

Great product costs are indirect costs (ranging from 30% to 50%, according to private studies), these costs must be reduced through the establishment of this project that examines the costs and process of re-engineering related costs. Direct and reduce costs that do not add value, but in addition to these steps, there is a lack of career development and staff in general to understand the relationship between the cost of the product and process design decisions or product taken by them in

addition to the use of style and understanding (ABC) cost based on the activity of these (Cost Drivers) routers cost the organization knows the basis for understanding how to make design decisions and their impact on indirect costs and therefore allow to avoid indirect costs

2-9 Traditional ways of reducing cost :

Operation of conventional followed in the United States to reduce costs significantly varies from the target costing method, the traditional way to start to reduce the costs of market research on customer requirements related to product specifications, and so the company will exploit the design and engineering of the product and get prices from processors process. At this stage the cost of the product is not an important factor in the design of the product, then the engineers and designers determine the design of the product, and are estimating the cost of the product after placing figures derived by conventional thinking, in the case of the high estimated costs, it is necessary later to be filmed or modify product design and to find a desired profit or desirable is margin put the estimated cost of the expected sale price of any that:

Profit = expected selling price margin - the estimated cost of production

On the other hand selling price may be calculated by adding a profit margin expected to estimated cost of the product that is to say:

Selling price = the estimated production cost + expected profit margin

In both the traditional methods, the production designers are not trying to accomplish specific target cost.

3-3 Reducing costs by using modern methods

At this point is to clarify the role of the ways of modern cost management to reduce costs through the total product life and the comparison between these methods cycle with a focus on re-engineering, starting will be to clarify the concept of the cost of the product, which is the style of the user administration in the diagnosis and control of product costs through the life cycle of cycle his life any life of the product, this session is made up of all steps starting from product design and purchase of raw materials and ending with the delivery of the final product to the customer. The main product life cycle three own to reduce costs main stages, mainly includes the first phase stage of research and development, design, engineering, and the second phase is phase manufacturing or production and the third phase is post-sale and disposal services, the traditional cost management focus on cost of production stage or manufacturing only, while the Management Accountant at present manages the costs of the total product life cycle, including the beginning of the product life-cycle costs and end in addition to the industrial costs and this trend focused on the meaning of that attention and care for the design product minute by taking design decisions, the subsequent product's life-cycle costs or the following will be affected by the fall. In the first phase of stage R & D and engineering, they include the following:

- 1- Use market research to assess what are the customer's requirements that lead to generate ideas for new products.
2. The design of the product by the experts and engineers to develop the technical aspects (technical) of the products.
3. Product development by the company developed distinctive and important

characteristics of customer satisfaction and design models and production processes and any special tool is required.

Estimated Studies show that from

80% to 85%) of the total cost of a product's life are bound by the costs of which are: (costs associated with a configure a basic economic unit and the exercise of its business which are necessary to enable the facility to do basic work such as rent expense and the extinction of plant and equipment and other costs) and the decision is made at the stage of research and development and engineering of Product life, as the decision is crucial at this stage because any extra amount spent on activities during this stage lead to cost-saving significantly in the two phases of manufacturing (production) and after-sales services.

CHAPTER THREE
THE FIELD STUDY APPROACH
METHODOLOGY

Chapter 3

The Field Study Approach Methodology

This chapter deals with the discussion of the field study results illustrating the study tools, the methodology of the field study and the ways of the executing anticipation and the description of the population and the samples of the study, and the evaluating of the study tool to confirm its validity in addition to the statistical means methods, through which, the data has been analyzed and the study hypotheses tested and in the following the researcher shows the steps of the field study as :

- i. The verification of the sample volume sufficiency.
- ii. The study tools description.
- iii. The evaluation of the study tools (measurement)
- iv. The description of the population and study samples.
- v. In the following, these steps are shown in details

3.1 : The verification of the sample volume sufficiency:

Table No (4-1) the results of the exploration factors to the variables:

| | | |
|--|-------------------------------|---------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .646 |
| | Approx. Chi-Square | 859.532 |
| | Df | 378 |
| | Bartlett's Test of Sphericity | .000 |

Table No(3- 1) above shows the value of KMO and Bartlett's test of sphericity reaches (0.65) above of the minimum limit 60% indicating the sufficiency of the sample volume and the explanatory ability of the determined factors by factor

analysis related to the total variety in accordance to the incorporeal (Intangibility) value of the test (0.000) its below 5%.

3.2: The study tools description:

The study tools represent the style/mean used by the researcher in necessity data collecting and accumulating about the phenomena (the subject of the study), there are many of the tools used in the field of scientific research to obtain the information and the necessary data to the study , the study depend on preparing private form to progress the field study , the sentences/phrases (of the importance of the value/Value engineering and the fundamentals , techniques that work by , and the range of the application to reduce the cost by the same required quality for establishing the construction establishment in Sudan) been proved /demonstrated

During the study the researcher follow the following steps:

- I. Reviewing several and many studies related to the subject of the study, in addition to reviewing previous studies, for the beneficiary of preparing tool of data accumulating.
- II. Showing the questionnaire to the some of the specialist for validation , who recommend to ease and remove some phrases and adding new phrases , and rephrasing the language form, in some of the clauses and terms ,the questionnaire involve two sections :

3.2.1 The first section: including the private data especially of the study's samples individuals as:

- i. Gender.
- ii. Age.
- iii. Educational Qualification

iv. Years of Experiences.

3.2.2. The Second section : Including the data of the organization:

- i. The Specialty/specialization.
- ii. Scope of the organization work.
- iii. The concepts of the value engineering.

3.3.1questionnaire data

3.3.1 the first section includes the statements of the first hypotheses:

The availability of applying target cost (essentials) to the constructions firms, consist of (8) phrases.

3.3.2 The Second Axis: Including the phrases of the second hypothesis:

The organization realization the (the Target cost) principles and concepts and how to applied: Consist of (5) phrases

3.3.3 The Third Axis : Including the phrases of the third hypothesis:

The application of the aimed/Target cost to improving the benefits:

Consist of (6) phrases:

3.3.4 The fourth Axis: Also including the phrases of the fourth hypothesis

The application of the Target cost is reducing the cost, it's including (4) phrases.

3.3.5 The Fifth Axis: Including the phrases of the fifth hypothesis:

The Value Engineering Difficulties, consist of (5) phrases

The study depended on preparing the section upon (triple likert scale) ,it's in range of (Yes-Sort Of/Fairly -No)

The measurement of the study corrected as the following:

- The total value (degree) it's the sum of the single over the phrases:
- Giving every degree of the Quintuple **likert scale** a Fuzzy/weighting Measure as the following: Accordingly and the virtue of as what proven in the following table :

Table NO(4.2) the degree acceptance measurement:

| The (Theoretical Hypothetical Mean | The Predominant /Probable Mean | The Weights | The Degree of The Acceptance |
|---|---------------------------------------|--------------------|-------------------------------------|
| 2 | 1 – 1.65 | 1 | No |
| | 1.66 – 2.32 | 2 | fairly/Sort of |
| | 2.33 –3 | 3 | Yes |

The reference: the researcher preparation/composing:

The used measurement been corrected in the study as following:

The total degree of the measurement it's the sum of the single /word over the phrases : (, 3= (3/6) =2 /(1+2+3) and its represent the hypothetical mean of the study , and therefore the phrase average increase above the hypothetical mean (2) its indicating the acceptance of the sample individuals of the phrase , but if the phrase average decreasing below the hypothetical mean its indicates to non-acceptance of the individuals of the sample :

3.4: The evaluation of the measurements tools:

The evaluation and testing of the measurement tools is done by the following measurements:

i. The measurement constancy (questionnaire)

The constancy means (the stability of the measurement and non-contradiction of itself, also means the measurement gives the same results with equal probability to the factor's value, if its repeated to the same sample 1(Cronbach's,Alpha coefficient/factor) it is used for the constancy of the measurement, and takes values range between zero and integer one, if there is not any stability and constancy of the data, the factor value will equal to zero, and in the opposite if there a complete constancy of the data, the value of the factor will equal to the integer one, the increasing of Cronbach's Alpha coefficient/factor means the increasing of the reliability of the data which reflect the results of the sample to the study population.

The researcher took into consideration the verification of the measurement constancy designed by the researcher before it is use in the study, by the retaking test on 20 individuals and calculating the Cronbach's Alpha factor/ coefficient, of the study phrases which represent five hypotheses and its reaches 0.91 and its high value, and also tests of the phrases of every severally hypothesis of the hypotheses. And calculating of the constancy factor, as the following table:

Table (3.3): calculating of the constancy factor .

| The Constancy Factor : | The Phrases No | The Axis Phrases |
|------------------------|----------------|-----------------------------|
| 0.90 | 8 | The First Axis |
| 0.83 | 5 | The Second Axis |
| 0.82 | 6 | The Third Axis |
| 0.83 | 4 | The Fourth Axis |
| 0.64 | 5 | The Fifth Axis |
| 0.91 | 28 | The Total Of Phrases |

The Reference: the preparation of the researcher by using SPSS

1-Dr.Ezz Eldeen Abd-Elfatah , Introduction in The descriptive and inductive statistic by SPSS page 560.

