مجلة العلوم الاقتصادية والإدارية
Journal homepage:
http://scientific-journal.sustech.edu/

Value Engineering Technique and Its Role on Reducing of Manufacturing Costs

(Case Study: Giad Industrial Group- Sudan)

KARRAR MOHAMED HASSAN MOHAMED and AL HEDI ADAM MOHAMED

ELDAEIN UNIVERSITY
AL NEELAIN UNIVERSITY

المستخلص:

هدفت هذه الدراسة الى التعرف على أثر تطبيق تقنية هندسة القيمة على تخفيض التكاليف الصناعية بمجموعة جياد الصناعية، كما هدفت ايضاً الى التعرف على اسباب عدم تطبيق تقنية هندسة القيمة بمجموعة جياد الصناعية محل الدارسة، ولهذا الغرض قام الباحثان بتوزيع عدد (130) إستبانة، وتم الحصول على عدد (105) إستبانة صالحة للتحليل، اي ما يعادل نسبة (81%) . تم استخدام برنامج (SPSS) للتوصل إلى نتائج الدراسة من خلال حساب كل من (الوسط الحسابي، الانحراف المعياري، مربع كاي، والنسب المئوية). أشارت نتائج الدراسة إلى أن مجموعة جياد الصناعية لا تستخدم تقنية هندسة القيمة في قياس وتحفيض تكلفة منتجاتها علي الرغم من ان هندسة القيمة توفر معلومات كافية للرقابة على التكلفة الصناعية ومن ثم تخفيضها، بالإضافة إلى ذلك فإن تحقيق الربح يتطلب تخفيض جميع عناصر التكاليف الصناعية. وخلصت الدراسة إلى أن الأسباب الرئيسة وراء عدم استخدام تقنية هندسة القيمة بمجموعة جياد الصناعية يرجع إلى نقص المعرفة بهذه التقنية ومزاياها التى تمتاز بها، وعدم دعم ومساندة الإدارة العليا لتطبيق التقنيات الحديثة في إدارة التكاليف، بالإضافة الى أن مجموعة جياد الصناعية تستخدم نظام التكلفة المعيارية بالاضافة الى اسلوب تحليل نقطة التعادل. وأوصت الدراسة بضرورة تطبيق تقنية هندسة القيمة بمجموعة جياد الصناعية حيث اعتبرتها نظاماً مكملاً لأنظمة التكاليف الآخرى.

ABSTRACT:

This study reviewed the impact of value engineering technique on reducing of manufacturing costs at Giad industrial group, also, it aimed to explore the reasons behind not adopting the value engineering technique by the company. For this purpose the researchers distributed (130) questionnaires, while (105) questionnaires were retrieved representing (81%) of the total sample. The study used SPSS program to arrive at the results of the study by calculating mean, standard deviations, chi-square, and percentages. The study results indicated that Giad industrial group doesn't adopt value engineering technique in measuring and reducing the cost of its products, although the adoption of value engineering technique may provide useful information for controlling and reducing manufacturing costs. Moreover, achieving profit requires reducing the overall costs of industrial elements. The study concludes that the major reasons behind not adopting value engineering technique at Giad industrial group can be attributed to the lack of knowledge about value engineering and its merits; besides the lack of support from the top management at the company for the application of this technique. Furthermore, Giad industrial group uses the absorption costing and break-even point analysis rather than value engineering

technique. The study calls for the necessity of applying value engineering technique at the company since it has been regarded as a complementary technique for other costing systems.
Keywords: Value engineering, Cost reduction, Manufacturing costs.

Introduction:

With the globalization of Sudan economy, there is a greater awareness on the part of the manufacturers about the need to improve quality of product, service and reduce cost, not only to maintain market share but also to improve it. Competition has increased by leaps and bound and customer awareness of quality has reached new heights. To meet the customer expectations of quality and value for money, the premier tool that can be used is "VE". VE is recognized as an effective technique for reducing costs, increasing productivity, and improving quality-related features such as durability, reliability, and maintainability. On the other hand keeping costs low with traditional techniques has been a common practice to improve competitiveness. Reducing cost and at the same time to provided that better value is a concept that everyone emphasizes. VE is a practice whose goal is always to achieve value for money and reduce costs.

Problem definition:

Managing costs efficiently during new product development or developing a current products has become a competitive weapon for industrial companies and a focus for research on product development. Reducing costs in the early stages of production process to create advantages in market share, profit, and long term competitiveness. The following question may shed some light upon the existing problem: Does applying of Value engineering technique reducing the manufacturing costs in Giad industrial group?

Objectives of study:

The general objective of this study; is to examine and to evaluate Value engineering technique as a tool for reducing manufacturing costs. Below are other objectives to which the researchers intend to examine:

1. To examine the relationship between; value engineering and reducing manufacturing costs.
2. To provide some insight about the role of value engineering in reducing the costs.

Significance of study:

The importance of this study can be highlighted in two ways as follows:

Scientifically: This study it seems to be important for accounting and management which is treating the cost from strategic prospective, especially the failure of traditional cost tools in managing the cost to support the competitive advantage and increasing the value of company.

Practically: The researchers want to contribute in the field of strategic cost management tools and to contribute to apply one of the most important tool e.g. value engineering.

Methodology of study:

The researchers analyzed data by using a descriptive analytical approach and Statistical Package for Social Sciences (SPSS).

Hypotheses of study:

H1: Giad industrial group doesn't apply value engineering technique.

H2: There is a relationship between value engineering and reducing manufacturing costs.

Data collection sources:

There are two sources used:

1. Initial data sources: collected by using questionnaire distributed to employees that work in Giad industrial group; financial manager, accountant, cost accountant, auditor, mechanical engineer, manager, and other career.
2. Secondary data sources: References, Books, journal articles, previous studies, publications, annual reports.

Boundary of study:

The study applied at

1. Spatial boundaries: Giad industrial group.
2. Time limits: (July 2018).
3. Subjective limits: Due to limitation of this study value engineering and manufacturing costs are included.
4. Human Boundaries: The study aims at measuring the opinions of a sample of specialists in accounting, cost accounting, administrative and mechanical engineering.

Limitations of study:

Results of this study are subject to some limitations. First of all, this research examines only Giad industrial group. Secondly, because of the limitation in data source, manufacturing costs information. Furthermore there is a sample issue. For instance, this study looks at only Giad industrial group and 130 sample of its employees.

Review of the previous studies:

Study of Wen-Tsann Lin, et at, (2011):

This study focused on manufacturing phases, the structure of which should be especially described in detail. The work-in-process information should be obtained by the system at any time. The study found that, the rational function weights were guaranteed through hierarchy consistency, and compared with the labor costs of operating such system functions to analyze whether the functions were in a suitable domain. Based on expert comments and application functions, production control based on an intelligent manufacturing system can reduce personnel and time costs, thus, effectively increasing the competitive power.

Study of Chougule & Kallurkar , (2012):

This paper presents the basic fundamental of value engineering that can be implemented in any product to optimize its value. A case study of a Universal Testing Machine is discussed in which the material, design of components is changed according to the value engineering methodology. It is observed that the unnecessary increase in cost is due to the use of expensive material, increase in variety of hardware items and thereby increasing the inventory and so on. The study found that, applying value engineering technique can help to achieve the goal of costs reduction.

Study of Maksud & Yusof, (2013):

This study presented a process on how to apply VE tools in manufacturing company. Therefore, the study aimed to application of VE approach method and at the same time investigating how much cost reduction can be done. The function of product will be defining and cost reduction is suggested by proposing alternative method to achieve that function. However, the function quality is never degrading. , the study result shown that, proposal will be done for the five ideas that have been selected till final stage, which mostly to abolish or combined the part to reduce the part quantity or usage.

Study of Florian, (2014):

This study presented a model for integrated value engineering. This model is extended by the consideration of manufacturing processes as well as supply chain networks, as those factors emerge as drivers for costs and values in manufacturing firms, while the original model already considers requirements, functions and physical components of a product. The objective of this study is to provide a model based on the original model for integrated value engineering, which is extended by manufacturing processes and the supply chain network. This study gave an overview of the established approaches within this field through Target costing and value engineering.

Study of Ainul,(2015):

This study presented one of the methodologies applied during New Product Development phase; VE it can lead to high-quality products which meet customer desires and at the same time increase the operating income requirements for an organization. The application of VE to New Product Development can enhance the products value by increasing performance without increasing the cost and affecting the quality and maintainability. The study found that the cost can possibly be reduced using VE methodology.

Study of Renata, (2016):

The study deals with the possibility of using value engineering in highway projects. The researchers believes that value engineering methodology can help to find ways to improve solutions to these problems by balancing cost, schedule, and scope through the generation of innovative alternatives. It was found that a project can significantly save on costs and improve performance of project functioning by using the appropriate value engineering process at the right time. The study summarizes the benefits and effectiveness of the value engineering methodology along with recommendations.

Study of Walaa, (2017):

The problem of this study which lead to a perceived need to cover a drain are: to minimize the adverse impact of a polluted drain, especially close to residential areas, need to use the land area occupied by the drain for an access road or some other use, poor soil stability leading to bank failure, and to protect them from pollution. Results show that the value engineering is a technique directed toward analyzing the functions of an item or process to determine the best relationship between worth and cost. VE must create a balance between all the needs of the project.

Study of R. Janani et at, (2018):

The study dealt about the value engineering in construction industry that is helpful to gain knowledge about the work study, value management, and improvement techniques. This study based on qualitative and quantitative analysis, questionnaire, interview by the engineers. The study found that the VE plans to bring quantifiable value developments through price lessening and to get better excellence for the customer. This can be applied in the architectural, structural and material components of the building. VE can achieve accurate and cost effective solutions to the problems.

The difference between current study and previous studies, most of the previous studies focused on identifying the important of the using value engineering, identify the factors that influence on applying the value engineering. This study added to the benefit of previous studies, which examined the relationship between value engineering and reduce manufacturing costs, determined the reasons surrounding a decisions of Giad industrial group for not using VE.

Secondly: Theoretical framework:

The concept of Value engineering

Value engineering is systematic application of recognized techniques which identify the function of product or service, establish a monitory value for that function and provide the necessary function reliability at the lowest overall cost**. (**Chougule M. & Kallurkar S., 2012, P.618**)**

The society of American Value Engineering define it as "the systematic application of recognized techniques, which identify the function of product or service, establishes a monetary value for that function and provides the necessary function reliability at the lowest overall cost". (F. Jariri & S.H. Zegordi, 2008, PP.406, 407)

VE is essentially a process which uses function cost analysis to reduce cost, it has a proud history of success at reducing cost. VE is also known as function analysis, Value analysis and value management. Value analysis is a problem-solving system implemented by the use of a specific set of techniques, a body of knowledge and a group of learned skills. It is an organized creative approach that has for its purpose the efficient identification of unnecessary cost, i.e. cost that provides neither quality nor use, nor life, nor appearance, nor customer features. To be effective within the integrated product design environment, VE has to move upstream and becomes an integral element of the design process. (J. Sharma, 2012, P. 314)

The researchers thought the value engineering is a technique that helps to reduce costs in initial step of product lifecycle, and its can plays a critical role in the cost management of future products.