From table (3-3)the results of the constancy test , values of Cranach's Alpha coefficient for all axes of the study are bigger than 60% , and it's the values means availability of acceptable degree , of the inner constancy for all the axes of the questionnaire whether it's for every severally axis or for all the axis of the questionnaire , whereas the value of Cronbach's Alpha coefficient reaches in the total measurement 0.81 , and it's very high value , Thus it could be said the measurements has the inner constancy of its phrases , which lead us to depend answers to verify the study aim ,and analysis of the results .

ii. The content veracity:

A test of content verity was conducted for the measurement phrases through concept validity evaluation, and the validity of the questions from the formulation and the validity , which may refer to the meanings differences accordingly to the population or as result of translation measurements from language to another, the researcher showed a questionnaire many of the academic referees and research specialists, to analyze of the measurements phrases , and for determination of the complying compatibility between the phrases of every measurement and then acceptance and modification of some items , and after taking the questionnaire from the academicians the suggested modification , were the questionair was prepared in it is frail form.

iii. Population and sampling:

The population of the study means the total group of the elements which the researchers seek to generalize the related results to the problem study , In this study the population of the study consist of the labor in construction , purpososive sampling was usied to select 20 samples is technique by the researcher to gain point of views or specific samples , non getable unless by the meant category , the nature of the problem and the hypotheses of the study , have appreciated importance among the community of the study , and distribution of (100) questionnaire and (83) restored undamaged questionnaire used in analysis by the percentage of restoration reaches (83)%.

Table (3.4) :

| The Percentage | The Number | Description |
|----------------|------------|--|
| 83 | 83 | Restored questionnaire after completely filled |
| 17 | 17 | Non-restored questionnaire |
| 100 | 100 | The total of distributed questionnaire |

The reference: the researcher preparation

To obtain objective accurate results as possible as it could be, the researcher makes sure that the sample representative for the community of the study by its all details and that by its inclusion of the following characteristic:

1. The Gender
2. The Age
3. The Qualification
4. The Years of Experiences
5. The Sector (scope of work)
6. Specialization.

CHAPTER FOUR
THE ELEMENTARY DATA ANALYSIS

Chapter 4

The Elementary Data Analysis

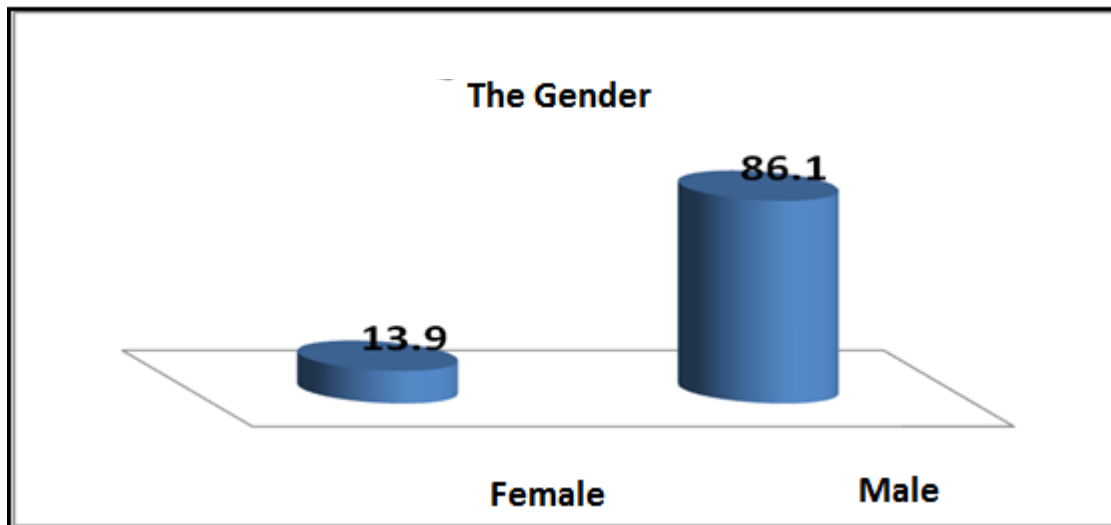
4.1 The distribution of the samples individuals according to the gender

Table (4.1) the repeated distribution of the sample individuals according to gender

| The Percentage | The Number | Gender |
|----------------|------------|--------|
| 86.1 | 68 | Male |
| 13.9 | 11 | Female |
| 100.0 | 79 | Total |

The Reference: The researcher preparation of the 2015 questionnaire:

Figure (4.1):



The table (5-1) above and the chart, shows the majority of the sample from the males by percentage (86.1%) of the total sample, and the females 13.9% of the total sample of the study.

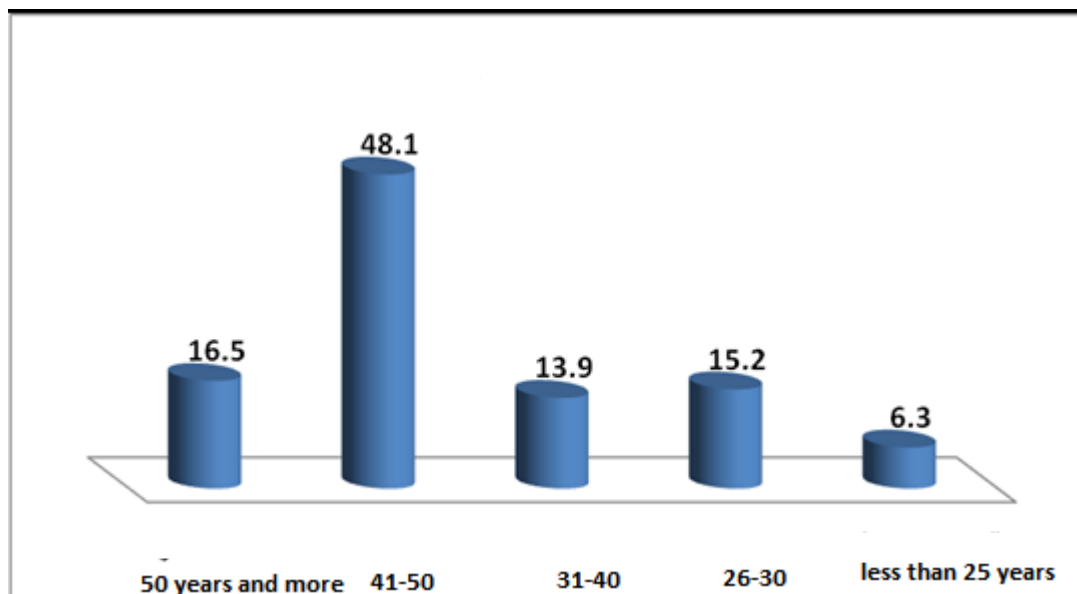
4.2 The sample individual s distribution according to the Age difference

Table (4.2) the repeated distribution for the sample individual s according to the age difference:

| The Percentage | The Number | Age |
|----------------|------------|--------------------|
| 6.3 | 5 | Less than 25 years |
| 15.2 | 12 | 26-30 |
| 13.9 | 11 | 31-40 |
| 48.1 | 38 | 41-50 |
| 16.5 | 13 | 50 years and more |
| 100.0 | 79 | The total |

The reference: The researcher preparation of the questionnaire results 2016

Figure (4.2):



From the table (4-2) and the previous chart the majority of the sample individuals range from 41-50, whereas their percentage reaches 48.1 % of the total sample , when the percentage of age of more than 50 years , 16.5% , and the sample individuals range from 31 to 40 years , the percentage was 13.9% of the study sample.

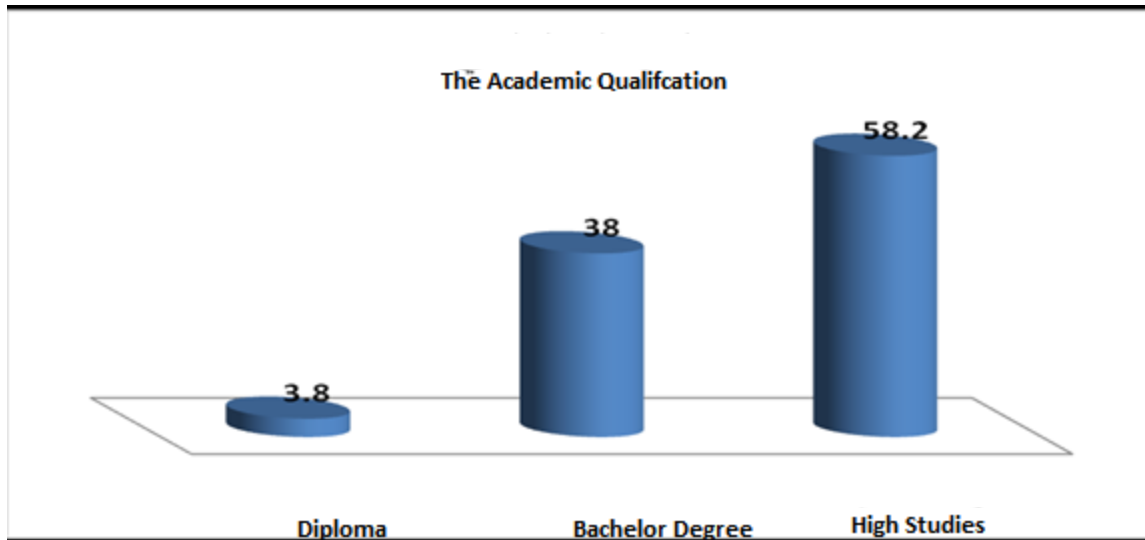
4-3 The sample individuals according to the qualification.

Table no (4-.3) the repeated distribution to the sample individuals according to the qualification difference .

| The Percentage | The Number Of | The Educational Stage/Qualification |
|-----------------------|----------------------|--|
| 58.2 | 46 | High Studies |
| 38.0 | 30 | Bachelor Degree |
| 3.8 | 3 | Diploma |
| 100.0 | 79 | The Total |

The reference: the researcher preparation of the questionnaire 2016.

Figure (4.3):



The table and the chart (4-3) shows: the majority of the sample individuals from the educational level higher studies , by percentage reaches (58.1) % of the total samples , when the bachelor holders in the sample represent 38.01% , the diploma in the sample by percentage 3.8% out of the total study samples.

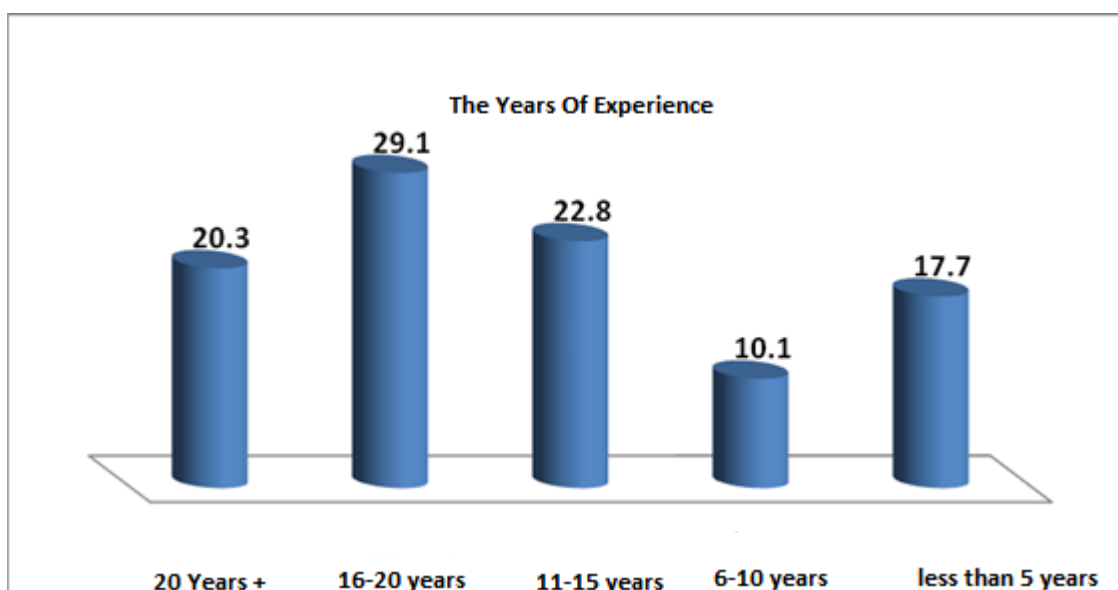
4-4 The sample individual's distribution according to the years of experiences:

| The Percentage | The Number | The Years Of The Experiences |
|----------------|------------|------------------------------|
| 17.7 | 14 | Less Than 5 Years |
| 10.1 | 8 | 6-10 Years |
| 22.8 | 18 | 11-15 Years |

| | | |
|-------|----|--------------------|
| 29.1 | 23 | 16-20 Years |
| 20.3 | 16 | More Than 20 Years |
| 100.0 | 79 | Total |

Table (4-4) the repeated distribution to the sample individuals according to the years of experiences,

The references: the research preparation out of questionnaire results 2015



The table (4-4) and the chart above shows the majority of the sample individuals , the years of the experiences varied from (16-20)years and its reaches 29.1% of the total sample individuals , when the(11-15) years of experiences represent 22.8% , and the people who have experiences more than 20 years , reaches (20.3)% , but the sample individuals who they have experiences below 5 years reaches 17.7% , and the lowest percentage for the 6-10 years which is reaches 10.1% of the total study sample .

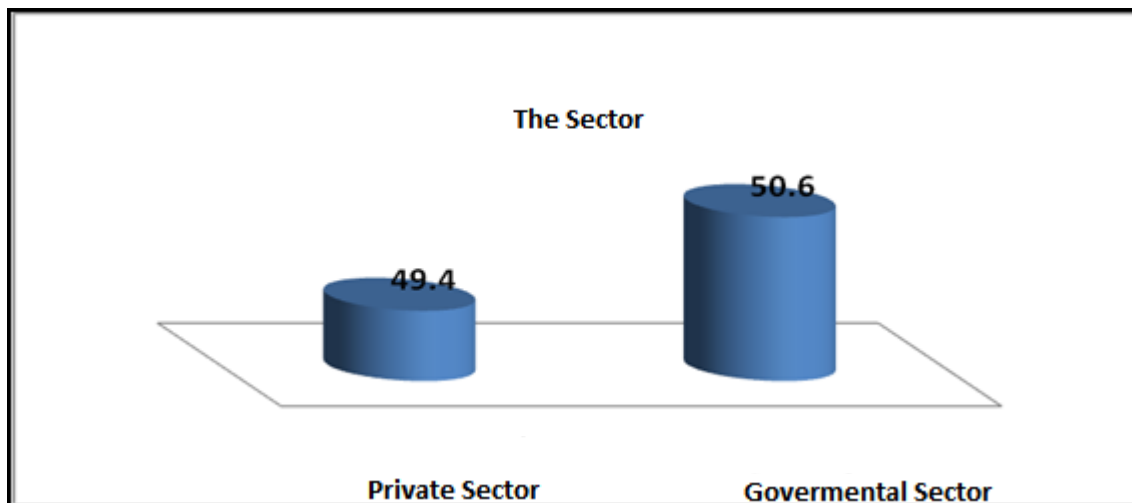
4-5 The distribution of the sample individuals according to the sector:

The table (4-5) the repeated distribution of the sample individuals accordingly to the sector .

| The percentage | The Number | Sector |
|----------------|------------|---------------------|
| 50.6 | 40 | Governmental sector |
| 49.4 | 39 | Private sector |
| 100.0 | 79 | The Total |

The references: the researcher preparation of the questionnaire results 2015

Figure (4-5)



The table shows (4-5) and the shape above shows (50.6) % of the total sample individuals belong to the government sector, when the percentage of who belong to the private sector only (49.4) % of the total individuals

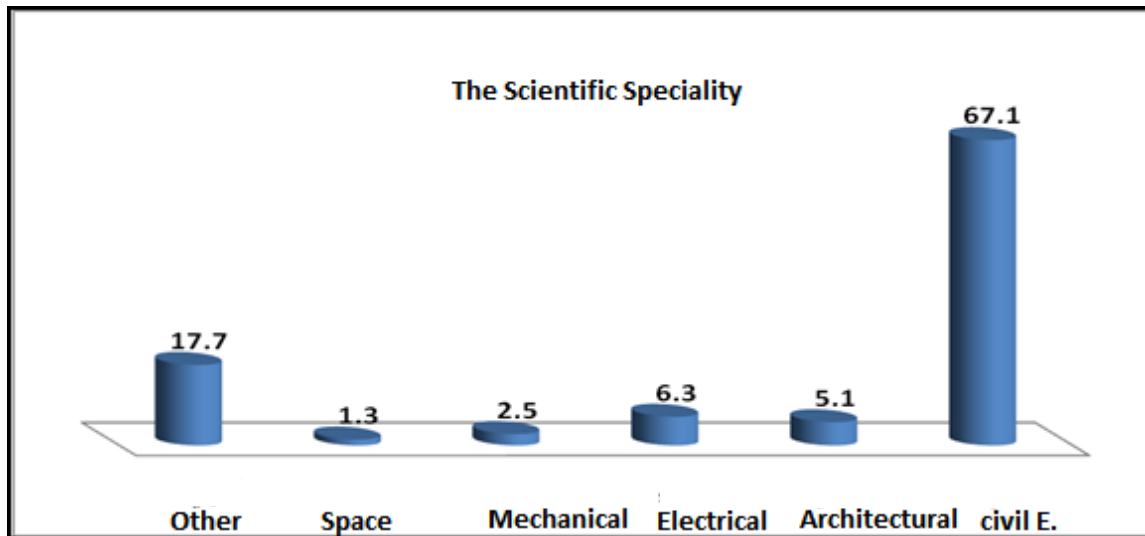
4-6 The sample individual's distribution according to the scientific field /educational qualification:

Table (4-6) the Frequency distribution: of the sample individuals accordingly to the scientific major specialization

| The Percentage | The Number | The Major/Specialization |
|----------------|------------|---------------------------|
| 67.1 | 53 | Civil Engineer |
| 5.1 | 4 | Architectural Engineering |
| 6.3 | 5 | Electrical Engineering |
| 2.5 | 2 | Mechanical Engineering |
| 1.3 | 1 | /Space Engineering |
| 17.7 | 14 | Other |
| 100.0 | 79 | The Total |

The Reference : the researcher preparation of the questionnaire results 2015

Shape (4-6)



The table (4-6) shows and the shape above 67.1% of the total sample individuals , their scientific major is civil engineering , when the architecture engineering (5.1)% and the electricity (6.3)% , mechanical engineering 2.5% , when the space engineering 1.3% and its minimum percentage of the total study sample ,