The basic principle of Value engineering:

Value engineering which is also called value analysis is a kind of management technology which takes value enhancement of a product or operation as its goal and seeks for the lowest life cycle cost through creative work, and then reliably realizes the required functions of the users. What its basic principle reflects is the relationship between function and cost. Its expression formula is: Value = $\frac{\text{Function}}{\text{Cost}}$. (Min Cheng, et at, 2013, P. 3065)

A good costing system can follow two basic objectives:

- Providing accurate information about products and inventory cost, through a list of accounts related to production, costs of correct identification, correct capacity production lines, and the basis for sharing of indirect costs.

- Information for planning, monitoring and evaluation, through the budget, deviations recorded, compiled and circulated to appropriate methods of operation and management reports. (Min Cheng, et at, 2013, P. 3065)

The steps of application Value Engineering:

There are multi-step process for VE as the follows: (Florian G. H. Behncke, et at., 2014, P.783)

- The first step (a preliminary): is the preparation and planning of the scope. Thereby, restrictions and objectives of the VE effort are elaborated.
- The second step: describes the information acquisition in order to clarify on the challenges and objectives. Therefore, relevant background information is gathered and customer requirements are derived.
- The third step: features a functional analysis of the product based on essential information (e.g. drawings, costs, quantities).
- The fourth step: focuses on the generation of ideas for the accomplishment of functions by different alternative courses of action.
- The fifth step: focuses on the discussion and assessment of the ideas or even alternatives with a suitable evaluation technique (e.g. score evaluation).
- The sixth step: focuses on the development of ideas to sound alternatives that are presented to decision makers. Then again, the alternatives of the fifth step are further detailed to a proposal.
- The seventh step: deals with the presentation and implementation of the conducted alternatives.

Value Engineering Process:

VE is a structured problem solving process based on function analysis to improve the value of a system. Value is defined by a ratio of function to cost and consequently it can be increased by either improving the function or reducing the cost. The VE study is normally conducted by a team of members of multi-disciplinary experience and expertise. First, the VE team establishes the functional relationships in a system through a "how–why" questioning technique. Then, the VE team develops a matrix of the various functions of the system against their associated costs. The value of the system is maximized by an optimal between the functions and their associated costs. A VE study includes three sessions, pre-workshop, workshop and post-workshop. Each session in turn has some phases. For example, the workshop session includes three phases: information and function analysis phase, creativity phase and evaluation phase. It is generally recognized that the creative phase of the workshop is the most critical phase that determines the success or failure of a VE because it is in this phase that creativity techniques are applied to generate innovative ideas for enhanced project functions and reduced costs. (Xiaoyong Li et at, 2012, PP. 2115, 2116)

On the other hand VE is exclusively driven by function, new or improved concepts will always be yielded, offering a more simple way to achieve the essential functions. Innovation is the core of Value Engineering. Innovative thinking is a special ability that needed in the carrying-out process of Value Engineering. Through the use of technological progress that achieved in means of production and put human creativity into utilization on every project that needs to be improved, the rapid rise of the cost of goods and services procurement could be offset to some extent. Implementation of VE is a persistent project in the corporate action. According to internal and external environment's changes, the constraints that business activities get such as the object of labor, means of operation, market competition and market capacity will alter. (Wang Donghua & Ge Xin, 2012, P.241).

The application phases of Value engineering:

The application of VE include five phases as follows: (AMIT SHARMA & R.M.BELOKAR, 2012, PP. 66, 67)

- Information Phase: Further familiarization of the project by the team; all team members participate in a function analysis of the project as a whole, and then of its component parts, to determine the true needs of the project. Areas of high cost or low worth are identified.

-Creative Phase: The team lists creative ideas generated from its review of the project with the aim of obtaining a large number of ideas through brainstorming.

- Judgment Phase: Creative ideas are analyzed, and the team selects the best ideas for further development.

- Development Phase: The team prepares alternative designs with capital and/or life cycle cost comparisons of original designs and proposed alternatives. All recommendations are supplemented with written descriptions, sketches, basic design concepts, technical information and cost summaries.

- Presentation Phase: The team presents an oral summary of its findings to the owner and the designer, explaining the basic ideas recommended their cost saving implications and their attendant rationales.

Cost reduction:

Cost management is not cost reduction, because the latter simply implies the reduction in functionality and quality of products, while the real task would be to provide exactly the same function with better quality, but at lesser cost. (U. Ibusuki, P.C. Kaminski, 2007, P.460).

Cost accounting is a part of internal management accounting and designed for providing information to managers (internal users) to assist them in making decision. It has the three functions: documentation, information, planning and control, and conflict resolution and decision making. It's usually divided into cost element accounting, cost center accounting and cost object accounting.

The purpose of reducing costing:

Cost reduction and cost effectively manage the process for selecting Research, development and design (pre-production). Because is the processes and production methods, types of equipment and products already in the planning stage is identified and fixed. Thus, the cost of such a definition is that:

- Reduce the costs of new products, so that the profit goals of products with the goals of quality and price of products within the marketplace, they guaranteed.
- To motivate all employees to achieve the anticipated benefits of new product development process, the conversion of the costing system.

Value engineering job plan:

The job plan is the road map for defining the required task and determining the most economical combination of functions to achieve the task. The job plan also helps us to identify high cost areas in the design, i.e. items that are at a higher cost than on other similar facilities, VE plays a vital role in the implementation of a target costing process. (R. Gandhinathan, et at, 2004, P.1004).

Value engineering is an organized effort directed at analyzing the function of products for the purposes of achieving basic functions at the lowest overall cost, consistent with achieving essential characteristics.

Value engineering is a process using multidiscipline teams to review projects and standards to identify high cost functions with improvement potential. The teams follow the systematic, creative Value engineering job plan to establish an optimum value for selected functions. Alternatives, which will provide the necessary functions at the most economical initial capital costs and/or life cycle cost, are developed consistent with requirements for safety, quality, operation, maintenance, and aesthetics. (Florian G. H. Behncke, et at, 2014, P.782).

A market research was carried out, through the Internet and contact with suppliers, in search of concept alternatives on the market for the function under analysis. It was verified that, besides the currently used electric drive system, hydraulic, spring and pneumatic engine-starters were also available. The analysis was conducted on an engine-starter with a pneumatic drive due to the availability of this system in commercial vehicles. (Ibusuki & Kaminski, 2007, P.463).

The role of value engineering in reducing costs:

Value engineering was introduced as a technique that aimed to manage product costs throughout the design stage. Its important tool for sustaining manufacturers' overall efforts to remain cost competitive while meeting standards and specifications demanded by customers, Cost reduction is principally an indicator of productivity gains and increasing returns, and are essentially a measure of the dynamism of the economic system. Typically, cost reductions are the result of many small incremental and cumulative innovations along the value chain. (Lars Strupeit, 2017, P.274)

Thirdly: The empirical study:

This part focuses on testing the hypotheses of the study. The hypotheses were tested with the path analysis that discloses the effect of independent variables on dependent variable, procedures of the empirical study, include the following:

Data collection procedures:

Primary data was collect useing questionnaire, the questionnaire was initially written in English language and then translated to Arabic. Next, the questionnaire was reviewed by five academics to ensure that content and translation was appropriate for the study purpose. Based on the received comments, the questionnaire was revised as needed. The questionnaire was distributed by the researchers to a sample consisted of financial manager, financial accountant, cost accountant, internal auditor, production engineer, managers, and other careers that related to the topic of study, and then it was collected for analysis.

Profile of case study:

Giad industrial group company is the flagship Company of the industries in Sudan, a premier engineering manufacturer & agro- industries with more than 25 modern companies and factories. The group deals with steel products, cars, trucks, equipment for the core sectors of agriculture, transportation, electrical, textile, tanneries and others services and has achieved market leadership in each of the above categories.

Population and Sample Selection:

The study targeted to measure the opinion of employees' that work in Giad industrial group about applying value engineering. Therefore, the population of this study will consist of; financial managers, financial accountants, cost accountants, internal auditors, Production engineers, Managers, and other jobs relate to the topic of study.

Sample size:

The total number of questionnaires distributed (130), but (105) were retreived representing (81%) of the total number of questionnaires distributed.

Data analysis instruments:

The data collected was coded, and analyzed through SPSS. Descriptive statistics such as percentages, mean, standard deviation, Chi-Square, degree of freedom, and value of probability was used for testing the hypotheses of study.

Internal validity:

In order to reduce the threats of internal validity, researchers systematically reviewed the literature and identified multiple variables that might be alternative explanations for knowledge contribution in the study. However, since researchers choose to use the case study as the research method, it is impossible to completely eliminate the risk of alternative explanations. Another important threat to internal validity is the non-responder bias. On the other hand concern is the common method variance which is an important threat to internal validity in general and to study that collect the responses in a single setting in particular. When the same method is used to measure the correlations between variables, common method variance may occur. The best measure to minimize common method variance is to collect the data of the independent and dependent variables in two steps. In order to do that, participants' anonymity has to be compromised to link the data of the first and second survey. Moreover, it will be difficult to get a high response rate for the second survey since the participants are quite busy and have limited time for the survey Therefore, the researchers decide to collect the data in one single step. As a remedy, the scales are designed under the guidelines of item and questionnaire design to reduce common method variance.

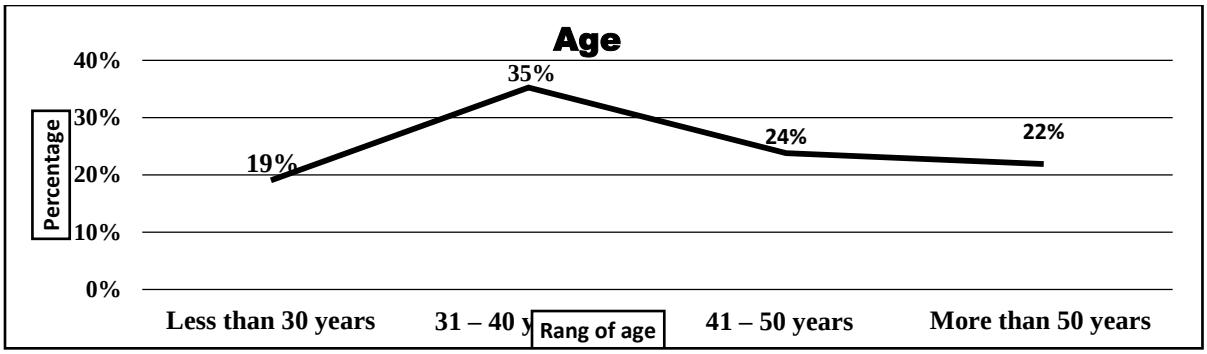
Respondents' profile:

1. Age

Table (1):The distribution of frequency and percentage of the age groups of study sample

Rang of age	Frequency	Percentage (%)
Less than 30 years	20	19%
31 – 40 years	37	35%
41 – 50 years	25	24%
More than 50 years	23	22%
Total	105	100%