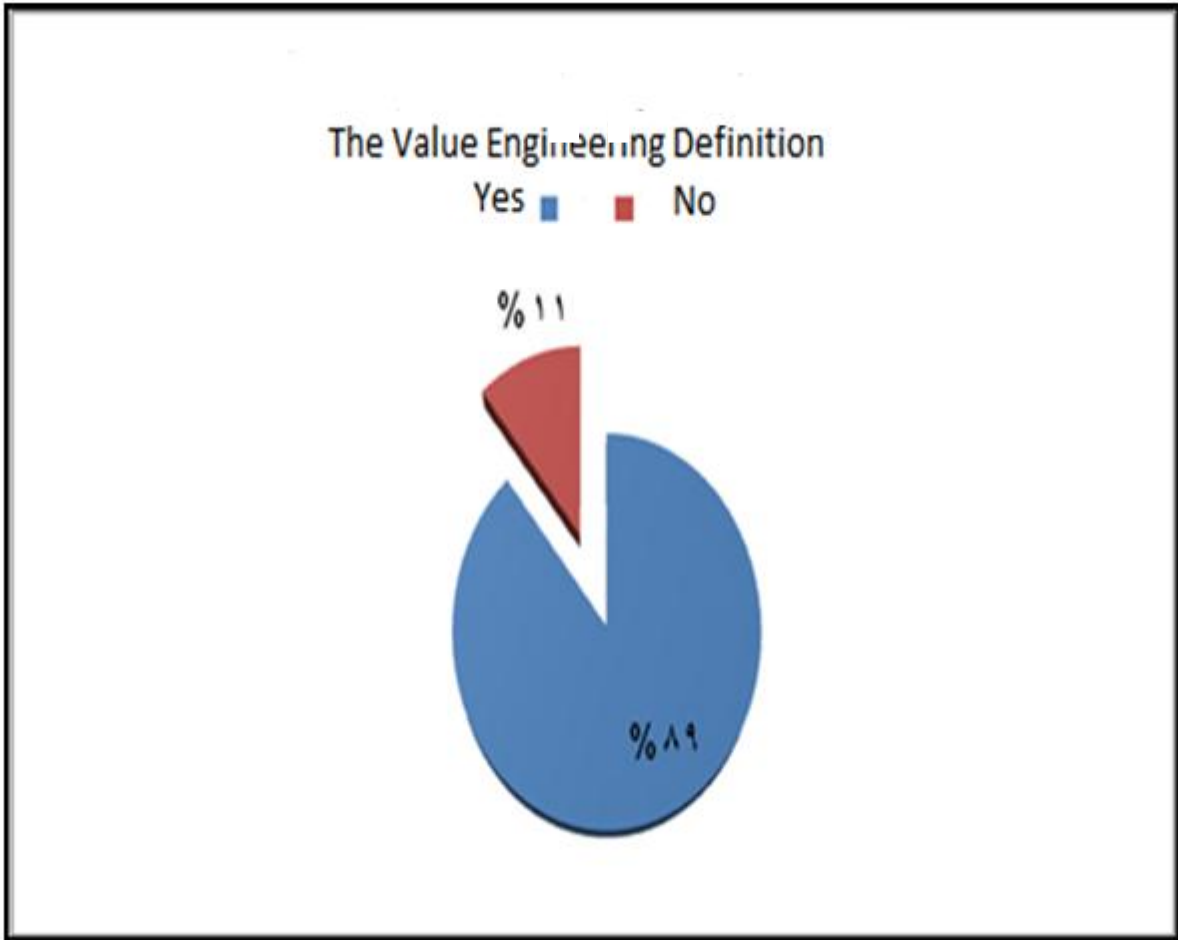
4-7 The descriptive analysis of the Value engineering concepts

1-the study sample individual's distribution by vision of the researchers thought of the Value engineering:

Table (4-7) the Frequency distribution of the sample individuals according to the thoughts and opinions difference.

| The Percentage | The number | The Idea |
|-----------------------|-------------------|-----------------|
| 88.6 | 70 | Yes |
| 11.4 | 9 | No |
| 100.0 | 79 | The Total |

the Reference : the researcher of the questionnaire 2015



The idea of the Value engineering

Form the table (4-7) and the shape above , shows the 88.6% of the total sample individuals has thought about what is the Value engineering and 11.4% only have no idea of the total study sample individuals .

4-8 The distribution of the sample individuals according to their knowledge of the Value engineering:

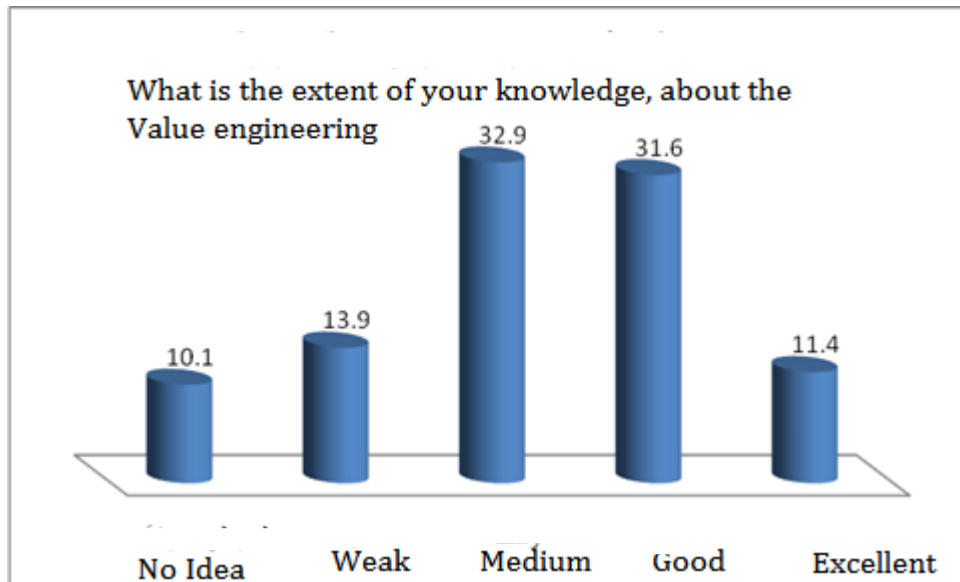
Table.(4-8) the Frequency distribution for specific answers

What is the extent of your knowledge, about the Value engineering?

| The percentage | The Number | Idea/Realization |
|----------------|------------|------------------|
| 11.4 | 9 | Excellent |
| 31.6 | 25 | Good |
| 32.9 | 26 | Moderate |
| 13.9 | 11 | Weak |
| 10.1 | 8 | No Any Idea |
| 100.0 | 79 | Total |

The Reference : the researcher of the questionnaire 2015

Figure (4-8)



4-9 The distribution of the sample individuals according to their opinion /thoughts of the value engineering which help in developing the construction establishing in Sudan

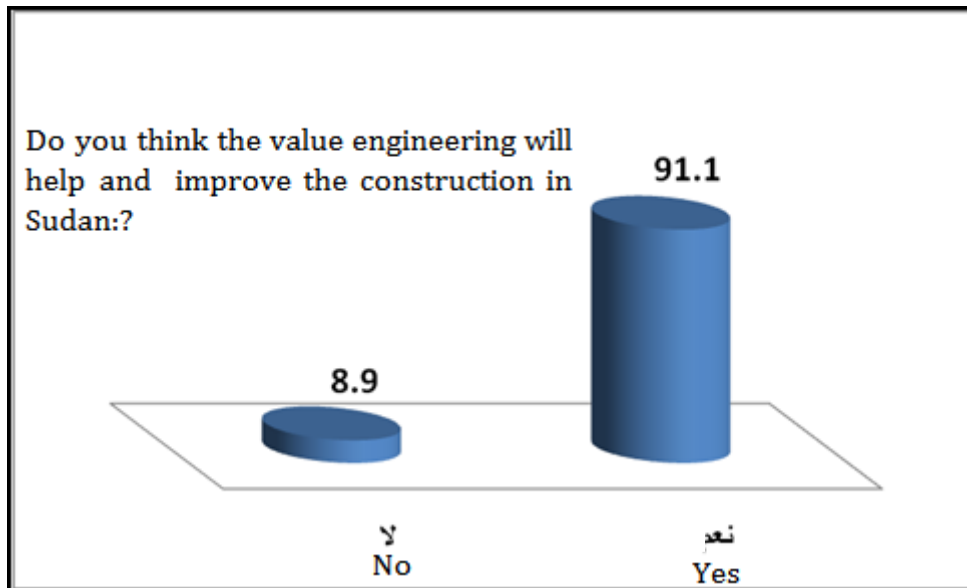
Table (4-9) shows the Frequency distribution for sample answer:

Do you have any point of view the value engineering that help to improve the construction in Sudan:?

| The percentage | The Number | |
|----------------|------------|-------|
| 91.1 | 72 | Yes |
| 8.9 | 7 | No |
| 100.0 | 79 | Total |

The Reference : the researcher preparation of the questionnaire 2015

Figure



4-10 the distribution of the sample individuals according to the presence of value engineering management in the firm/institution

Table. (4-10)

In the firm you are working for, is there a value-engineering management?