Source: prepared by researchers depending on questionnaire's data 2018



Source: prepared by researchers depending on questionnaire's data 2018

Figure (1):The distribution of percentage of the age groups of study sample

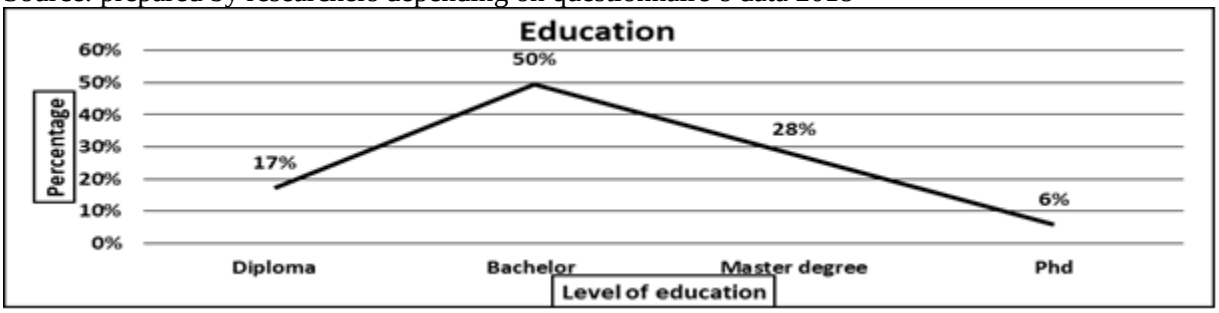
The result presented by table (1) and figure (1) illustrate the Age of the study sample indicated that 19% of age groups are less than 30 years, 35% of age groups their age range between (31-40 years), 24% of age groups range between (41- 50 years), and finally 22% of age groups their age is more than 51 years. Consequently, this result indicated that the age of the majority of the study sample are more than 31years, indicating the maturity of the study sample and hence increasing the reliability of the study.

2. Education

Table (2):The distribution of frequency and percentage of the Education of study sample

Level of education	Frequency	Percentage (%)
Diploma	18	17%
Bachelor	52	50%
Master degree	29	28%
PhD	6	6%
Total	105	100%

Source: prepared by researchers depending on questionnaire's data 2018



Source: prepared by researchers depending on questionnaire's data 2018

Figure (2):The distribution of percentage of the Education of study sample

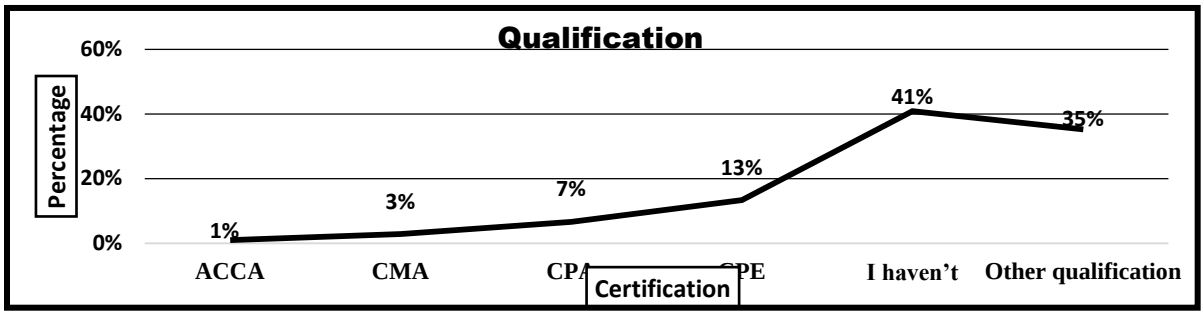
The results showed by table (2) and figure (2) illustrate the education, pointing that 17% from the study sample have got diploma, while 50% have got a bachelor degree, 28% from the study sample hold a master degree, and 6% from the study sample hold PhD. Accordingly, this analysis indicated that more than 83% are holding a bachelor or postgraduate certificates, therefore, it increases the reliability of this study.

2. Qualification:

Table (3):The distribution of frequency and percentage of the Qualification of study sample

Certification	Frequency	Percentage (%)
ACCA	1	1%
CMA	3	3%
CPA	7	7%
CPE	14	13%
I haven't	43	41%
Other qualification	37	35%
Total	105	100%

Source: prepared by researchers depending on questionnaire's data 2018



Source: prepared by researchers depending on questionnaire's data 2018

Figure (3):The distribution of percentage of the Qualification of study sample

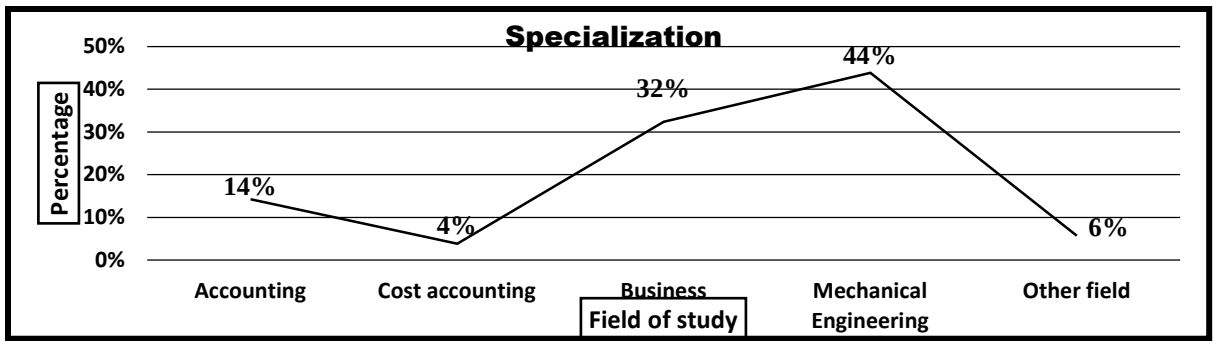
The results showed by table (3) and figure (3) illustrate the qualification, pointing that 1% from the study sample have got ACCA, while 3% have got CMA, 7% have got CPA, 31% from the study sample hold CPE, 35% from the study sample hold other certificates. Accordingly, this analysis indicated that 59% are holding qualification certificates, therefore, it increases the reliability of this study.