Is there a Value Engineering Management in your Institution/firm?

| The percentage | The Number | |
|----------------|------------|-------|
| 12.7 | 10 | Yes |
| 87.3 | 69 | No |
| 100.0 | 79 | Total |

The Reference: the researcher preparation of the questionnaire 2015

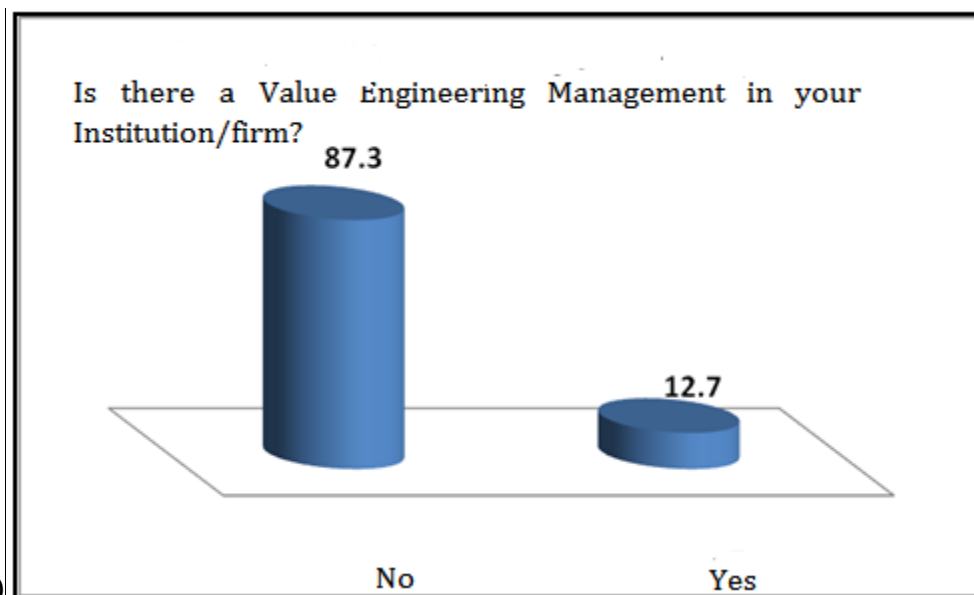


Figure (4-10)

4-11 The Distribution of the sample individuals according to the knowing of Sudanese institution contains a value engineering Management

Table (4-11) the frequency distribution of sample results:

Do you have any idea about a Sudanese firm/institution containing value engineering Management ?

| The Percentage | The Number | The Idea |
|-----------------------|-------------------|-----------------|
| 12.7 | 10 | Yes |
| 87.3 | 69 | No |
| 100.0 | 79 | Total |

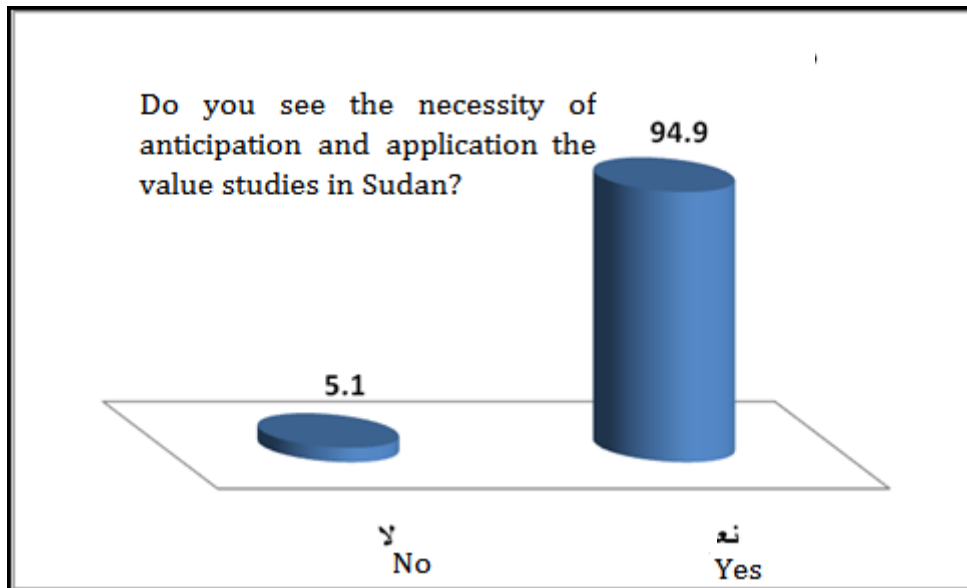
The Reference: the researcher preparation of the questionnaire 2015

Figure

| The Percentage | The Number | The Idea /Thought |
|----------------|------------|-------------------|
| 94.9 | 75 | Yes |
| 5.1 | 4 | No |
| 100.0 | 79 | Total |

The Reference: the researcher preparation of the questionnaire 2015

Figure (4-12)



4-13 The distribution of the sample individuals according to the best and proper project stages to anticipation and application of the value engineering

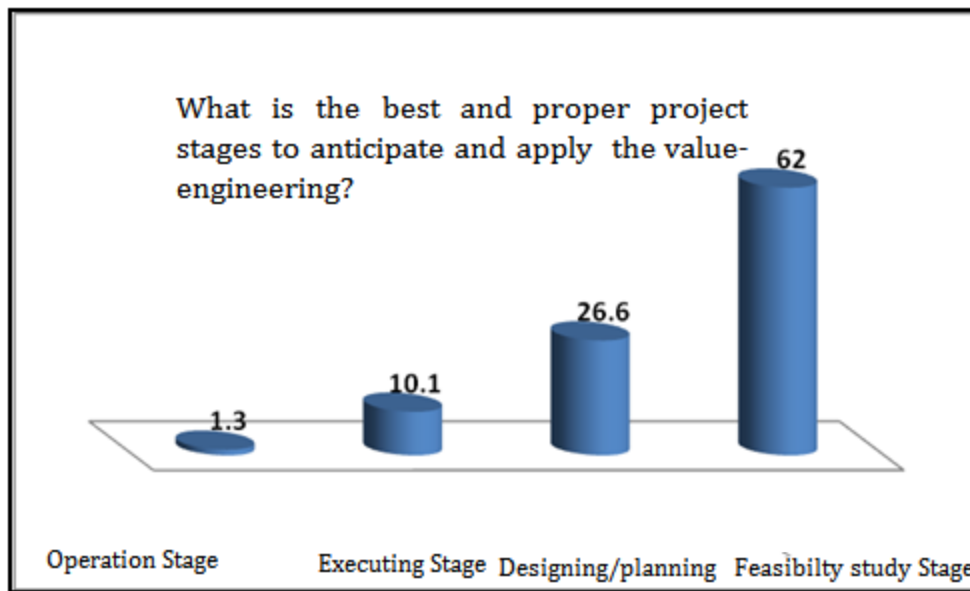
Table (4-13) the frequency distribution for the results/answers of sample

What is the best and proper of project stages to anticipation and application of the value-engineering?

| The percentage | The Number | |
|----------------|------------|-------------------------------|
| 62.0 | 49 | The feasibility study stage |
| 26.6 | 21 | The planning /Designing stage |
| 10.1 | 8 | The Executing Stage |
| 1.3 | 1 | The operating Stage |
| 100.0 | 79 | Total |

The Reference: the researcher preparation of the questionnaire 2015

Figure (4-13)



4-14 The distribution of the sample individuals according to the opinion of possibility to reduce the cost and quality raising in project

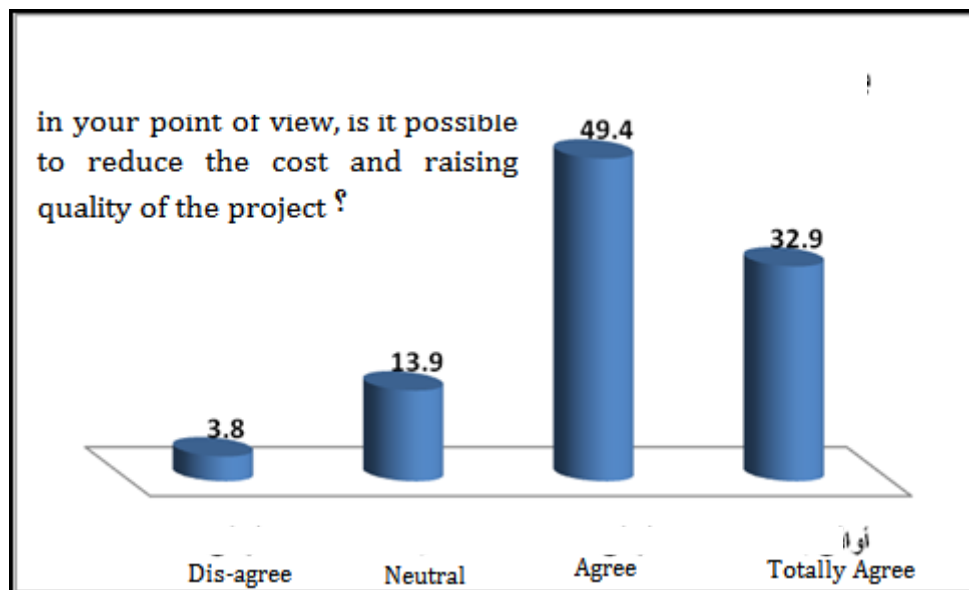
Table (4-14) the frequency distribution for the results/answers of sample

in your point of view, is it possible to reduce the cost and raising quality of the project ?

| The percentage | The Number | The Idea |
|----------------|------------|----------------|
| 32.9 | 26 | Totally Agree |
| 49.4 | 39 | Agree |
| 13.9 | 11 | Neutral |
| 3.8 | 3 | Dis-Agree/Deny |
| 100.0 | 79 | The Total |

The Reference: the researcher preparation of the questionnaire 2015

Figure (4-14)