4. Specialization:

Table (4):The distribution of frequency and percentage of the Specialization of study

Field of study	Frequency	Percentage (%)
Accounting	15	14%
Cost accounting	4	4%
Business Administration	34	32%
Mechanical Engineering	46	44%
Other field	6	6%
Total	105	100%

Source: prepared by researchers depending on questionnaire's data 2018



Source: prepared by researchers depending on questionnaire's data 2018

Figure (4):The distribution of percentage of the Specialization of study

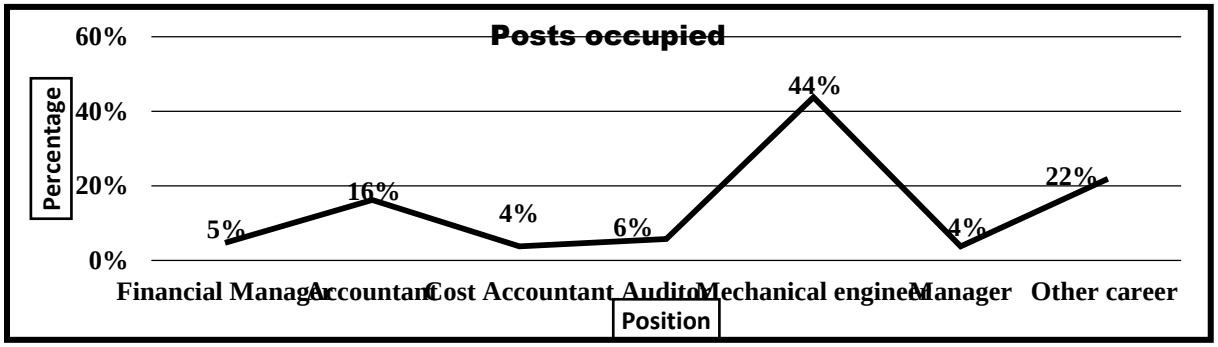
The results showed by table (4) and figure (4) illustrated the specialization, which showed that 14% from the sample specialized in accounting, while 4% specialized in cost accounting, 32% specialized in business administration, 44% specialized in engineering and finally 6% have others 'specialization. Accordingly, this analysis indicated that 94% are accounting, cost accounting, business administration and mechanical engineering, therefore, it increases the reliability of this study.

5. Posts occupied:

Table (5):The distribution of frequency and the percentage of the Posts occupied by study sample

Position	Frequency	Percentage (%)
Financial Manager	5	5%
Accountant	17	16%
Cost Accountant	4	4%
Auditor	6	6%
Mechanical engineer	46	44%
Manager	4	4%
Other career	23	22%
Total	105	100%

Source: prepared by researchers depending on questionnaire's data 2018



Source: prepared by researchers depending on questionnaire's data 2018

Figure (5):The distribution of the percentage of the Posts occupied by study sample

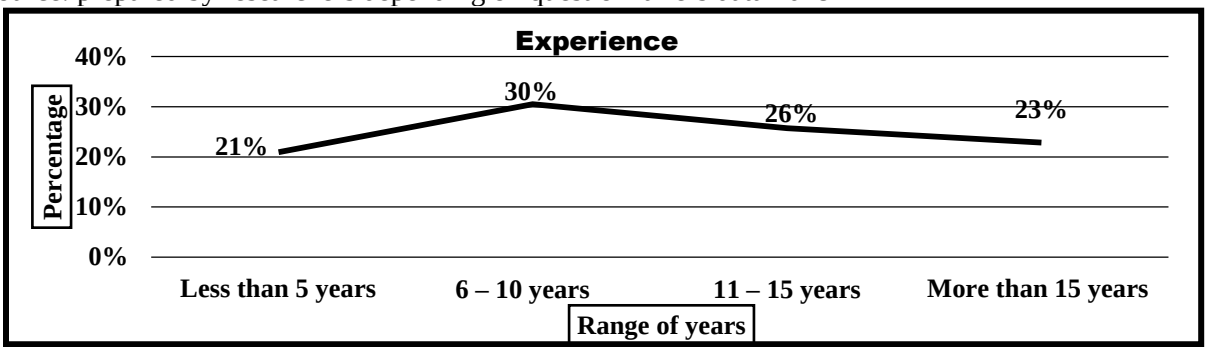
Table (5) and figure (5) showed that 5% of study sample are financial manager, 16% are accountants, 4% are cost accountants, 6% are auditors, 44% are mechanical engineers, 4% are managers and finally 22% are others jobs. Accordingly, this analysis indicated that more than 78% are (financial manager, an accountants, cost accountant, an auditors, mechanical engineer and manager), therefore, it increases the reliability of this study.

6. Experience:

Table (6):The distribution of frequency and percentage of the years of Experience of study

Range of years	Frequency	Percentage (%)
Less than 5 years	22	21%
6 – 10 years	32	30%
11 – 15 years	27	26%
More than 15 years	24	23%
Total	105	100%

Source: prepared by researchers depending on questionnaire's data 2018



Source: prepared by researchers depending on questionnaire's data 2018

Figure (6):The distribution of frequency and percentage of the years of Experience of study

The results showed by table (6) and figure (6) illustrated the distribution of frequency and percentage of the experience, and showed that 21% from study sample have got five or less years of experience, 30% have got (6-10) years of experience, 26% have got (11-15) years of experience, 23% have got more than 16 years of experience. Consequently, indicating that the majority of the study sample years of experience ranged from (6 - More than 15 years), this means that about 79% of the sample have got more than five years of experience, indicating that their knowledge about the work nature is so high, then their opinion about the statements is considerable, this supports the reliability of study.

Testing of hypotheses:

H1: Giad industrial group doesn't apply the value engineering technique.