4-2-1: The Inferential Statistic (Inductive) Analysis And The Hypotheses

Testing:

Table . (4-2-1) the means , the standard deviations and the results of the T test for the first axis:

Which answer and explain the first hypothesis?:

The availability of the fundamentals of the Target cost application in the

| The Opinion | The Interpretation | The Significance level | , The Value Of T Test | The Standard Deviation | , The Mean, | The Phrase | The Phrase Number |
|--------------------|---------------------------|-------------------------------|------------------------------|-------------------------------|--------------------|------------------------|--------------------------|
| Agree | Indicator | .000 | 5.066 | .64405 | 2.3671 | Refer to questionnaire | 1 |
| Agree | indicator | .000 | 4.820 | .72355 | 2.3924 | Refer to questionnaire | 2 |
| Sort of | Indicator | .009 | 2.699 | .75020 | 2.2278 | Refer to questionnaire | 3 |
| Sort of | Indicator/functional | .016 | 2.455 | .77907 | 2.2152 | Refer to questionnaire | 4 |
| Agree | Indicator | .000 | 6.197 | .63543 | 2.4430 | Refer to questionnaire | 5 |
| Sort of | Indicator | .000 | 3.833 | .70446 | 2.3038 | Refer to questionnaire | 6 |
| Sort of | Indicator | .001 | 3.514 | .73645 | 2.2911 | Refer to questionnaire | 7 |
| Agree | Indicator | .000 | 4.119 | .71472 | 2.3333 | Refer to questionnaire | 8 |
| Sort of | Indicator | .000 | 6.106 | 3.74057 | 18.5696 | The All Axis | |

the table above shows the sample individuals verifying the probable availability of the fundamentals Target cost application in construction firms/organizations, its appears through the mean of the sample individuals, around all the phrases which above the phrase average/Mean (2) , and standard deviations in approximate to one integer, and T test value , statistically significance s for the majority of the axis phrases , the observation Through the probable value less than level of the statistical significance (0.05), also the table above through the special part of the axis test , there are differences in the statistically significance among the mean of the sample individuals , and the measurement average for the sample individuals as it reached the sample individuals mean/average 18.5696 , but the measurement average 16 whereas the T value =6.106 verified the difference , as it was statistically significance of the incorporeal level 0.05 for the sample individuals , also we could find by the arrangement of the phrases in accordance to the acceptance /compliance percentage , that the fifth phrase come in the first order (the firm focuses by the engineers on designing /planning the work in form of applicable production without any exceed to the maximum allowed cost.) However the second phrase come in the second order (the availability of the required concerning and attention to manage the costs by the top management), while the fourth phrase come in the last order (its available for the firm to open channels of communication continuously between the firm sections and the clients to know their details and the reactions toward the product and the price , this discussion answered the hypothesis which stated (the availability of the fundamentals of the Target cost application in the construction firms/institutions , by the acceptance , which verifying the hypothesis acceptance above,

The explanation of the researcher

Table (4-2-3) the Means, the standard deviations and T test results for the second phrase"

Which answer the following second Hypothesis?

The knowledge of the firms the concepts of the Target cost and its application:

| The Opinion | The Interpretation | The Significance | , The Value Of The Test | The Standard Deviation | , The Mean, | The Phrase | The Phrase Number |
|-------------|----------------------|------------------|-------------------------|------------------------|-------------|------------------------|-------------------|
| Agree | Indicator/functional | .000 | 4.395 | .71679 | 2.3544 | Refer to questionnaire | 1 |
| Agree | Indicator/functional | .000 | 6.816 | .67673 | 2.5190 | Refer to questionnaire | 2 |
| Agree | Indicator/functional | .000 | 5.219 | .66829 | 2.3924 | Refer to questionnaire | 3 |
| Agree | Indicator/functional | .000 | 11.074 | .52833 | 2.6582 | Refer to questionnaire | 4 |
| Agree | Indicator/functional | .000 | 4.848 | .73353 | 2.4079 | Refer to questionnaire | 5 |
| Agree | Indicator/functional | .000 | 9.012 | 2.24714 | 12.2785 | The All Axis | |

Noticing table (4-2-3)the sample individuals verified the knowledge /the realization of the firms, of the concepts of the Target costs and the application ways, and it appear through the medium/Mean, of the sample individuals around the all phrases , which above the average 2 ,and standard deviations in approximate to integer one, and test value T , statistically significance s for the majority of the axis phrases , the observation

Through the probable value less than level of the statistical significance 0.05 , also the table above through the special part of the axis test , there are differences in the statistically significance among the mean of the sample individuals , and the measurement average for the sample individuals as it reached the sample individuals mean/average 12.2785 , but the measurement average 10 whereas the T value =9.012 verified the difference , as it was statistically significance of the incorporeal level 0.05 for the sample individuals , also we could find by the arrangement of the phrases duly and accordance to the acceptance /compliance percentage , that the fourth phrase come in the first order (the realization of the firm to determine the work cost or its works group cost will be during the planning and designing stage of the product)However the second phrase come in the second order (the management concerning to know the competitive price of work , due its role in calculating the maximum allowed cost), while the first phrase come in the last order (there are attention of the company management toward adopting an inlet for the cost management through reduction by reserving the committed quality , as an inlet to the Target cost), and this discussion answered the hypothesis which stated (there is realization of the firms/institution about fundamentals of the Target cost application in the construction firms , by the acceptance , which verifying the hypothesis acceptance above,

The researcher explanation

The table no (5-2-4) the mean and the standard deviations and results of the test T for the third axis :

The following results verify of the third hypothesis :

The Target cost application for enhancing the profits and benefits

| The Opinion | The Interpretation | The Significance | , The Value Of The Test | The Standard Deviation | , The Mean, | The Phrase | The Phrase Number |
|--------------------|------------------------------|-------------------------|--------------------------------|-------------------------------|--------------------|------------------------|--------------------------|
| Agree | Indicator/ Functional | .000 | 16.866 | .41358 | 2.7848 | Refer to questionnaire | 1 |
| Agree | Indicator/ Functional | .000 | 8.050 | .61492 | 2.5570 | Refer to questionnaire | 2 |
| Agree | Indicator/ Functional | .000 | 11.167 | .54407 | 2.6835 | Refer to questionnaire | 3 |
| Sort of | Indicator/ Functional | .000 | 3.833 | .70446 | 2.3038 | Refer to questionnaire | 4 |
| Agree | Indicator/ Functional | .000 | 4.435 | .74046 | 2.3718 | Refer to questionnaire | 5 |
| Sort of | Indicator/ Functional | .000 | 3.381 | .73674 | 2.2821 | | 6 |
| Agree | Indicator/ | .000 | 11.296 | 2.35063 | 14.9873 | The All Axis | |

| | | | | | | | |
|--|------------------------|--|--|--|--|--|--|
| | Functiona l | | | | | | |
|--|------------------------|--|--|--|--|--|--|

The table above shows that the sample individual verified the Target cost application for optimizing the profits and benefits of the firms, and it appears through the medium/Mean, of the sample individuals around the all phrases, which is above the average 2, and standard deviations in approximate to one integer, and test value T, statistically significance for the majority of the axis phrases, the observation Through the probable value less than level of the statistical significance 0.05, Also the table above through the special part of the axis test, there are differences in the statistically significance among the mean of the sample individuals, and the measurement average for the sample individuals as it reached the sample individuals mean/average 14.9873, but the measurement average 12 whereas the T value =11.296 verified the difference, as it was statistically significance of the incorporeal level 0.05 for the sample individuals, also we could find by the arrangement of the phrases duly and accordance to the acceptance /compliance percentage, that the first phrase come in the first order (the Target cost provide and contribute to the strategic management for the future profits and benefits of the firm) followed by the third phrase (the system/management assist in reducing the wastage of raw materials, wages and in-direct manufactural costs to the maximum allowed limit), while the last phrase of the acceptance (the firm applying the quality control management on the production stages which provide and enhance the beneficiary of the firm), and this discussion answer the hypothesis which state(the application of the Target or aimed costs/expenses to provide the beneficiary/profits) by the acceptance, which verify the hypothesis acceptance above,

Table no(4-2-5) the mean and the standard deviation , the T test results for the fourth phrase

Which answer the following fourth hypothesis

The application of the Target cost reduce the costs

| The Opinion | The Interpretation | The Significance | , The Value Of The Test | The Standard Deviation | , The Mean, | The Phrase | The Phrase Number |
|-------------|----------------------|------------------|-------------------------|------------------------|-------------|------------------------|-------------------|
| Agree | Indicator/Functional | .000 | 12.241 | .54227 | 2.7468 | Refer to questionnaire | 1 |
| Agree | Indicator/Functional | .000 | 5.225 | .68909 | 2.4051 | Refer to questionnaire | 2 |
| Agree | Indicator/Functional | .000 | 5.236 | .70905 | 2.4177 | Refer to questionnaire | 3 |
| Agree | Indicator/Functional | .000 | 8.283 | .57417 | 2.5385 | Refer to questionnaire | 4 |
| Agree | Indicator/Functional | .000 | 10.378 | 1.82129 | 10.1266 | The All Axis | |

From the table above the sample individuals verified the application of the target cost reduce the costs, it is shown through the mean for the sample individuals , and

it appears through the medium , of the sample individuals around all phrases , which is above the average 2 ,and standard deviations in approximate to one integer, and test value T , statistically significance s for the majority of the phrases , the observation Through the probable value less than level of the statistical significance 0.05 , Also the table above through the special part of the axis test , there are differences in the statistically significance among the mean of the sample individuals , and the measurement average for the sample individuals as it reached the sample individuals mean/average 10.1266 , but the measurement average 8 whereas the T value =11.296 verified the difference , as it was statistically significant of the incorporeal level 0.05 for the sample individuals , Also we could find by the arrangement of the phrases duly and accordance to the acceptance /compliance percentage , that the first phrase come in the first order (the firm focuses on the determination of the project expenses and cost or a group of projects during the designing and planning stage) followed by the fourth phrase (the firm encouragement of working by the team as one to reduce possibility of wastage) , while the last phrase of the acceptance (the firm form a team of planning and designing including members of different department to extract the best design for the project which achieved the Target cost) , and this discussion answer the hypothesis which stated (The application of the Target cost reduce the costs) by the acceptance , which verify the hypothesis acceptance above.