Table (7):The percentage answers of study sample about the study's Phrases

Phrases	Agree	Highly agree	Neutral	Disagree	Highly disagree
Lack of familiarity with value engineering.	37%	54%	4%	4%	1%
Lack of training about modern techniques e.g.; value engineering.	40%	45%	4%	6%	5%
We face more pressing manufacturing problems in our company.	%9	12%	20%	28%	31%
Our accounting system help to apply modern techniques.	%35	39%	13%	8%	5%
Value engineering technique are not suitable for our company.	%10	13%	20%	26%	31%
We have a good understanding of our design's costs.	%28	26%	20%	14%	12%
The product`s design helps to achieving satisfy customers demand.	36%	38%	19%	4%	3%
People in our company unwilling to change.	43%	31%	12%	8%	6%
New ideas are taken seriously.	45%	36%	8%	6%	5%

Source: prepared by researchers depending on questionnaire's data 2018

The results showed by table (7) the percentage answer of study sample about the first phrases (54%) highly agree, while (45%) also highly agree about the second phrase, but (31%) don't agree totally about the third phrase, (39%) also highly agree about the fourth phrase, (31%) highly disagree about the fifth phrase, (28%) agree about the sixth phrase, (38%) highly agree about the seventh phrase, (43%) agree about the eighth phrase, and finally (45%) also agree about the ninth phrase. All that indicated the majority of respondents are strongly agreed to the positivness to first hypothesis.

H2: There is a relationship between value engineering and reducing manufacturing costs.

Table (8):The percentage answers of study sample about the study's Phrases

Phrases	Agree	High agree	Neutral	Disagree	High disagree
Continuous research& development (R&D) helps to reducing the raw materials costs.	42%	34%	13%	7%	4%
Innovation a new ways for production process helps to reduction the wages costs.	38%	41%	4%	9%	8%
VE helps to abolishing elements and activities that don't add value.	30%	45%	12%	7%	6%
VE helps to design products according to the study of customers' needs and desires.	48%	35%	8%	5%	4%
Reducing the time of production in design stage helps to reducing wages costs.	34%	51%	4%	5%	6%
Overhead costs can be reduce in the design stage.	49%	45%	2%	3%	1%
VE focuses on reducing costs at different stages of production.	34%	47%	6%	7%	6%
The idea of VE is design the products by teams from different disciplines.	35%	36%	12%	9%	8%
VE helps to reduce waste in the use of materials and time of production.	38%	43%	6%	5%	8%

Source: prepared by researchers depending on questionnaire's data 2018

The results showed by table (8) the percentage answer of the study sample about the first phrases (42%) agree, while (41%) highly agree about the second phrase, also (45%) highly agree about the third phrase, (48%) agree about the fourth phrase, (51%) highly disagree about the fifth phrase, (49%) agree about the sixth phrase, (47%) highly agree about the seventh phrase, (36%) highly agree about the eighth phrase, and finally (43%) also highly agree about the ninth phrase. All that indicated the majority of respondents are strongly agreed to the positivness to hypothesis.

Table (9):The means, standard deviation, Chi-Square, degree of freedom, probability value of first hypothesis's phrases

No	Phrases	Means	STD	Ch2	D.F	P. value
1	Continuous research& development (R&D) helps to reducing the raw materials costs.	3.22	0.91	30.00	3.09	0.00
2	Innovation a new ways for production process helps to reduction the wages costs.	3.33	0.83	30.20	3.00	0.00
3	VE helps to abolishing elements and activities that don't add value.	3.13	0.89	30.32	3.80	0.00
4	VE helps to design products according to the study of customers' needs and desires.	3.09	0.80	30.34	3.00	0.00
5	Reducing the time of production in design stage helps to reducing wages costs.	3.29	0.93	30.15	3.00	0.00
6	Overhead costs can be reduce in the design stage.	3.12	0.90	30.31	3.00	0.00
7	VE focuses on reducing costs at different stages.	3.03	0.79	30.43	3.00	0.00
8	The idea of VE is design the products by teams from different disciplines.	3.29	0.87	30.19	3.00	0.00

9	VE helps to reduce waste in the use of materials and time of production.	3.17	0.94	30.21	3.00	0.00
	Total phrases	3.19	0.87	30.24	3.10	0.00

Source: prepared by researchers depending on questionnaire's data 2018

Table (9) illustrated the mean, standard deviation, Chi-Square, degree of freedom, and probability value of answer of the study sample about first hypothesis**,** the researches realized that all means are greater than the default mean and equal (3.26), that indicates all means of phrases go to positive direction; also it shows that the all standard deviations equal (0.82) is less than one, which indicates the similarity and homogeneity of answers of the study sample about the phrases and pointed that the probability value of all phrases is less than (0.05) indicating that all answers of study sample go to positive direction and agreed to hypothesis.

Table (10):The means, standard deviation, Chi-Square, degree of freedom, probability value of second hypothesis's phrases

No	Phrases	Means	STD	Ch2	D.F	P. value
1	Lack of familiarity with value engineering.	3.40	0.87	30.85	3.00	0.00
2	Lack of training about modern techniques e.g.; value engineering.	3.26	0.92	31.63	3.00	0.00
3	We facing more pressing manufacturing problems in our company.	3.63	0.59	27.92	2.98	0.00
4	Our accounting system help to apply modern techniques.	3.25	0.97	30.48	3.00	0.00
5	Value engineering technique doesn't suitable for our company.	3.14	0.62	28.10	3.00	0.00
6	We have a good understanding of our design's costs.	2.98	0.91	32.03	4.00	0.00
7	The product`s design helps to achieving satisfy customers demand.	3.11	0.88	30.84	3.00	0.00
8	People in our company unwilling to change.	3.08	0.84	29.99	3.00	0.00
9	New ideas are taken seriously.	3.51	0.82	30.21	3.00	0.00
	Total phrases	3.26	0.82	30.23	3.11	0.00

Source: prepared by researchers depending on questionnaire's data 2018

Table (10) illustrated the mean, standard deviation, Chi-Square, degree of freedom, and probability value of answer of the study sample about second hypothesis**,** the researches realized that all means are greater than the default mean and equal (3.19), that indicates all means of phrases go to positive direction; also it shows that all standard deviations equal (0.87) is less than one, which indicates the similarity and homogeneity of answers of the study sample about the phrases and pointed that the probability value of all phrases is less than (0.05) indicating that all answers of study sample go to positive direction and agreed to hypothesis.

Fourthly: Findings and recommendations

Findings:

1. Value engineering is essentially a process which uses function-cost analysis to reducing manufacturing cost. (J. Sharma, 2012)
2. The results affirmed the positive and significant effect of Value engineering on reducing cost.
3. Value engineering helps out workforce in healthier thoughtful of employment. (R. Janani, et at, 2018)
4. Value engineering is plans to bring quantifiable value developments through price lessening and to get better excellence for the customer. (R. Janani, et at , 2018)
5. Giad industrial group uses absorption costing, and break-even point analysis rather than VE.

6. Value engineering focuses on reducing costs at different stages of production.
7. Value engineering helps to evaluating the functions of product to determine whether they can be provided at lower cost without sacrificing the features of the product.

Recommendations:

1. Use of aesthetically pleasing and more durable materials without increase in cost. (R. Janani, et at, 2018)
2. Use Value engineering to optimize reengineering the manufacturing process has its practical significance.(Min Cheng, et at , 2013)
3. The level of training has proved to be statistically influential on the application of VE. Most responders expressed their distrust about the value that fresh graduates receive or acquire from colleges.
4. The organizational culture does indeed has statistical influence on the application of VE.
5. One of the key principles for the proper application Value engineering is cross functional involvement where cross-functional product and process teams are responsible for the entire product from initial concept through final production.
6. Many respondents expressed their concern that their organizations do not enjoy a good teamwork spirit.
7. Most respondents agreed that there were major improvement in the infrastructure in company, they concluded that there is still a long way to go before this infrastructure can be trusted and depended on.

References:

1. AMIT SHARMA & R.M.BELOKAR, (2012) implementation of value engineering: A case study, International Journal of Marketing, Financial Services & Management Research Vol. (1) No. (3), PP.64-70.
2. Ainul Farahin Binti Abdullah, et at, (2015) Organizing Value analysis Value engineering (VAVE) during New Product Development (NPD), ARPN Journal of Engineering and Applied Sciences, VOL. (10), NO (21), PP. 10052- 10057.
3. Chougule M. & Kallurkar S. P., (2012) Application of value engineering for cost reduction: A case study of Universal Testing Machine, International Journal of Advances in Engineering & Technology (IJAET), Vol. (4), Issue (1), PP. 618-629.
4. Florian G. H. Behncke, et at.(2014) Extended Model for Integrated Value Engineering, Procedia Computer Science, issue (28), PP.781- 788.
5. F. Jariri & S.H. Zegordi, (2008) Quality Function Deployment, Value Engineering and Target Costing, an Integrated Framework in Design Cost Management: A Mathematical Programming Approach, Scientia Iranica, Sharif University of Technology Vol. (15), No. (3), PP 405-411.
6. J. Sharma, (2012) A cross-disciplinary approach to product development and design through quality function deployment, target costing and value engineering, Int. J. Productivity and Quality Management, Vol. (9), No.(3), PP.309-331.
7. Lars Strupeit, (2017) An innovation system perspective on the drivers of soft cost reduction for photovoltaic deployment: The case of Germany, Renewable and Sustainable Energy Reviews (77), PP.273-286.

8. Min Cheng et at, (2013) Value Engineering-Based Selection strategies of Construction Scheme, Advanced Materials Research Vols (671-674) PP. 3065-3068.
9. M. I. Maksud & M. S.Yusof, (2013) Cost Reduction Through Value Engineering Practices In Manufacturing Assembly, Applied Mechanics and Materials, Vol. (315) PP. 503-506.
10. Renata Schneiderova Heralova, (2016) Possibility of Using Value Engineering in Highway Projects, Procedia Engineering Journal, issue (164), PP. 362 -367.
11. R. Janani, et at (2018) A study on value engineering & green building in residential construction, International Journal of Civil Engineering and Technology (IJCIET) Volume (9), Issue (1), PP. 900-907.
12. R. Gandhinathan, et at, (2004) QFD- and VE-enabled target costing: a fuzzy approach, International Journal of Quality & Reliability Management Vol. (21) No. (9), PP. 1003-1011.
13. U. Ibusuki, P.C. Kaminski (2007) Product development process with focus on value engineering and target-costing: A case study in an automotive company, Int. J. Production Economics (105), PP.459- 474.
14. Walaa Y. El-Nashar, (2017) Effect of drains coverings on environment by using value engineering, Alexandria Engineering Journal- Egypt, issue (56) PP.327-332.
15. Wang Donghua & Ge Xin, (2012) Research on Comparison of Methodology between Industrial Engineering and Value Engineering, Applied Sciences and Engineering, Vol. (197), PP. 240-245.
16. Wen-Tsann Lin, et at, (2011) Intelligent Manufacturing System of Product Life Cycle Management in Value Engineering, Applied Mechanics and Materials, Vols. (63-64), PP.251-254.
17. Xiaoyong Li et at, (2012) Cost Management Method with Value Engineering, Advanced Materials Research Vols (433-4400 PP. 2114-2119.