Table no (5-2-6) the mean and the standard deviation and the T test results for the fifth axis

The following results validate the fifth hypotheses

difficulties of anticipation of the Value engineering in the firms

| The Opinion | The Interpretation | The Significance | , The Value Of The Test | The Standard Deviation | , The Mean, | The Phrase | The Phrase Number |
|--------------------|-----------------------------|-------------------------|--------------------------------|-------------------------------|--------------------|------------------------|--------------------------|
| Agree | Indicator/functional | .000 | 7.016 | .65752 | 2.5190 | Refer to questionnaire | 1 |
| Sort of | Indicator/functional | .000 | .630 | .71890 | 2.0513 | Refer to questionnaire | 2 |
| Agree | Indicator/functional | .000 | 4.964 | .72535 | 2.4051 | Refer to questionnaire | 3 |
| Agree | Indicator/functional | .000 | 10.877 | .54823 | 2.6709 | Refer to questionnaire | 4 |
| Agree | Indicator/functional | .000 | 8.935 | .59057 | 2.6053 | Refer to questionnaire | 5 |
| Agree | Indicator/functional | .000 | 10.912 | 1.78366 | 12.1899 | The All Axis | |

From the table above the sample individuals verified difficulties of anticipation of the Value engineering in the construction firms, it is shows through the mean for the sample individuals , and it appears through the medium/mean , of the sample individuals around all phrases , which is above the average 2 ,and standard deviations in approximate to one integer, and test value T , statistically significance s for the majority of the axis phrases , the observation through the probable value less than level of the statistical significance 0.05 , Also the table

above through the special part of the axis test , there are differences in the statistically significance among the mean of the sample individuals , and the measurement average for the sample individuals as it reached the sample individuals mean/average 12.1899 , but the measurement average 8 whereas the T value =10.912 verified the difference , as it was statistically significant of the incorporeal level 0.05 for the sample individuals , also we could find by the arrangement of the phrases duly and accordance to the acceptance /compliance percentage , that the fourth phrase come in the first order (unavailability of training of the labors and employees on anticipation and application the Value engineering) followed by the fifth phrase (the rising of the prices continuously and by unpredictability make it hard to adopting and anticipation of the Value engineering) , , and this discussion answer the hypothesis which stated (Difficulties of anticipation of the Value engineering in the firms :

) by the acceptance , which verify the hypothesis acceptance above,

Table (4-2-7) the chi square independency tests

Which answers?

The Following Sixth Hypothesis:

The age influencing in knowledge and knowing of the Value engineering

Table of **Chi-Square Tests for** showing the relation of age knowledge and knowing of the Value engineering

| Chi-Square Tests | | | |
|---|---------------------|----|-----------------------|
| | Value | Df | Asymp. Sig. (2-sided) |
| Pearson Chi-Square | 30.116 ^a | 16 | .017 |
| Likelihood Ratio | 28.680 | 16 | .026 |
| Linear-by-Linear Association | 8.200 | 1 | .004 |
| N of Valid Cases | 79 | | |
| a. 22 cells (88.0%) have expected count less than 5. The minimum expected count is .51. | | | |

In the above table and value sig=.017 for chi-square test independency which is below the significance level 0.05, we determine and conclude that are relation between the Age and the knowledge of Value engineering , which mean the knowledge of the engineering is affected by age , in the appendix below () showing the percentage and frequencies of the relation .

The Seventh Hypothesis :

The experiences effectiveness toward knowledge and awareness of value engineering

Table (4-2-7)

| Chi-Square Tests | | | |
|---|---------------------|----|-----------------------|
| | Value | Df | Asymp. Sig. (2-sided) |
| Pearson Chi-Square | 33.479 ^a | 16 | .006 |
| Likelihood Ratio | 33.747 | 16 | .006 |
| Linear-by-Linear Association | 8.953 | 1 | .003 |
| N of Valid Cases | 79 | | |
| a. 19 cells (76.0%) have expected count less than 5. The minimum expected count is .81. | | | |

| Chi-Square Tests | | | |
|---|---------------------|----|-----------------------|
| | Value | Df | Asymp. Sig. (2-sided) |
| Pearson Chi-Square | 11.800 ^a | 8 | .006 |
| Likelihood Ratio | 10.441 | 8 | .006 |
| Linear-by-Linear Association | 5.343 | 1 | .003 |
| a. 19 cells (60.0%) have expected count less than 5. The minimum expected count is .30. | | | |

In the above table value sig=.006 for chi-square test independency which is below the significance level 0.05 , we determine and conclude that are relation between the experiences and the knowledge and awareness of value engineering ,

which mean the knowledge of the engineering is affected by experiences , in the appendix below showing the percentage and frequencies of the relation .

The Eighth Hypothesis:

The scientific qualification /and its effectiveness in knowledge and awareness of value engineering

| Chi-Square Tests | | | |
|------------------------------|---------------------|----|-----------------------|
| | Value | Df | Asymp. Sig. (2-sided) |
| Pearson Chi-Square | 11.800 ^a | 8 | .160 |
| Likelihood Ratio | 10.441 | 8 | .235 |
| Linear-by-Linear Association | 5.343 | 1 | .021 |
| N of Valid Cases | 79 | | |
| Chi-Square Tests | | | |
| | Value | Df | Asymp. Sig. (2-sided) |
| Pearson Chi-Square | 11.800 ^a | 8 | .160 |
| Likelihood Ratio | 10.441 | 8 | .235 |

| | | | |
|--|-------|---|------|
| Linear-by-Linear Association | 5.343 | 1 | .021 |
| N of Valid Cases | 79 | | |
| | | | |
| a. 9 cells (60.0%) have expected count less than 5. The minimum expected count is .30. | | | |

In the above table value sig=.160 for chi-square test independency which is below the significance level 0.05, we determine and conclude that are relations between the educational qualification and the knowledge and awareness of value engineering, which means the knowledge of the value engineering doesn't affect by educational engineering , in the appendix below showing the percentage and frequencies of the relation

CHAPTER FIVE
CONCLUSION AND RECOMMENDATION

Chapter 5

The conclusion and Recommendation

5-1 Conclusion:

The researcher found that the range of knowledge in value engineering is very wide in construction industry, and through analyzing data of studying, and it is noticed that knowledge is individual, and the organizations that individuals are employed in did not benefit from it. The constructional industry institutions didn't develop a value engineering management.

Anyhow, we find a use of value engineering, for example reducing cost in projects and choosing alternatives, construction institutions depend on individual experience and skills, while value engineering was applied and a value engineering management is initiated a better measurable results could be achieved and these projects can be improved, quality controlled, this equation can't be applied in the absence of value engineering studies.

The top management in Sudan , specially the one responsible for construction industry , must adopt the idea of having a value engineering management , and Encourage the private and governmental sectors to apply it , especially in the standing tough economic status , that why we must consider taking value engineering seriously , because it is a very developed and useful sciences' , It must be took a curriculum in universities and institutes , and consider training the staff of construction industry sector for making a value engineering studies teams , and how to apply these studies by reducing costs and finding alternatives maintaining the same quality .

5.1.2 The Most important results:

1- the research found out that most of the respondents (89%) in constructional industries do have good knowledge with value engineering, and(91%) they know how important it is, and how it helps developing this industry.

2- Most of the respondents (94%) consider that it is very necessary to apply the value engineering where they work.

3-The research found out that more than (88%) did not initiate a value engineering management, and it's very large percentage even know that this since appeared in the forties of this century.

4- Most of the respondents (89%) said that the most important time to make value studies is the feasibility study and the design stages.

5- Constructional organizations consider reducing costs and using the targeted cost and improving profits and this is a good introduction to value engineering management.

6- Constructional organizations depend on the experience factor and skills of its individual employees in reducing the costs and targeted cost without implementing the correct bases and techniques of value engineering.

7- There are a lot off difficulties facing the constructional industry sector implanting value engineering localized in the knowledge of the institution knowledge with value engineering and the high expenses of initiating value engineering department.

8- The research also found out that the training is one of the difficulties that face value engineering implementation.

5-2 Recommendation:

- 1- The necessity of adopting value engineering by the high management of the state , mating the economic status of the country and to benefit from the experiences of others specially KSA , that its higher management adopted it and obligated the other sectors .
- 2- Creating a specialized curriculum in the universities and institutes for value engineering , to obtain a graduate that bases the implementation of this very important science
- 3- Paying attention to training the working staff in constructional industries sector by courses and workshops ,for value engineering to raise the efficiency and skills of the workers in constructional industries
- 4- Support and encourage universities high studies institutes to increase the number of master and PHD studies in this field.
- 5- Create the Sudanese Value Engineering association with a qualification curriculum by training and testing.

APPENDIX

| | | | Age | | | | | Total |
|---|-----------|--|--------------|-------|-------|-------|--------------|--------|
| | | | More than 50 | 41-50 | 31-40 | 26-30 | Less than 25 | |
| What Knowledge or your extent of knowledge of value engineering | Very good | Count | 5 | 4 | 0 | 0 | 0 | 9 |
| | | % within What Knowledge or your extent of knowledge of value engineering | 55.6% | 44.4% | .0% | .0% | .0% | 100.0% |
| | | % within age | 38.5% | 10.5% | .0% | .0% | .0% | 11.4% |

| | | | | | | | |
|-------------|---|-------|-------|-------|-------|-----|--------|
| | % of Total | 6.3% | 5.1% | .0% | .0% | .0% | 11.4% |
| Good | Count | | | | | | |
| | | 3 | 12 | 7 | 3 | 0 | 25 |
| | % within What Knowledge or your extent of knowledge of value engineering | 12.0% | 48.0% | 28.0% | 12.0% | .0% | 100.0% |
| | % within age | 23.1% | 31.6% | 63.6% | 25.0% | .0% | 31.6% |
| | % of Total | 3.8% | 15.2% | 8.9% | 3.8% | .0% | 31.6% |

| Medium | Count | | | | | | |
|--------|--|-------|-------|-------|-------|-------|--------|
| | | 2 | 16 | 2 | 4 | 2 | 26 |
| | % within What Knowledge or your extent of knowledge of value engineering | 7.7% | 61.5% | 7.7% | 15.4% | 7.7% | 100.0% |
| | % within age | 15.4% | 42.1% | 18.2% | 33.3% | 40.0% | 32.9% |
| | % of Total | 2.5% | 20.3% | 2.5% | 5.1% | 2.5% | 32.9% |

| Week | Count | | | | | | |
|------|--|------|-------|------|-------|-------|--------|
| | | 1 | 4 | 1 | 4 | 1 | 11 |
| | % within What Knowledge or your extent of knowledge of value engineering | 9.1% | 36.4% | 9.1% | 36.4% | 9.1% | 100.0% |
| | % within age | 7.7% | 10.5% | 9.1% | 33.3% | 20.0% | 13.9% |
| | % of Total | 1.3% | 5.1% | 1.3% | 5.1% | 1.3% | 13.9% |

| I don't know | Count | | | | | |
|---|-------|-------|-------|-------|-------|--------|
| | 2 | 2 | 1 | 1 | 2 | 8 |
| % within What Knowledge or your extent of knowledge of value engineering | 25.0% | 25.0% | 12.5% | 12.5% | 25.0% | 100.0% |
| % within age | 15.4% | 5.3% | 9.1% | 8.3% | 40.0% | 10.1% |
| % of Total | 2.5% | 2.5% | 1.3% | 1.3% | 2.5% | 10.1% |

| Total | Count | | | | | |
|---|--------|--------|--------|--------|--------|--------|
| | 13 | 38 | 11 | 12 | 5 | 79 |
| <p style="text-align: center;">% within What Knowledge or your extent of knowledge of value engineering</p> | 16.5% | 48.1% | 13.9% | 15.2% | 6.3% | 100.0% |
| <p style="text-align: center;">% within age</p> | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

| | % of Total | | | | | |
|--|------------|-------|-------|-------|------|--------|
| | 16.5% | 48.1% | 13.9% | 15.2% | 6.3% | 100.0% |

What knowledge or your extent of knowledge of value engineering *

Qualification Crosstab

| | Qualification | | | Total |
|--|---------------|-----|---------|-------|
| | Post graduate | BCS | Diploma | |
| | | | | |

| | | | | | | |
|--|--|--|-------|-------|--------|--------|
| What knowledge or your extent of knowledge of value engineering * Qualification | Very good | Count | 7 | 2 | 0 | 9 |
| | | % within What Knowledge or your extent of knowledge of value engineering | 77.8% | 22.2% | .0% | 100.0% |
| | | % within المؤهل | 15.2% | 6.7% | .0% | 11.4% |
| | | % of Total | 8.9% | 2.5% | .0% | 11.4% |
| | Good | Count | 17 | 8 | 0 | 25 |
| | | % within What Knowledge or your extent of knowledge of value engineering | 68.0% | 32.0% | .0% | 100.0% |
| | | % within المؤهل | 37.0% | 26.7% | .0% | 31.6% |
| | | % of Total | 21.5% | 10.1% | .0% | 31.6% |
| | Medium | Count | 14 | 11 | 1 | 26 |
| | | % within What Knowledge or your extent of knowledge of value engineering | 53.8% | 42.3% | 3.8% | 100.0% |
| | | % within Qualification | 30.4% | 36.7% | 33.3% | 32.9% |
| | | % of Total | 17.7% | 13.9% | 1.3% | 32.9% |
| Week | Count | 5 | 4 | 2 | 11 | |
| | % within What Knowledge or your extent of knowledge of value engineering | 45.5% | 36.4% | 18.2% | 100.0% | |
| | % within Qualification | 10.9% | 13.3% | 66.7% | 13.9% | |
| | % of Total | 6.3% | 5.1% | 2.5% | 13.9% | |
| I don't know | Count | 3 | 5 | 0 | 8 | |
| | % within What Knowledge or your extent of knowledge of value engineering | 37.5% | 62.5% | .0% | 100.0% | |
| | % within Qualification | 6.5% | 16.7% | .0% | 10.1% | |

| | | % of Total | 3.8% | 6.3% | .0% | 10.1% |
|--------------|---|-------------------|---------------|---------------|---------------|---------------|
| Total | Count | | 46 | 30 | 3 | 79 |
| | % within What Knowledge or your extent of knowledge of value engineering | | 58.2% | 38.0% | 3.8% | 100.0% |
| | % within Qualification | | 100.0% | 100.0% | 100.0% | 100.0% |
| | % of Total | | 58.2% | 38.0% | 3.8% | 100.0% |

| | | Expertise | | | | | Total | |
|---|-----------|--|-------|-------|-------|-------------|-------|--------|
| | | More than 20 | 16-20 | 11-15 | 6-10 | Less than 5 | | |
| What knowledge or your extent of knowledge of value engineering*Expertise | Very good | Count | 6 | 3 | 0 | 0 | 0 | 9 |
| | | % within What knowledge or your extent of knowledge of value engineering | 66.7% | 33.3% | .0% | .0% | .0% | 100.0% |
| | | % within expertise | 37.5% | 13.0% | .0% | .0% | .0% | 11.4% |
| | | % of Total | 7.6% | 3.8% | .0% | .0% | .0% | 11.4% |
| Good | Count | 4 | 7 | 10 | 1 | 3 | 25 | |
| | | % within What knowledge or your extent of knowledge of value engineering | 16.0% | 28.0% | 40.0% | 4.0% | 12.0% | 100.0% |
| | | % within expertise | 25.0% | 30.4% | 55.6% | 12.5% | 21.4% | 31.6% |
| | | % of Total | 5.1% | 8.9% | 12.7% | 1.3% | 3.8% | 31.6% |
| Medium | Count | 3 | 10 | 3 | 6 | 4 | 26 | |
| | | % within What knowledge or your extent of knowledge of value engineering | 11.5% | 38.5% | 11.5% | 23.1% | 15.4% | 100.0% |
| | | % within expertise | 18.8% | 43.5% | 16.7% | 75.0% | 28.6% | 32.9% |
| | | % of Total | 3.8% | 12.7% | 3.8% | 7.6% | 5.1% | 32.9% |
| Weak | Count | 1 | 2 | 3 | 1 | 4 | 11 | |
| | | % within What knowledge or your extent of knowledge of value engineering | 9.1% | 18.2% | 27.3% | 9.1% | 36.4% | 100.0% |
| | | % within expertise | 6.2% | 8.7% | 16.7% | 12.5% | 28.6% | 13.9% |
| | | % of Total | 1.3% | 2.5% | 3.8% | 1.3% | 5.1% | 13.9% |
| I don't know | Count | 2 | 1 | 2 | 0 | 3 | 8 | |
| | | % within What knowledge or your extent of knowledge of value engineering | 25.0% | 12.5% | 25.0% | .0% | 37.5% | 100.0% |
| | | % within expertise | 12.5% | 4.3% | 11.1% | .0% | 21.4% | 10.1% |
| | | % of Total | 2.5% | 1.3% | 2.5% | .0% | 3.8% | 10.1% |

| Total | Count | 16 | 23 | 18 | 8 | 14 | 79 |
|-------|--|--------|--------|--------|--------|--------|--------|
| | % within What knowledge or your extent of knowledge of value engineering | 20.3% | 29.1% | 22.8% | 10.1% | 17.7% | 100.0% |
| | % within expertise | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| | % of Total | 20.3% | 29.1% | 22.8% | 10.1% | 17.7% | 100.0% |

1-The reference: the researcher preparation/composing

2-The Reference: the preparation of the researcher by using SPSS

1-Dr.Ezz Eldeen Abd-Elfatah , Introduction in The descriptive and inductive statistic by SPSS page 560.

3-The reference: The researcher preparation of the questionnaire results 2016

The Reference: The researcher preparation of the 2015 questionnaire: