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Exploring the Level of Acceptability and Implementation of Value Engineering In the Ghanaian Construction Industry: A Case study of Tamale Metropolis

by:

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in Partial Fulfilment of the Requirement for the degree of

MASTER OF SCIENCE

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DECLARATION

I hereby declare that this submission is my own work towards Master of Science construction management and that, to the best of my knowledge, it contains no material which has been accepted for the award of any degree of the University, except where due acknowledgement has been made in the text.

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Date---------- **Certified**

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THE HEAD OF DEPARTMENT: DR. THEOPHILUS ADJEI-KUMI

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Date----------

ABSTRACT

This study was aimed at investigating the level of acceptability and implementation of Value Engineering (VE) among construction professionals in the Tamale Metropolis. The study sought to: find out the perceptions of construction professionals about value engineering in Ghana; determine the level of knowledge of construction officers on value engineering in Ghana; ascertain the level of acceptability and implementation of value engineering in the construction industry; and find out the factors that hinders the acceptability and implementation of value engineering in the construction industry in Ghana. The discussion of the objectives were used to gain more insight into the level of acceptability and implementation of value engineering among construction professionals. The population of 200 construction professionals were put into clusters, for each cluster 40% was taken as sample which gave a total sample size of 86, due to rounding off of the figures.The main instrument for data collection was the questionnaire which was selfadministered. Out of the 86 questionnaires given out, 82 respondents filled and returned the questionnaires, giving a return rate of 95% which was considered satisfactory enough for the research purpose. The returned questionnaires were analysed using the descriptive statistics such as means, standard deviations, frequencies and percentages which was aided by the use of Statistical Packages and Service Solutions (SPSS version 20.0). The study found out that most construction professionals had positive perceptions about VE and thereby be willing to implement value engineering. The respondents had adequate knowledge in value engineering to effectively execute a project. The study recommended that management of organizations should develop positive attitude towards Value Engineering. They should draw up strategic policies that would encourage value engineering.

DEDICATION

To my Lovely “Angel” Mrs. Magdalene Tahiru

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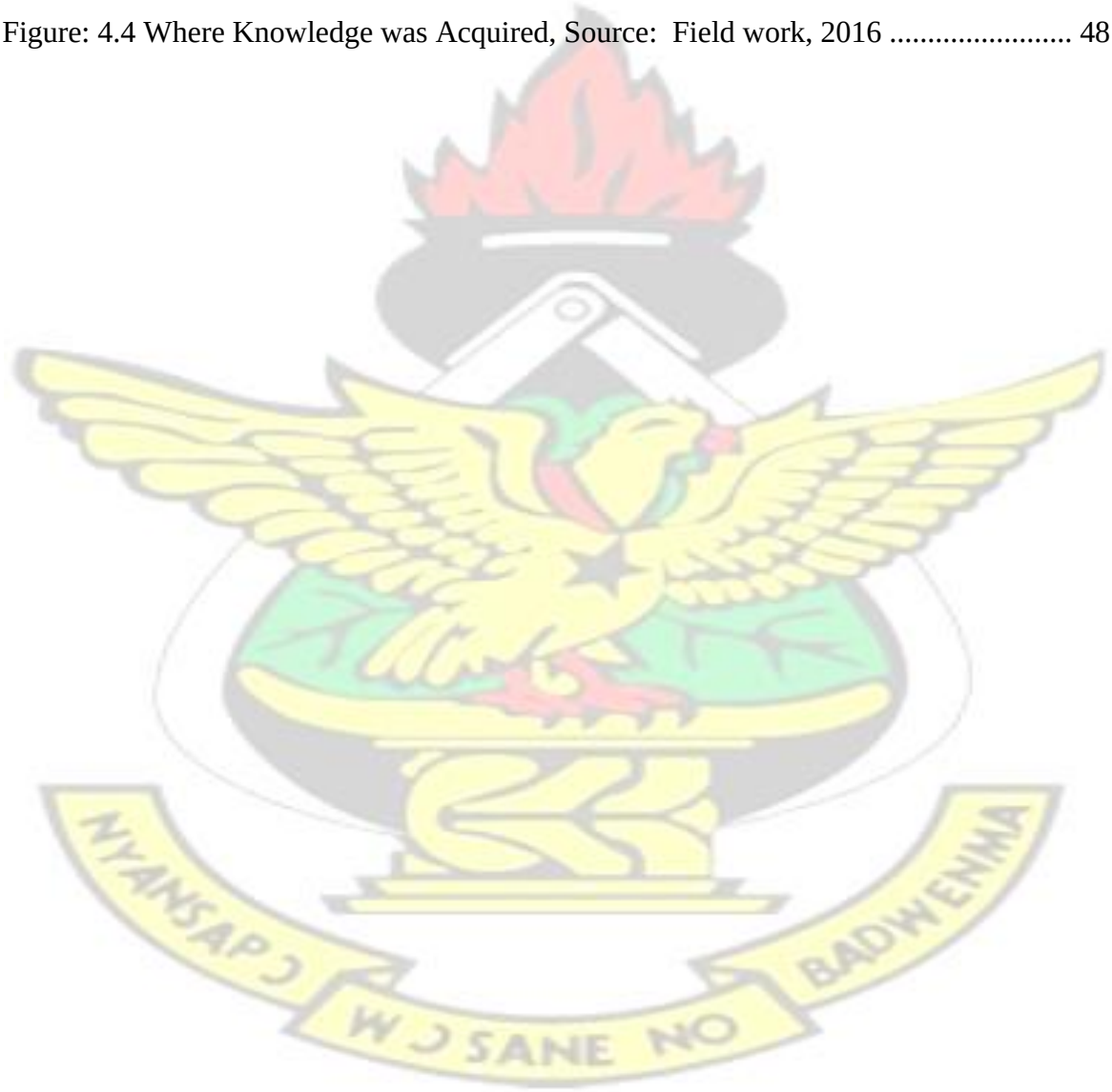

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

The Construction Industry is one among the moving sectors of the economy today that has a so much influence and contributes significantly to the financial progression of a nation; it is an investment-led sector where management of the economy shows high concentration because of it varied nature (Houston, 2016). Houston further stated the sector involves several clients like contractors, designers and suppliers and appeals to many inward financiers, for well-constructed structures create a friendly environment to work in, thereby increasing efficiency. The previous year's indicate that the construction sector has been growing speedily. Significant public and private developments are predominantly growing. With many developments concurrently ongoing, the likelihood of development interruptions and complications is bound to increase. Dealing with such tasks competently and efficiently avoid extra expenses, thus reducing the costeffectiveness of a project (Gyu, 2015).Analysts predicted 6% growth next year with the value of construction reaching an estimated $712 billion (Dodge, 2016). According to Dodge, despite the growth of the construction sector over the years unlike other sectors, the sector has been slow to adopt new technologies, and has certainly never undergone a major transformation. As a result, productivity should have been higher than it is now and may decline in the very near future if new concepts are not developed (Gibson, 2016). Gibson indicated that, this unimpressive record looks set to change very soon, and very dramatically.Infact Propound changes are already taking place – though not yet on a sufficiently wide scale – in many aspects of the construction industry. The writer William Gibson's famous phrase fits the industry

perfectly: *The future is here today – it is just not evenly distributed.* (Gibson, 2016). The best cost, execution and standard requirements for constructions, their Components and/or materials are the main objectives in almost every construction project. Various concepts and ideas have been developed to help owners meet these needs, including value engineering;

The idea of Value Engineering (VE) took place at the time of world war two. Confronted with scarcity of funds, resources and both skilled and unskilled labour, General Electric considered surrogates. What began as an emergency plan headed to an opportunity when the establishment engineer came to understanding that replacing unattainable parts with those obtainable reduced the general charges, or developed eminence. In certain cases, the new products led to both bargain cost and product growth (SAVE International, 2015). Value engineering is a powerful approach for cost saving and quality improvement; especially that the construction industry holds an important weight with respect to the worldwide economy. Currently, value engineering does not influence just project costs and quality, but also it has proved to have positive impacts on the environment and the worldwide trend of green construction. Value engineering takes into consideration both the initial and life-cycle costs. The overall estimated savings of the project resulting from the full value engineering study ranged between 20% to 30% percent of the element cost; hence a significant reduction in the overall project cost as well as the saving in energy consumption that reached about 7%. The paper provides a good example on how value engineering and sustainability are inter-related; and how they have compounded (Rocha et al, 2016).For instance, the World Bank has specified that, the rural road network

reintegration project in Ghana, abetted the costs of conveying goods and travellers by approximately one-third on average (World Bank, 2000)

1.2 STATEMENT OF THE PROBLEM

The construction industry has become the lifeblood of prosperity and economic confidence in this 21st century globally (Donkor, 2014**).** The construction industry is then measured as a main fiscal contributor to the Gross Domestic Product (GDP) of every country of which Ghana is not an exception. However, the performance of Ghanaian construction professionals is a major cause of worry amongst client groups and other stakeholders in the construction industry in the country (Badu et al 2012). Most contractors in Ghana experience difficulty in accessing funding (Badu et al, 2012). Fugar et al, (2013) discovered seven challenges which comprises of the lack of major development governing organization, absence of investment in human resource increase, insufficient monetary resources, failure to embrace modification, low knowledge in the industry, absence of gratitude for staff in the industry and high level of workers flexibility. Most clients are therefore left dissatisfied seeing their projects not being completed on time and if completed, at a very high cost. Value Engineering (VE) is a structured scheme of examining, using qualified multi-disciplined players to scrutinize the requirements of a project by using substitutes for original parts or materials, and in doing so, attaining cost decrease and enhanced performance or both (Save International, 2015).The concept has been in existence since 1947. Many countries have embraced this cost management procedure in the construction industry and have actually set up value engineering associations to regulate the construction industry to drive the maximum benefits and to

ensure value for money in the construction sector. Some of the associations are the Society of American Value Engineers (SAVE), the Society of Iranian

Value Engineers (SIVE), the Society of Japanese Value Engineers (SJVE), the Indian Value Engineering Society (IVES), and the institute of value management UK (IVMUK). Despite it long inception across the world, its benefits has not been felt much in the construction industry in Ghana and this is the main reason why there are so many challenges in the industry . A lot of researches have been conducted in the area of value engineering (Mahadik, 2015; Bijay, 2014; Firmawan, Othman &Yahya, 2012; Male, 2007). It is against this backdrop that this research sought to explore the level of acceptability and implementation of value engineering in the construction industry aimed at attaining its indispensible meanings at the lowest over-all budget (resources, process, and preservation) over the lifecycle of the projects.

1.3 RESEARCH QUESTIONS

The study tries to find answers to the following questions:

What are the perceptions of construction professionals about value engineering in Ghana?

What is the level of knowledge of construction professionals about value engineering?

What is the level of acceptability and implementation of value engineering in the construction industry in Ghana?

What are the factors that hinder the acceptability and implementation of value engineering in the construction industry in Ghana?

1.4 GENERAL RESEARCH OBJECTIVE

This research work was aimed at exploring the level of acceptability and implementation of value engineering in the construction industry in Ghana.

1.4.1 Specific Research Objectives

Based on the above stated aim the specific objectives of the study were:

To find out the perceptions of construction professionals about value engineering in Ghana;

To determine the level of knowledge of construction professionals on value engineering in Ghana;

To ascertain the level of acceptability and implementation of value engineering in the construction industry in Ghana; and

To find out the factors that hinders the acceptability and implementation of value engineering in the construction industry in Ghana.

1.5 SIGNIFICANCE OF THE STUDY

Construction plays an enviable role in the development of every nation, if it is well coordinated and structured. However the construction industry in Ghana is saddled with problems such as high cost of construction projects, clients do not achieve fully their anticipated project objectives, constructions firms fails to produce to the exact specification thus decreasing the quality of products, absence of major development supervisory body, insufficient monetary capitals, absence of investment in human resource growth, resistance to transformation, low knowledge in the industry (Donkor, 2014). The study therefore will help to bring to light how Value Engineering can best be applied in the construction

industry. The results of the study will enhance the existing body of knowledge on the issue of value engineering in the construction industry. The output of this research will also contribute and serve as basis for policy makers to make informed decisions relating to the construction industry and assist in policy formulation in establishment of principal development regulatory body as standpoint of moulding thoughts on value engineering principle s in the construction industry in Ghana and finally to maximize the high benefits to the industry and to ensure customers satisfaction.

1.6 SCOPE OF THE STUDY

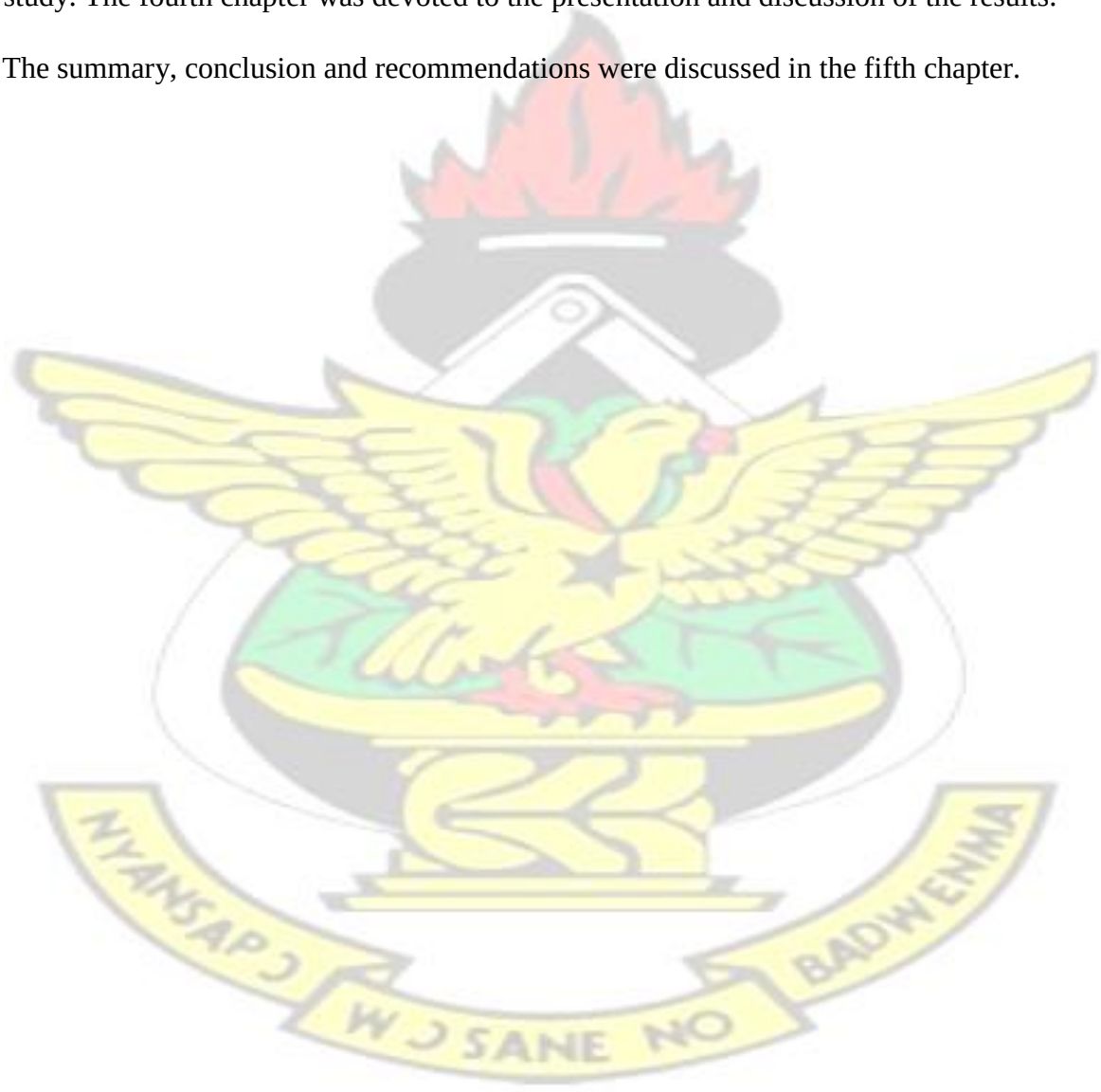
The research concentrated on exploring the level of acceptability and implementation of value engineering methodology in the construction industry in Ghana. Value engineering is applicable to many sectors of the economy, e.g. the manufacturing industry, service industry, construction industry, etc. However, the study focused on the construction industry in Ghana. Geographically, the study was limited to the Tamale Metropolis of the Northern Region of Ghana

1.7 BRIEF METHODOLOGY

The study adopted the descriptive survey of the quantitative research. Available literature from books, journal articles and papers provided substantial information for the study. Self-administered questionnaire was the main instrument employed to collect data from the respondents in the Tamale Metropolis. The questionnaire was well structured with close-ended and open-ended items. Some of the closed-ended items were rated on a Likert scale. Central tendencies such as means and standard deviations were used to analyse the data.

1.8 ORGANISATION OF THE RESEARCH

The study was organized in five chapters. The first chapter gave the background of the study, problem statement, and the objectives of the study, research questions and the significance of the study among others. The second chapter dealt with a review of related literature on the topic whereas the third chapter covered the detailed methodology of the study. The fourth chapter was devoted to the presentation and discussion of the results. The summary, conclusion and recommendations were discussed in the fifth chapter.



CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The study aimed at exploring the level of acceptability and implementation of value methodology in the construction industry in Ghana. The review of literature which forms the substance of this chapter has been purposely restricted to cover those works which are relevant to this study. The chapter begins with an introduction followed by conceptual review and the next section discusses related issues such as the perceptions of construction officers about value engineering, the rate of acceptability and implementation of value engineering methodology, the factors that hinder the acceptability and implementation of value engineering, value engineering methodology (techniques) and the benefits of value engineering.

2.2 DEFINITIONS OF VALUE ENGINEERING

According to Kelly et al (2007), Value Engineering (VE) is an organised and advanced multidisciplinary technique that studies functional needs of a product design, project design, service design, facility and system in achieving greater value and reducing cost without affecting the level of performance in a programme and project. They state further that, the value engineering process is an inclusive activity that demands the effort of all stakeholders and related project experts who pay attention to the function, and also quality of the project. Again, value engineering is considered as one of the most efficient methodologies that help to achieve the lowest cost to execute the plans and minimise unnecessary expenditure along with the guarantee of design, usefulness, maintenance capability and preservation of the

aesthetic aspects of the work. Mahadik (2015) on his part defined value engineering (VE) as an organised presentation with recognised methodology which identify the functions of the product or service, establish the importance of those functions, and provide the necessary functions to meet the required performance at the lowest overall cost.

Value engineering is also applied throughout several phases of a project cycle. However, if the application of VE is done in later stages it may result in higher project cost.VE may be utilised several times before a project comes to an end. Male et al (2007) opine that application of VE helps in more organised execution of project activities, thereby reducing the overall cost as well as avoiding any major changes right from the beginning. Value Engineering (VE) can function in an organised method known as value engineering work plan. The tenacity of the work plan is towards the support study experts to categorise and highlight on main development roles in an organised way, in order to generate fresh concepts that will result in value enhancements.

The Office of Federal Procurement Policy Act, Section 36 of the USA states that VE is "the analysis of the functions of a program, product, system, item of equipment, building, service, facility or supply to improve performance, reliability, quality, safety and life cycle costs". The Act further defines VE as "the recognised methodology by which contractors may willingly propose approaches for performing more economically, and share in any subsequent investments or be required to establish a database to identify and submit to the government methods for performing more carefully". Value Engineering (VE) is a

concentrated, multidisciplinary problem solving activity that focuses on improving the value of the functions that are required to accomplish the aim, or objective of any product, method, service, or administration (Firmawan,et al, 2012). The main idea behind value engineering is it organised presentation of recognised methods which recognise the roles of the product or service, found the value of those roles, and afford the required tasks to meet the essential performance at the overall charge (Bryant, 1998 as cited in Firmawan et al, 2012). Farahmandazad (2015) on his part also defines value engineering as "a planned effort to examine the performance of developments, packages, organisations, tools, and establishments in order to achieve presentation with the best cost throughout the life of the project which is always used to the anticipated excellence with much concern on security.

Mousavi et al (2014) on their part define value engineering as an organised technique to increase product and its uses by using an analysis of purpose. They explained value as the percentage of its uses to price. This means that to be able to increase value, you need to improve function or reduce cost. Shublaq (2003) views Value Engineering as "a specialised cost control technique, performed by a group of experienced professionals. The technique involves an intensive, systematic and creative study to decrease cost while increasing trustworthiness and performance. Therefore based on the various definitions value engineering is a concept that is practiced to preserve functionality in adjusting cost of projects and is most effective during the early programming and design phases when functionality and performance criteria is adhered too.

2.3 HISTORICAL BACKGROUND OF VALUE ENGINEERING

Historically, according to the Society of American Value Engineers (SAVE), VE started at General Electric Company (G.E.) during World War II. There was scarcity of skilled labour, raw materials and spare parts components during that period. Lawrence Miles, Jerry Leftow, and Harry Erlicher (Fathers of Value Engineering) looked for how best they could substitute these. They later understood that these replacements often reduced the amount, upgraded product, or both. What began out as a necessity technique later twisted into an organised process. The technique is known as "value analysis". Two concerns manifest the use of value engineering as used by the US navy during the 1950s, the background application of value engineering has change as one of the method from completed service to the intellectual project. Secondly, the US Navy in the 1950s placed an embargo on the acquisition of experts. The experts of value study remained creatively hired under the allowable designated engineer thus giving birth to the value engineers of today (SAVE, 2010). The use of value engineering in the US rapidly grew in 1993 resulting in two that makes the practice compulsory. Later in the 20th century, value engineering spread widely across the world.

Value engineering is practiced within the project organisation or industrial engineering body of discipline as a method in which the value of a scheme's end-product remains increased in creating a blend of purpose and expenditure. This system helps to identify and eliminate unnecessary costs, thus growing the value for the producer and their customers (SAVE International, 2010). The World Congress on Engineering and Computer Science (WCECS) also confirms that Value Engineering begun during World War II, at a time when

many manufacturers and producers were compulsory stayed to utilise alternative supplies and plans as an outcome of serious measurable deficiencies. When the General Electric Company established that a lot of of the alternatives were issuing equivalent and enhanced option at best rate, management took an initiative in 1947 to increase the product capacity by systematically and deliberately bringing on board less costly substitutes. Lawrence D. Miles, a staff engineer for General Electric, was the initiator of this method. He collectively joined a number of ideas and systems to grow a successful practical approach for safeguarding value in a product. When the idea proved to be effective,many organisations rapidly spread it through industries as the options for large returns after comparatively modest reserves were identified (WCECS, 2012).

Value engineering primarily provides an enhanced value over the generalization of goods or service by scrutiny and improved presentation. It stayed through its forthcoming submission to routine production which it always developed to consider client needs as standards and in so doing increase from being a merely reconsidering practise to one simultaneously helping in the strategy development (Thompson & Austin, 2001 as cited in O'Farrell, 2010) .The resulting competitive effect produced easily ascertainable savings. Also, Davis (2004) as cited in O'Farrell (2010) further stated that, the main substance of the value organisation was the advancement of a focus on role.

From 1978, the Chinese manufacturing industry has acknowledged Value management in its administrative assessments as being their second maximum celebrated management organization which has helped regularice the industry and attain it maximum benefits (Shen & Liu, 2004).

2.4 VALUE ENGINEERING METHODOLOGY (TECHNIQUES) IN THE CONSTRUCTION INDUSTRY

Atabay and Galipogullari (2013) explain that value practice is an organised process succeeding the job strategy process and practical use by a well experience team to advance the cost of a project over the study of tasks. To Caldwell (2006); Mandelbaum, (2006); (Mahdi et al 2015); SAVE International (2010) and (Rich et al 2000) methodology is composed of the following phases:

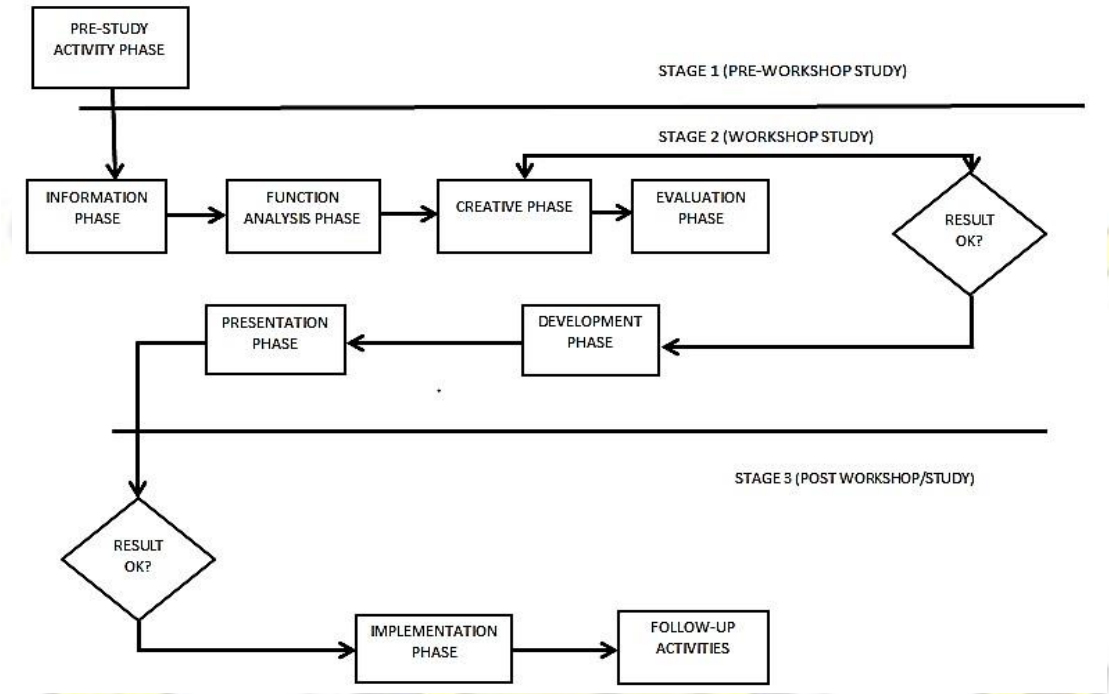


Figure 2.1: Value Engineering Methodology (SAVE International, 2007)

2.4.1. The Pre-Study/Orientation Phase:

This is the first phase of the value engineering methodology which determines the criteria of study which help to attain the objective of the VE study. Holweg et al (2000) states that, this phase usually express the customer priorities. The reason for going through this phase

is that it helps project managers to polish the difficulty at hand and formulate for the cost study. Although a difficult area may have been acknowledged, there is a greater likelihood that the value study will be successful if adequate time is dedicated to (1) influence which facets of the difficulty detail look into and (2) arrangement that will be required for the study itself (Holweg et al, 2000). Also for a successful outcome, it is also very important that the front runner and the sponsoring director of the project establish a close working relationship. Mandelbaum (2006) and SAVE International (2010) have described the various activities that occur during the pre-study phase of the VE methodology:

(a) ***Identifying the specific problem to be addressed*** : The problem to be addressed should first of all be identified. The problem is then disconnected into its integral features. Each component ought to represent an exact difficult that can be addressed and resolved. Identifying such specific problem helps in emerge and understanding of the clients difficulties and escaping areas that the customer would not be able to change because certain implications such as cultural, political, and feasibility. The problems can be addressed once the problems are fully understood. Detail work must be done at this stage of the value methodology in order to acquire a universal grasp of possible VE developments;

(b) ***Assessing the possible benefits for determining every issues***: Once the issue or problem is identified, the team goes ahead to measure the possible gains for determining any one of the concerns. The main objective of this action is to help ascertain matters that have the highest potential for cost improvement. Mandelbaum (2006) maintains that solution areas identified first in the course should be used for this drive only. Such resolutions ought not to prevent creative actions used later in the work strategy to bring

changes. The valuation of the possible gains for deciding issues should be assessable, even though Mandelbaum (2006) is of the view that estimates at this stage will be crude; **(c)** ***Prioritising the Issues*****:** This involves prioritising issues. It should be taken into account the potential gains, and the probability of shaping an active solution and the viability of executing that explanation while arranging. Thoughtful considering the importance of the difficulty to the client/customer is similarly a major reason at this stage. If the customer is resolute to resolve the difficulty, the possibility of achievement is improved. Interruption that can stand in the method of a determination is another significant feasibility deliberation that should arrive into the ranking procedure;

(d) ***Drafting the limit and aim for the value study*****:** For the group to achieve some level of efficiency the study's scope and objectives must be set well in advance. The choice need to be accepted using the training supporter. Finally, the aim will be accomplished at the evidence phase;

(e) ***Establishing Evaluation Factors*****:** Atabay and Galipogullari (2013) direct that objectives for progress should organised and must be thoroughly argued, and the factors should be quantifiable and achievable. According to Mandelbaum (2006) the assessment issues will regulated and the relative reputation of the notions and possible answers produced by the group. Equally the routine aims and appraisal issues need to be accepted and agreed;

(f) ***Determining Team Composition*****:** For the study to be effective, the team must be well composed. Practical or efficient know-how, problem-solving and policymaking aptitude, and solitary skills must stand the major characteristics among the team members.Also, SAVE International (2010) has reiterated that all the work force must be

discipline and this must include the stake holders and experts. It is also propose that because collecting all the information needed to make decision of no risk is impossible, a multidisciplinary team should provide different perspectives to help reduce risk to its barest minimum; and

(g) ***Collecting Data*****:** Prior to the workshop, the front runner organises the activities for data collection. Varied information collected helps to increase benefits.

2.4.2. Information Phase:

This is the second phase of the value engineering methodology. Mandelbaum (2006) observed that the reason of the evidence phase is to bring to the end the scope of problems to speak to and assessment factors while putting up a structure among team colleagues. Presentation is made to the VE team to explain the main concepts of the design. Caldwell (2006) is of the opinion that persons who delivered the material should not be part of the VE team. In this phase the main concept is to determine the high cost areas for detailed study in the following phases of the VE study (Mahdi et al, 2015). In many areas, the evidence stage finalises the orientation phase. The specific activities in the information phase are defined in the subsequent subsets;

(a) ***Establish Workshop Rules of the Road*****:** The value engineering building group procedures starts from here. Where team leaders certify, members identify every one other and their related knowledge and credentials. For any team to be successful there must be stringent rules and regulations to help run the team; and

(b) **Complete *the Difficulty as well as the related issues*:** Deliberate on the difficulty so that all group members get to know the problem as being discuss. The team must be

concerned with specifics and not generals. The Value Engineering team should have gathered relevant information that is in connection with the study plan before the workshop begins. Where supported facts cannot be obtained, the advice of experts in the area should be sought. The specialists could be requested to take part in the workshop or their guidance may be accepted. Quality function deployment activity should be adopted at this stage. Quality function deployment is defined by Crow (2002) as strategic way to explaining clients' specification and needs and converting them into precise policies to manufacture goods or progress methods to encounter those requirements (Crow, 2002 as cited by Mandelbaum (2006). Ball (2003) suggests that quality function deployment approach is critical in the information phase because it affords the team to gain a proper understanding of clients' needs that will lead to a proper understanding of function.

2.4.3. Function Analysis Phase:

Major projects, their functions and estimated cost are recognised at this level (Mandelbaum, 2006). The main aim of the job study stage is to detect the maximum useful training area. Mandelbaum (2006) has indicated that this stage forms the source of the work strategy. Crow (2002) asserts that the utilisation of job study is the main feature that differentiates the value engineering from added techniques for improving processes. SAVE International (2010) has described the activities in the function analysis phase as follows;

(a) ***Categorise the Roles*****:** Another main action in the job examination stage is to categorise the jobs into binary groups, namely, elementary and secondary. Bryant (1998) defines simple function as the primary purpose(s) for which an element was planned when it is functioning in its usually agreed way. He explains that the function must be accomplished to meet the purpose of the product, structure, or service. A service or product

may have more than one basic function (Bryant, 1998). Bryant again explains secondary function as that part of a product or service that support the basic function. Normally, secondary tasks may add immensely to price and could be vital to the performance of the main task: A role that ropes the simple function and results from the precise design methodology to accomplish the elementary role. As techniques or design methods to achieve the elementary task are altered;

(b) ***Develop function relationships:*** Function Analysis System Technique (FAST) is a development of the value study process which was formed by Charles Bytheway. FAST practises charting to sketchily signify and relate to the recognised function to every other and point out both the main and secondary locations (SAVE, 2007). FAST is a technique that allows persons with diverse methodological capability to efficiently disseminate and decide concerns that necessitate discipline deliberations (Crow, 2002). FAST builds upon value analysis by connecting the basically articulated an d multi-layered structures. FAST is not a close but a means to an end. It describes the item or system under study and causes the team to think through the functions that the item or system performs, forming the basis for a wide variety of subsequent approaches and analysis techniques. FAST contributes greatly to the most important stage of value engineering: function analysis.

FAST is a creative stimulus to explore innovative avenues for performing functions;

(d) ***Estimate the cost of performance of each purpose*****:** All VE efforts include some type of cost/economic analysis that is used to identify areas of VE opportunity and provide a financial basis from which the economic impact of the effort can be determined. It is very important that reliable and appropriate data is obtained in order to make an effective economic analysis. Consequently, the VE effort should use the services of one or more

individuals who are skilled in estimating, developing, and analysing cost data. The cost of the original or present method of performing the function is determined as carefully and precisely as possible given the time constraints for preparing the estimate;

(e) ***Improve Study Scope*****:** As a final activity in the Function Analysis Phase, the study scope is refined to reflect the changes that have taken place (Mandelbaum, 2006).

2.4.4. Creative Phase:

At the creative phase, it is required to generate ideas on all likely ways to achieve the required functions. At this stage all possible technologies and unconventional solutions are generated without any restrictions or limitations (Walk, 2012). Creative problemsolving methods are an essential element for real value engineering. By means of the knowledge and experience of the value engineering study team members, some new ideas will be developed. Mandelbaum, (2006) states that "the synergistic consequence of merging the skill and knowledge of all group members will lead to a far larger number to carry out the works. Mandelbaum, (2006) describes the activities in the Creative Phase as follows;

(a) ***Discourage Creativity Inhibitors*****:** The facilitator's work at this stage is to discourage negative attitudes that hinder creativity;

(b) ***Establish Ground Instructions***: The ground instructions for conception of knowledge generation are summarised by Mandelbaum as follows: idea generation and judgment of the idea should not be finished at the similar time; judgment and assessment should be reserved until the Assessment Stage; emphasis on quantity, not excellence at this stage,

i.e. make sure enough ideas are generated. The greater number of thoughts perceived, the more possible there will be a substitute that hints to improved value; generate a large amount of potential results; seek a wide variety of solutions that can possibly help resolve the problem. Include them as new ideas; do not replace anything; no idea should be judged as useless;

(c) ***Generate Alternative Ideas*****:** This stage involves generating an unrestricted stream of ideas and several ways to perform the functions selected for study, not how to design a product or service. A varied number of techniques or tools are available to help the team generate ideas. Crow (2002) has indicated that the collection of precise tools or techniques and the level to which they are used is will be decided upon by the team leader and number of ideas a particular technique can help generate. There are several techniques/tools for generating ideas such as;

(i)Gordon Technique**:** Another popular technique used in value engineering team meeting is the Gordon technique which is closely related to brainstorming. The main difference lines in the fact that with the brainstorming the group leader knows the exact nature of the problem they are dealing with. With Gordon Technique it is difficult for a leader to select a topic. In this technique a participant continues to produce additional ideas until the best solution is reached. The theme needs to be strictly connected to the difficulty, but its precise nature must not be exposed till the debate is determined; ***(ii)Checklist*****:** Yet another effective technique to generating ideas is checklist. In this technique team members generate thoughts by relating a reasonable list of classes with the problem or topic under deliberation (Sperling, 2009).

2.4.5. Evaluation Phase:

This is the stage where criteria are set to help the team to compare alternatives. This phase is well done by using brainstorming at the initial stage and then through a thorough definition of each criteria. Weights of criteria are developed by Value Engineering team. The goal of the assessment stage is to redefine and chose the finest preferences from the concepts generated for subsequent development into specific value improvement recommendations. At the Creative Phase, it was said that ideas should be created without any form of criticisms but at the assessment stage all the alternatives must be critically measured to ascertain the prospects for value enhancement.

2.4.6. Analysis Phase:

At this stage alternatives are compared with criteria set. Each team participant numerically evaluates each alternative against a specific criterion. The alternatives are then evaluated on a scale set by the team.

2.4.7. Concept Development Phase:

At the concept development phase, the concept selected by the Value Engineering team is structured and refined before presentation to the owner in a form of a sketch or a narrative report. Cost estimates are refined. The main objective of the development phase is to determine the "best" alternative(s) for decision-making. In the Expansion Stage (Mandelbaum, 2006) detailed practical studies are made for the outstanding options in order to eliminate the less important alternatives.

2.4.8. Presentation and Implementation:

This is the last but one phase in the value engineering methodology. In the presentation/implementation phase, VE recommendations are presented to the owner, client or project manager who is sponsoring the project. The project manager then decides whether the VE recommendations should be incorporated into project. Mandelbaum (2006) has also indicated that the execution stage arises once the value study is done and conclusions have been made. This stage tries to monitor the authorisation practice and operation of the achievement strategy. Project experts say approval should not be given only on the foundation of the brief performance that happens at the end of the workshop. Approval will usually be obtained after the completion of follow-up actions such as providing more data and meeting with others. Implementation itself begins when the final approval is obtained. Mandelbaum (2006) opined that the determination of the Performance Stage is to acquire an assurance to follow a sequence of deeds for originating a substitute. A presentation to the decision-maker (or study sponsor) is made at the end of the workshop. This presentation is normally the first step in the approval process.

2.4.9. Report:

Depending on the budget, issue, and importance of the Value Engineering workshop, a formal report may be prepared.

2.5 BENEFITS OF USING OF VALUE ENGINEERING IN THE CONSTRUCTION INDUSTRY

The main reasons for the adoption of value engineering is to achieve the best cost without decrease in value, dependability, and satisfaction (Jafari, 2000; Monden, 19 95). They

further indicated that the main idea behind value engineering methodology looks at the targeted estimation so as to bring down costs at the preliminary stage and long-term arrangement of proceeds as the objective of value engineering. Cooper (1997) as cited in Mandelbaum (2006) explains that the purpose of value engineering methodology is to help reduce total costs and at the same time increase customer satisfaction and facilities as well as increase profit margin in the competitive market.

Value Engineering (VE) is a useful tool for achieving sustainability in construction but must be applied at the early stages of a project. Sustainable construction is all about doing the right thing in order to safeguard the environment. As has been stated earlier VE plays vital role in sustainability for generating significant funds in initial installation and operating cost. It is not only a management approach in construction industry but also is the best technique for producing best results in other industries in achieving value for money for clients.

Another benefit of VE is that, it helps in the optimisation of requirements and projectoriented products so that the client is satisfied (Palmer, 2002). Again, VE helps construction officers to enjoy the improvement in quality, reduction in unnecessary expenses, and optimisation of events can be measured as ideas of this methodology (Sami, 2005). Sami (2005) opined that the many importance of value engineering methodology such as risk aversion, enhancement of excellence, enhancement and improvement of the plan, increasing output and self-confidence, transmission of data, utilisation of creativeness in the activities, reducing waste of capitals, reducing complexity of products and projects, reducing operation of costs and improving operational and organisational aspects can be

mentioned that provide monetary cost optimisation and enhancement of municipal projects in urban expansion and urban expansion of cities and increase the value, dependability and keywords of Value Engineering and executive reliability of the Projects.

Atabay and Galipogullari (2013) in their study on the presentation of Value Engineering in Construction Developments also identified some benefits of value engineering. The following are some of the benefits they identified:

***Reducing Construction Production Costs*:** Value engineering can help ensure that the production costs of constructions projects can be reduced without necessarily reducing production costs. Materials, equipment and specified invention techniques in the requirement and projects may delay owning to current increase in knowledge. In case the suggestion of the contractor for making changes is accepted by the employer, a much more economical solution will be provided for both sides. Carrying out production with better quality by using the suggested methods, in other words improving the quality may be a more economical solution; and

(i) ***Finishing the Work before the Period Program*:** When efficiently used, value engineering benefits construction officers to executive the work earlier by providing costeffective benefits in terms of reducing overall costs. By equating the cost and how works are gradually showing up at every place and the reduced overall costs, it can be decided that the work completes earlier before the actuall completion time. It may possibly not be compulsory to rush the construction speed to finish a job earlier. It may be potential

to begin in time. For such a situation to occur, Atabay and Galipogullari (2013) have stated that these conditions may be deliberated to materialise:

finishing the project designing before the schedule, especially for the jobs at the beginning; having the units ready in the worksite for implementation beforehand, which are necessary for operation; gaining the required construction permits and making construction site distributions before the delivery of projects which are necessary to start the job earlier;

Providing pre-financing before progress payment;

Employing the required or qualify workers ready for the start-up in a short time at the worksite; and

Employing a subcontractor at the beginning of the work if required.

2.6 PERCEPTIONS OF CONSTRUCTION OFFICERS ABOUT VALUE ENGINEERING

Ellegant (2015) has indicated that even though value engineering has proven worthy after more than 50 years of producing results in public and private sector construction, manufacturing, services and business process, it still remains a hard sell technique. He explained his ordeal in how he was invited to explain the concept to some companies in the USA and Japan but after the visit the organizations' production managers still felt reluctant to apply the concept. Researchers on value engineering (Mansour, 1999; Kelly and Male, 1999) have indicated that construction officers normally have different perceptions about the value engineering concept. The outline of value engineering is frequently met with confrontation and the refusal of the personalities to understanding due the observation people have about it. Mansour (1999) has held that construction officers with their wide

background, knowledge, qualification and practical expertise believe their project to be acceptable besides the best and that there is no need for the introduction of any method that will warrant additional and costly scrutiny. The precise natural surroundings of value engineering, its enthusiasm and the look for different ideas are alleged as being battle point with the potential to contest rather than agreeing to specialized practices (Fong & Shen, 2000). Mansour (1999) and Hulshizer (1997) assert that value engineering generates very little interest for construction experts and they take it as a burden and established as a condition by persons in charge for executing. They thus resist the recommendation of value engineering when it is driven upon them. Several construction professionals thought of it as a possible danger and question their qualities and challenge their knowledge (Mansour and Hershiser, 1997). They often perceive value engineering as an unnecessary use of time and a competition to their practical competences (Mansour, 1999). They believe that when confronted with closing date, value engineering becomes a less important method to use (Kelly & Male, 1999). Constructionot professionals believe that the time spent on value engineering process through the value engineering plan firm is frequently observed damagingly as unrecoverable prices and dropping their return margin especially when the value engineering strategy charge is calculated on the whole project prices (Jergeas & Cooke, 1997). Shen and Liu (2004) also report that a major obstacle to the adoption of value management in construction is the observation that it is waste of time and interruptive. Construction experts also perceive value engineering as an undesirable disruption to their already designed procedure. The extra problem of revising value engineering proposals, period misused, interrupted work and re-design is frequently apparent to be more expensive than any expected investments (Kelly & Male, 1999).

Construction experts also perceive their patrons as being dangerous, unfavourable and preferring an existing design to an advanced value engineering applications devoid of fortifying extra advantage (Jergeas et al. 1999). They often think their clients who have no knowledge of value engineering would not welcome the idea of introducing them to value engineering which they do not know the benefits of adopting. Clients being rationale beings consider importance for change as the most vital facet when hiring construction experts (Cheng et al 2006). The clients always question when they are not clear why they are being asked to pay more.

2.7 THE LEVEL OF ACCEPTABILITY IMPLEMENTATION OF VALUE ENGINEERING

Value engineering can be used as a rapid training to address a concern or as an essential part of a general organisational process to bring about invention and advance progress of work. Value methodology may be used to enhance an organisation's quality programs, new product development activities, manufacturing processes, and architectural and engineering design (SAVE International, 2010). According to SAVE International (2007), value engineering will be useful throughout the life cycle of the project growth, even if the utmost advantage and resource savings are normally attained timely in progress during the conceptual phases. The basic information of the project is established, but main design and development resources have not yet been committed (SAVE International, 2007). The purpose for which this is the best period to use value engineering methodology is because the flora in which the basic function of the project is accomplished and has not been recognised and alternative ways may be recognised and considered. Apart from the

construction industry, manufacturing industries also make use of value engineering in their design and production of products. Industrial products, either consumer or engineering possibly will be studied with an attention on either the strategy or industrial process of that artefact. A product could well be the element of a value engineering could start at any stage during the product's lifespan cycle. Value engineering can be accepted at the beginning of the projects expansion to enhanced well understanding of the client's requirements, recognise the tasks essential to fulfil those needs, and improve the original conception. During the course of the project expansion, value engineering practice can be used to polish and improve the project concept, based on the up-to-date proofs. Even after a product has been familiarized and is in manufacture, a value engineering study can be presumed to further advance the product and return to varying client and economic sceneries. A value engineering methodology can be accepted to either improve new methods to manufacturing new products or bring invention to a prevailing process.

Commercial schemes and events could also be the topic of value engineering approach. Several facets of our business may be raised through the use of a value methodology.

Service firms also benefit from the use of value methodology. Value engineering methodologies have been embraced to surge procedures and techniques in many service industries including the medical industry and the army. In terms of geography, the value engineering concept has been accepted and implemented widely in foreign countries.

Value engineering has been in existence since 1947, many countries (USA, Japan, Indian, Hong Kong, India, etc.) have embraced this wonderful technique in the construction industry and have actually set up value engineering associations to regulate the construction

industry to make sure that there is value for money in the construction sector. Some of the associations are the American Association of Value Engineers (SAVE), the Society of Iranian Value Engineers (SIVE), the Society of Japanese Value Engineers (SJVE), the Indian Value Engineering Society (IVES), and the Institute of Value Management UK (IVM-UK).

The Indian Value Engineering Society (INVES) for example, was established in October 1977. It serves Indian industries by disseminating value engineering knowledge to professionals, who then help industries to improve their techniques of working thereby improving profitability. INVES organises periodic conferences that help to educate it members on how to improve their performance at their workplaces.

2.8 FACTORS THAT HINDER ACCEPTABILITY AND IMPLEMENTATION OF VALUE ENGINEERING IN THE CONSTRUCTION INDUSTRY

Even though VE has been identified as a very important technique that can help increase cost efficiency in the construction as well as other sectors, a lot of factors hinder the successful implementation of VE. O'Farrell (2010), Mansour (1991) and Jergeas and Cooke (1997) have posited that there are various factors that hamper the acceptability and successful implementation of value engineering. These factors are explained below:

(a)Apathy: The foundation of value engineering is normally encountered with opposition and absence of understanding. Construction officers often believe with their rich background, experience, qualification and technical expertise, they see value engineering as an unnecessary design which challenges their expertise (Mansour, 1991, Jergeas & Cooke, 1997);

(b) ***Resistance to Change*:** Cayes (1998) held the view that construction officers who are able to competitively satisfy their clients are those that have embrace the concept of value engineering, However, they are normally prone to resisting the risk of change. Construction professionals typically dominate most construction companies and the belief of adopting a fresh method can be intimidating, and change can be a scare., Cayes (1998) further states that when people adopt to a particular way of doing things, switching to a new method becomes very difficult and is often met with resistance. Taghizadeh et al (2012) have also explained the following factors that can hinder acceptability and successful application of value engineering in the construction industry:

(c) ***Lack of Management Support*:** Implementing value engineering in the organisation requires the coordination of procedures, tactics and policies of the top managers of the organisations with the related project. The support of top level management is essential for the successful implementation of value engineering (Taghizadeh et al 2012). This support should not only be given, it must be seen to be given. Value engineering means change-change in methods of working, in thinking and in the procedures used. Subordinate look for a lead and respond to instruction, hence it is necessary for management to support by continually involving in the control of the overall value engineering programme. Management team must fully understand the implications of the introduction of value engineering into their business. This means that it should seek explanation of technique and its potential, together with some specialist advice on the way in which it may best be introduced and developed. It should then be possible for them to determine the long term objectives, the areas of initial application and to produce an outline policy and programme.

However, when management seems not to support the concept of value engineering, its implementation becomes very difficult;

(d) ***Lack of Resources*****:** Successful implementation of value engineering in the organisation demands that there is availability of necessary resources. Without adequate resources no firm can successfully implement value engineering methodology;

(e) ***Organisational strategy*****:** Organisational strategy that does not support the value engineering project in the organisation can hinder the implementation and acceptability of VE;

(f) ***Organisational structure*****:** structure is a framework that shows shape and direction to all the organisational activities. Value engineering cannot thrive in an organisation whose structure does not give room for it;

(g) ***Communication and Information Technology*****:** In any organisation that tries to implement value engineering, the managers should emphasise internal communication.The communication system inside the organisation should be coordinated with the other components of the organisation. Without ICT, value engineering cannot be implemented within an organisation;

(h) ***Organisational culture*****:** Organisational culture is a system of common inference that the members have about the organisation. An organisational culture that does not support value engineering might be very difficult to implement it successfully.

(j) ***Wrong Discernment*****:** Many construction captains usually have bad perception about value engineering implementation. Different construction officers accept as true that

applying value engineering methodology frequently causes needless costs for projects and it can increase the period of the projects as well. Also, some officers have reservations regarding the recommendations of the value team members (Fong & Shen, 2000); and

(K) ***Lack of Established Policy*:** It questionable to see a firm using VE where there are no developed policies to endorse value engineering methodology.

Sharma and Belokar (2012) of the WCECS also identified some hindrances to successful acceptability and implementation of value engineering;

1. Deficiency of facts, normally triggered by a shortage of time. Too many ideas based on sentiments rather and not on facts;
2. Wrong beliefs, insensitivity to public needs or unfortunate experience with products or processes used in unrelated prior applications;
3. Habitual thinking, rigid application of standards, customs, and tradition without consideration of changing function, technology, and value;
4. Risk of personal loss, the ease and safety experienced in adherence to established procedures and policy.
5. Reluctance to seek advice, failure to admit ignorance of certain specialized aspects of project development; and
6. Negative attitudes, failure to recognize creativity or innovativeness.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter of the study focused on the methodology used to address the objectives of the study. The chapter discussed the research design adopted for the study. It also focused on how respondents were selected for the study. Also how the research questions were analysed and interpreted was also discussed in this chapter.

3.2 RESEARCH DESIGN

Kothari (2008) defines research design as the organisation of conditions that will help in collection and analysis of data in a manner that aims to combine relevance to the research with economy in procedure. Saunders et al. (2007) on their part explain that it is the conceptual framework within which research is conducted. Aquantitative research design using survey was adopted for this study. Quantitative research using survey is which the researcher administers a survey questionnaire to a sample of respondents to describe the characteristics, behaviours, attitudes, or opinions, of the population (Creswell, 2012). In this strategy, Creswell explains that researchers collect data quantitatively using instruments such as questionnaires and analyse the data statistically in order to answer research questions. Data collected is also interpreted and the results used to confirm or disconfirm past research studies. Based on these characteristics associated with the survey design the present study found it prudent to adopt it since the aim of the study is to collect data to help describe a phenomenon.

3 3 RESEARCH STRATEGY

The main research strategy was the use of the questionnaire which was personally administered

3.4 POPULATION

The population of a study is defined as the total of items about which information is desired (Kothari, 2008). The population for this study comprised all the construction professionals and educators in the Tamale Metropolis. The units of analysis was the D1/KI, D2/K2, D3/K3, E1, E2, E3, G1 and G2 Classes of contractors with licenses from the Ministry of Water Resources, Works and Housing and construction professionals The study focused on Consar Limited, the Departments of Urban Roads and Feeder Roads,

Works Department of the Tamale Metropolitan Assembly, Public Works Department (PWD), Works and Physical Development Unit of the University for Development Studies, Estate Department of the Tamale Teaching Hospital, and some lecturers of the Building Technology Department Tamale Polytechnic. The entire population was 200.

3.5 SAMPLE AND SAMPLING TECHNIQUE

Cohen et al (2007) have stated that factors such as expense, time, and accessibility frequently hinder researchers from gaining access to the whole population. It therefore becomes essential to collect data from a smaller group of the whole population, known as the sample, in such a way that the knowledge obtained is generalised to the total population under study. Cohen et al (2007) have indicated that for a population of 200 a sample size of 80 will be adequate enough to make a generalization to the population. A population of 200 construction professionals were selected and put into clusters as shown in Table 3.1. For

each cluster 40% was taken as sample which gave a total sample of 86, due to rounding off of the figures. Convenience sampling procedure was used to select the sample from each cluster. The choice of the convenience sampling was that the researcher used any participant who was available at the time of data collection.

Table 3.1: Summary of Sample of Respondents

Organisations	Population	Sample
Consar Construction	40	16
Public Works Dept	15	6
UDS	30	12
Tamale Polytechnic	25	10
Feeder Roads	20	8
Urban Roads	25	10
Tamale Metropolitan Assembly	30	12
Tamale Teaching Hospital (Estate Dept)	15	6
Total	**200**	**86**

3.6 RESEARCH INSTRUMENT

Since the research adopted a quantitative approach the study used questionnaire as its main data collection instrument. It is expected that this instrument will be able to collective quantitative data which will be analysed quantitatively. Cohen et al (2000) defined

questionnaire as a widely and useful instrument for collecting quantitative data. They identified a number of advantages in using questionnaire. They explained that questionnaire can be administered in the absence of the researcher and often easy to analyse. The researcher adapted the questionnaire used by Kamran (2012) in Pakistan on value engineering with some modifications. The questionnaire was a self-administered one. The questionnaire consisted of five (5) sections, A – E. The first part of the questionnaire was to collect the demographic data of the respondents. The second section had fifteen (15) items which bothered on perceptions of construction officers on value engineering. The fourth section sought to find out the level of knowledge of construction officers on value engineering while the last section had items to determine the acceptability and implementation of value engineering.

3.7 DATA COLLECTION PROCEDURE

The researcher administered the questions personally due to the advantages that go with self-administered questionnaire. Questionnaire administered personally helps respondents get clarification from the researcher and also helps to ensure a high return rate. After gaining access to the various institutions where the research was conducted, the questionnaire was administered to the respondents and three (3) days were given to return them. The questionnaire had a return rate of 95%.

3.8 DATA ANALYSIS

The data collected was processed using the Statistical Package for Social Science (SPSS). Simple percentages and means (central tendencies) were used to analyse the quantitative data obtained. The open ended questions were analysed thematically such that the emerging

themes were grouped and analysed quantitatively. The data was analysed based on the research questions and supported with literature discussed in chapter two. The results of the data were discussed in the next chapter.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSIONS

4.1 INTRODUCTION

The study sought to explore the level of acceptability and implementation of value engineering in the construction industry in Ghana. The study focused mainly on construction officers in the Tamale metropolis. Four research questions were formulated to guide the study. This chapter dealt with the presentation, analysis and discussion of the results on the data collected from respondents for the study. A total number of 86 respondents were sampled to respond to items in the questionnaire regarding the study but 82 respondents (95% return rate) completed and returned the questionnaire. The data was analysed using tables and charts with the Statistical Package for Social Sciences (SPSS v. 20)

4.2 DEMOGRAPHIC BACKGROUND OF RESPONDENTS

Even though the research had little to do with the demographic data of the respondents, a little information about the respondents' demography was necessary to help get a general overview of the respondents' background. Therefore, demographic variables such as the current job title, qualification, and the type of firm of the respondents were posed to form the section A of the questionnaire.

4.2.1 Current Job Title of Respondents

Figure 4.2.1 shows that majority of the respondents are quantity surveyors representing a total number of 32(39%). Lecturers had the lowest representation of current job title with a total number of 10 (12.2%). The majority indicated that the greater number of

respondents would have the necessary knowledge in value engineering since quantity surveyors make use of this technique because of their know-how in value for money. The questionnaire gave room for respondents to indicate any other qualifications they hold which have not been captured. In all, 15 respondents (18.3%) wrote other qualifications. Six out of the 15 indicated that they were project managers, while four indicated they were property managers. One person also indicated that he/she is an electrical engineer.

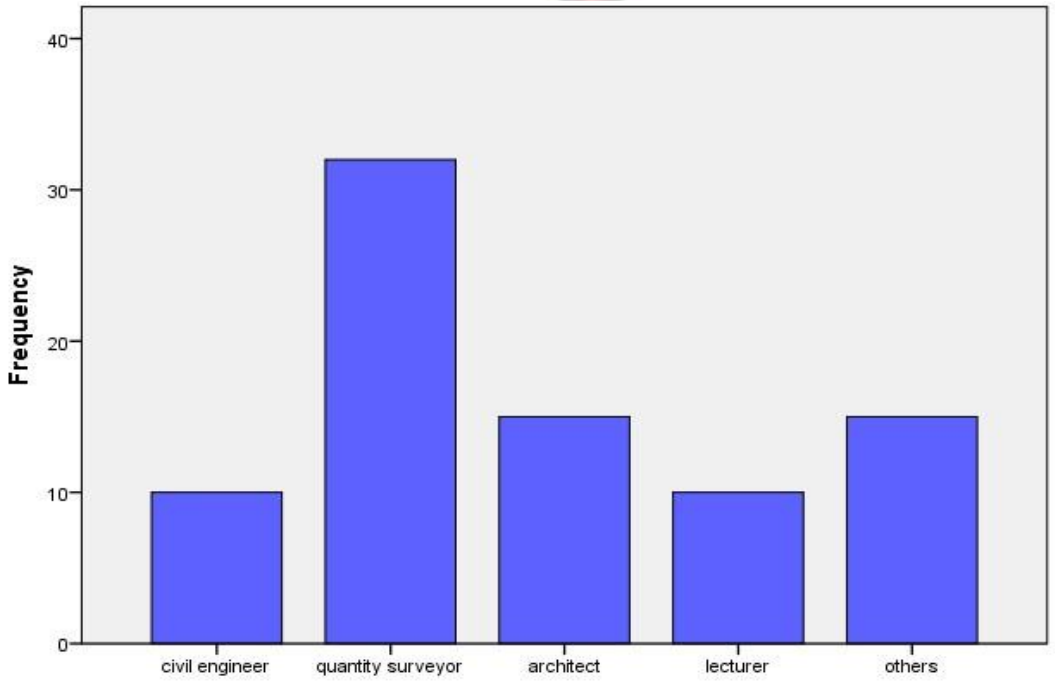


Figure 4.1 Current Job Title of Respondents.

Source: Field Work, 2016

4.2.2 Qualification of Respondents

The chart below indicated that of the 82 respondents, 38 (46.34%) are Bachelor of Science degree holders, a figure representing the majority of the respondents. Opportunity was also given to respondents who held none of the qualifications captured. In that regard, eleven (13.41%) of them indicated various forms of qualifications some of which include Masters in Business Administration (1), certificate in Valuation (1), and

M.Arch (1). Others include Advanced Project Management (7) though none incidentally holds a PhD. The figure indicates that the Bsc. holders dominate the construction industry in the Tamale Metropolitan Assembly.

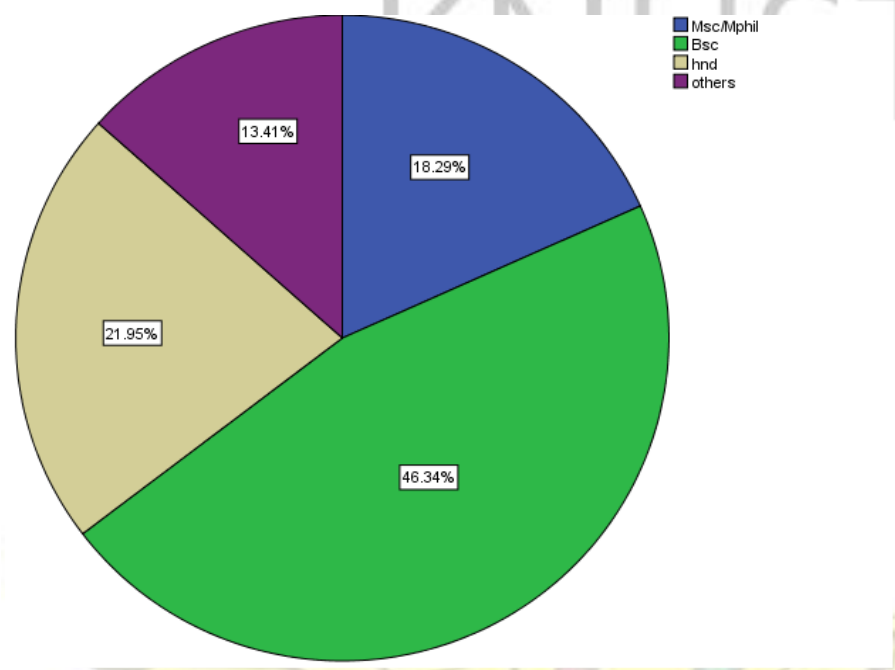


Figure 4.2 Qualification of Respondents, Source: Field Work, 2016

4.2.3 Type of Firm of Respondents

Table 2.2.2 clearly shows that there are 37 consultants representing (45.1%) of respondents. The reason for the high number of respondents is perhaps emanating from the classification of Tamale Metropolitan Assembly, Tamale Teaching Hospital, and the Public Works Department as consultancy firms. The respondents from the consultancy firms dominated the study and this clearly shows that the study was likely going to benefit from expert advice on value engineering, which is crucial for the study.

Table 4.1 Type of Firm in Which Respondents' Work

Type Firm	Frequency	Percentage
Consultancy Firm	37	45.1
University	8	9.8
Polytechnic	10	12.2
Urban/Feeder Roads	16	19.5
Construction Firm	11	13.4
Total	**82**	**100**

Source: Field Work, 2016

Table 4.2.2 clearly shows that there are 37 consultants representing (45.1%) number of respondents. The reason for the high number of respondents is perhaps emanating from the classification of Tamale Metropolitan Assembly, Tamale Teaching Hospital, and The Public Works Department as consultancy firms. The respondents from the consultancy firms dominated the study and this clearly shows that the study was likely going to benefit from expert advice on value engineering, which is crucial for the study.

4.3.3 Perceptions of Construction Officers about Value Engineering

Research question 2 sought to find out the perception of construction officers about value engineering. To be able to answer this question, a series of items were constructed in the questionnaire to help document their perceptions about value engineering. In the questionnaire the views were put on a Likert-scale from strongly agree to strongly disagree. The results have been discussed using means, standard deviations and mean ranking.

Table 4.2: Perceptions about Value Engineering

STATEMENT	Mean	Standard Deviation	Ranks
Is merely a cost cutting technique	2.6	1.4	7th
Increases functions and life-cycle costs	2.6	1.2	8th
A far-fetched idea	3.2	1.3	12th
Makes a difference project.	22.0	0.8	5th
Appropriate at the early stage	2.0	1.2	6th
Improves product value.	1.7	0.8	3rd
Typically a contractor-led initiative.	3.0	1.3	11th
Competes with my technical expertise.	2.7	1.3	9th
Is a waste of time.	3.9	1.3	14th
Interrupts already designed process.	3.3	1.1	13th
Clients do not approve of the method	3.0	1.3	10th
Improves quality.	1.7	0.9	4th
I will recommend to my colleagues	1.6	0.9	2nd

I will recommend to clients	1.6	0.9	1st

Source: Field Work, 2016

It can be gleaned from the table that on the issue of whether respondents perceive that value engineering is a mere cost-cutting technique, it generated a mean of 2.6 with a SD of 1.4. This clearly proved respondents had perceive that value engineering is a mere cost cutting technique while from the data, a conclusion can be drawn that majority of the respondents agreed that value engineering is a mere cost cutting technique and nothing more to it. This clearly indicates that construction professionals understand little about the benefits of value engineering. Also on the assertion that value engineering is a farfetched idea, 3.2 mean score and SD =1.3 were generated. This finding indicates that a greater number of the respondents were in doubt as to whether the concept is a far-fetched idea or not. A mean of 2.0 and SD=0.8 indicates that greater number of respondents perceived that value engineering makes a difference to the way a project is conceived and executed. This is in contradiction to the first perception that value engineering is a mere cost-cutting technique. It is apparent from table that the majority, (M=1.7 and SD= 0.9) of the respondents agreed and so perceived value engineering to improve the quality of construction projects. This finding resonates well with the findings of Sami (2005) and Palmer (2002) which suggest among other things that value engineering helps improve the quality of construction projects. The means and standard deviations were also run. On the issue of value engineering being a mere cost reduction technique generated a mean of 2.6 and a standard deviation of 1.2. This clearly shows that the respondents were to a lesser degree undecided about the issue and that dissenting views were expressed on the issue. Again, on the issue of whether value engineering technique competes with the technical expertise of

construction officers, the result generated a mean of 2.7 meaning a majority of the respondents were undecided and responses on the issue was varied (SD= 1.3). This result nearly agrees with the findings of Mansour and Hulshizer (1997) who indicated that most construction experts consider the technique as a potential threat and challenges their expertise. Also, on the issue of whether the value engineering technique was a mere waste of time. A SD of 1.3 was obtained implying that respondents gave varied views with a mean of 3.9 indicating total disagreement that value engineering technique was a mere waste of time and standard deviation of 1.3. Without doubt, the findings suggest that a majority of the respondents think value engineering is not a waste of time. This finding is dissimilar to an earlier one by Mansour (1999) which proposed that value engineering is always perceived as a waste of time. It also contradicts the findings of Shen and Liu (2004) and Kelly and Male (1999) who reported that a major obstacle to the acceptance of value management in the construction industry is the opinion that it is time consuming. The item that stated whether construction officers perceive that their clients do not approve of the method, a mean of 3.8 indicates that majority were undecided which clearly indicates that most of the construction officers were not too sure whether their clients accept value engineering or not. In the works of Jergeas et al. (1999) and Cheng et al (2006), they emphatically stated that many construction officers perceive their clients as being risk averse. They further stated that construction officers believe that their clients who do not have any idea about value engineering would not like to risk themselves trying it. As to whether the construction officers perceive value engineering as a technique for improving quality of project, the results produced a mean of 1.72 which indicates that majority of the respondents agreed to this asserti on. The overall mean of

2.49 suggests that a majority of the respondents were slightly positive in their perceptions about the issues that were investigated. When the means of the various statements were ranked the table shows that the statement with the highest was respondents claiming that they will be willing to recommend value engineering to their clients. The next item was recommendation to colleagues while value engineering is a waste of time had the lowest ranking which means the respondents perceive that value engineering is not a waste of time. The section also provided an open ended question for which respondents were allowed to indicate any other perception which was not captured in the statements. Some of the perceptions stated are: "it makes construction work simple", "promotes planning and schedule of work requirement", plan and control life-cycle of work".

4.4. KNOWLEDGE OF VALUE ENGINEERING

Research question 2 sought to find out the knowledge level of the respondents about value engineering. Concepts in value engineering were put in statement and respondents required to rate themselves on the scale of expert to no knowledge. The following tables and charts represent the responses analysed from the data. The figure demanded that respondents answered yes or no to the question posed. Figure 4.2.2 displays a pie chart which shows only a few respondents (6.1%) of the entire respondents indicating they were not aware of value engineering with the majority, 93.9% being aware of it. The findings hint that a greater number of respondents knew something about value engineering. Figure 4.5 gives information on how they get to know about value engineering.

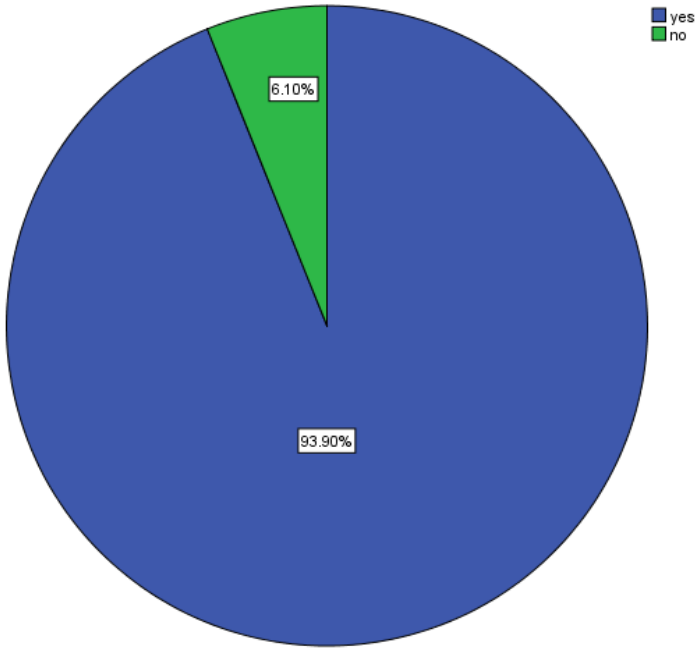


Figure 4.3 knowledge of Value Engineering, Source: Field Work, 2016

4.5 WHERE KNOWLEDGE WAS ACQUIRED

It is clear from the chart below that majority of the respondents indicated that they learnt about value engineering concept via journal publications. The next higher bar represented others giving the respondents room to indicate other ways they learnt about the technique. Internet was mention as the other means through which they learnt about VE. Since 6.1% of respondents indicated in the previous chart that they were not aware of Value Engineering, it was expected that the same number of respondents would not respond to this question and the subsequent ones, however, respondents still had answers for this section and the subsequent ones. This could be as a result of the fact that some of the respondents asked the researcher to brief them on the study. Therefore, it is not unexpected even though some respondents maintained they were not aware of the concepts and yet they

were able to respond to the subsequent questions. The finding suggests that knowledge about Value Engineering is acquired through various means.

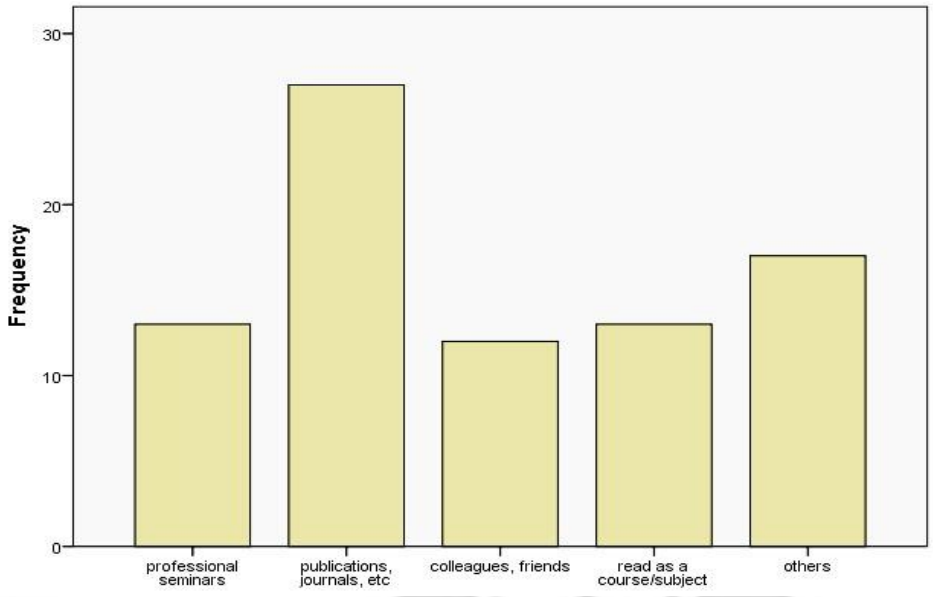


Figure: 4.4 Where Knowledge was Acquired, Source: Field work, 2016

Knowledge of Construction Officers about Value Engineering

Table 4.3 presents the data on knowledge of construction about VE. The statements were ranked from expert to no knowledge.

Table 4.3: Knowledge of Construction Officers about Value Engineering

STATEMENT	Mean	Standard Deviation	Rank
It involves the regulating of the life-cycle cost of a construction project.	2.1	1.1	5th
It is most applicable in the design stage of construction.	2.2	1.2	6th
It is a cost effective methodology.	2.0	1.0	3rd
It should be done in a team	2.2	1.0	7th

It eliminates, anything that increases support cost.	2.5	1.1	10th
40hour/5days workshop approach is the best formal approach.	2.8	1.2	13th
The Charette is the best formal approach.	3.8	4.8	14th
The Value Engineering Change Proposal (VECP) is the best approach.	2.5	1.1	11th
It helps to minimise cost.	1.9	0.8	2nd
It helps in finishing the jobs before the time schedule.	2.6	1.2	12th
It helps to eliminate mistakes and deficiencies in construction projects.	2.4	1.2	9th
It helps construction firms to gain competitive advantage.	2.3	1.1	8th
It helps to refine and improve construction project concepts.	2.1	1.0	4th
It improves quality and performance	1.9	0.9	1st

Source: Field Work, 2016

Table 4.3 presents the knowledge level of construction professionals about the concept of value engineering. Majority of the respondents (M=2.0 and SD=1.0) indicated that they know that VE is a cost effective methodology. This finding is in line with the work of Jafari (2000) and Monden (1995) who clearly indicated that Value Engineering aims at realising minimum cost without reducing the value, The table also shows knowledge level of the construction officers on the issue of value engineering helping to gain competitive advantage. A mean score of 2.3 and SD of 1.1 that majority of the respondents are very good in the area, with the mean scoring on whether they know that Value Engineering

involves the regulation of the life-cycle cost of a construction project, the mean score was 2.1 which suggest that the respondents have very good knowledge about it. Again, on the issue as to whether they know Value Engineering is best applied at the early stage of a design project, the mean score was 2.2 which implies that the respondents have very good knowledge in that area. This suggests that for construction officers to be able to accept and implement their knowledge level of the concept should be high. The mean score of the issue of the statement "it is a cost effective methodology" was 2.0 which the respondents also have very good knowledge that the Value Engineering process is well achieved when executed in a team The result is in line with Atabay and Galigullari (2013) work that explains that value engineering is a methodical procedure that follows the project plan process which is executed by a number of experts who help to improve project, the means score was 2.4 with a standard deviation 1.2. The mean score suggests that the respondents have very good knowledge in value engineering. The present study also resonate with the work of Rich et al (2000) which suggest that there should be a close working relationship among the team members. As to whether they know that value engineering helps to eliminate mistakes and deficiencies in construction projects. Again, whether they know that the 40hour/5days workshop approach is the best formal approach, the means score was 2.8 which is a little close to "good" means that the respondents know that the 40hr/5days workshop approach is the best value engineering approach. The mean ranking indicates that the statement with the highest scoring was "it improves the quality and performance of project" followed by minimizing cost. Respondents' knowledge level on whether they know Charette is the best value engineering approach gain the lowest scoring which means that the respondents were not so knowledgeable in the value engineering approaches. The

overall mean of the findings indicates that construction officers have knowledge in Value Engineering but are not experts in the area.

4.6 ACCEPTABILITY AND IMPLEMENTATION OF VALUE ENGINEERING

Research question 3 sought to find out the level of acceptability and implementation of value engineering among construction professionals. Series of items were constructed on a likert-scale. Respondents were expected to respond on a scale of Always to never.

Table 2.4 presents the results.

Table 4.4: Acceptability and Implementation of Value Engineering

Statement	Mean	Standard Deviation	Rank
I apply Value Engineering in all my projects.	1.2	0.8	5th
I recommend value engineering to my organisation.	1.9	0.8	3rd
I recommend value engineering to all my clients.	2.0	0.9	4th
I teach my colleagues/students the benefits of value engineering.	2.3	0.9	7th
I apply value engineering throughout the life-cycle of all my projects.	2.2	0.9	6th
I will gladly join a Value Engineering society to learn more and apply.	1.6	0.8	1st

I will be willing to attend seminars, workshops and awareness training programs on value engineering.	1.6	0.9	2nd

Source: Field Work, 2016

Table 4.4 also shows the responses given by the respondents as to whether they recommend value engineering to their clients. Similar results as seen in Table 25 is reflecting in this table with majority of the respondents indicating that they recommend value engineering to their clients always (31) and seldom (33). This also could be as a result of the fact that value engineering comes with a lot of benefits and construction officers do not hesitate to recommend it their clients. Majority, 34 respondents representing 41.5% also indicated that they will often teach value engineering when the opportunity presents itself with only 24 also indicating that they will always teach the concept when given the opportunity. 26 respondents representing 31.7% indicated that they will teach the concept but seldom with 8 indicating that will they never teach the concept. When asked whether respondents will join a value engineering society, 48 respondents representing more than half of the respondents indicated that they will also join with 24 also indicating that they will often join any value engineering society. It can be concluded that many construction officers are willing to learn more about value engineering. In the table 47 representing 57.3 respondents intimated that they will always be willing to attend value engineering seminar or workshop. Twenty-three (23) also answered that they will seldom attend value engineering seminar or workshop.

Table 4.4 shows the mean scores of the various responses. On the issue of whether the respondents will be willing to apply Value Engineering throughout the life-cycle of their projects, the mean score was 1.2 with a standard deviation 0.8 which meant that majority of

the respondents were of the view that they will always be willing to apply value engineering in their projects. The present study result resonate well with the findings of SAVE International (2007) who have postulated that Value Engineering is applied throughout the life-cycle of a project development. This work is in contradiction to the findings of Sadawi and Shaath (2008) who concluded that majority of construction officers of various Palestinian institutions do not apply value engineering. It can be concluded that construction officers apply Value Engineering because of its immense benefits that have been publicised by Atabay and Galipogullari (2013), SAVE International (2010), Kelly and Male (1999) and Cooper (1997) who have established that Value Engineering application helps in the reducing construction cost, finishing job before the time schedule, quality improvement and correction, reducing mistakes and deficiency in projects, just to mention a few. As to whether they will be willing to recommend the concept to their colleagues and clients the mean score was 1.9 and 2.0 respectively which meant that majority of the respondents indicated that they will seldom recommend value engineering methodology to their colleagues and clients. On the issue of whether they will be willing to teach their colleagues or students about value engineering, respondents mean score was 23. The overall mean of 1.54 indicates that majority of the will seldom accept and implement value engineering methodology. The reason for the respondents not willing to always accept and implement value engineering could be as a result of the many challenges they face in the implementation as reiterated by Sadawi and Shaath (2008) that many institutions fail to apply value engineering basically because of the challenges they face such as lack of knowledge, resistance to change, lack of management support among others. The conclusion drawn here is that construction officers accept and implement VE in construction works but not all the time.

4.7 CHALLENGES HINDERING THE ACCEPTABILITY AND IMPLEMENTATION OF VALUE ENGINEERING

Research question 4 sought to seek the respondents views on what they considered challenges/factors that hinder their acceptability and successful implementation of VE. The respondents were asked to indicate their level of agreement to the statements provided on a scale of Strongly Agree to strongly disagree.

Table 4.5 presents the results of the responses**.**

Lack of guidelines and information about VE	1.9	1.1	2nd
Inadequate knowledge and practice in VE	1.8	0.9	1st
Interruption to normal work schedule	3.1	1.1	12th
Too expensive to carry out VE	3.0	1.2	11th
Lack of management support	2.3	1.0	6th
Lack of inventive ideas	2.7	1.2	9th

Lack of communication and human relation	2.6	1.2	8th
Resistance to change	2.1	1.1	3rd
Negative attitude	2.2	1.1	4th
Rigid procedures and policy	2.3	1.1	3rd
Risk aversion	2.6	1.0	7th
Over design and over estimating	2.7	1.2	10th
STATEMENT	**Mean**	**Standard Deviation**	**Rank**

Table 4.5 Factors Hindering the Acceptability and Implementation of Value Engineering

Source: Field Work, 2016

In Table 4.5 respondents were asked to respond to statements bothering on the challenges that hinder their acceptability and successful implementation of Value Engineering, a mean score of 1.9 and SD of 1.1 indicates that majority of the respondents agreed that lack of guidelines and information about VE is a major hindrance. This revelation clearly supports the assertion of Taghizadeh, Taheri and Shokri (2012) that to implement value engineering effectively in an organisation, managers should emphasise the sharing of information. The communication system inside the organisation should be coordinated with the other components of the organisation. The further emphasised that without ICT value engineering cannot be implemented within an organisation.

On the issue of whether inadequate knowledge and practice prevent construction officers from accepting and implementing value engineering its numerous benefits, a mean of 1.8 and SD=0.9 showed that majority of the respondents agreed. The findings suggest that for any concept to be put into practice the implementers need adequate and constant training in order to gain the necessary knowledge needed. Also as practice makes perfect, if a concept is learnt and not practiced constantly it can easily be forgotten.

It can be depicted from Table 4.5 that majority of the respondents (M = 2.2, SD=1.1) agreed that without management support VE cannot be easily accepted and implemented in an organisation while 15(15.3%) respondents also stated otherwise. The above analyses confirmed the findings of Taghizadeh, etal 2012 that for an organisation to successfully implement VE there should be coordination of procedures, tactics and policies of the top managers of the organisations with the related project. They further reiterated that the support and direction of directors and senior managers is vital for the satisfactory introduction and operation of a value engineering programme.

A mean of 2.1 and SD=1.1 indicated that majority of the respondents agreed that resistance to change is one major hindrance to the successful implementation of value engineering. The majority confirms that view of Cayes (1998) that when people are used to doing the old things, change becomes a difficult thing. This finding therefore suggests that there is much apathy and resistance when people are used to a particular concept when asked to change to a new system.

It can be deduced from Table 4.5 that majority (M = 2.2 and SD =1.1) agreed that negative attitude and failure to recognise creativity or innovativeness is a hindrance to the successful implementation of VE .This finding is in line with Sharma and Belokar (2012)

who noted that negative attitude and failure to recognise creativity by people is a major hindrance to the successful implementation of VE.

A mean of 2.3 indicates that lack of management support is another key factor that hinders the smooth implementation of value engineering. When the mean score was calculated on the issue of resistance to change, it generated a score of 2.1 which is an indication that Value Engineering cannot be accepted and implement when construction professionals resist change.

The mean ranking indicated that the greatest challenge of the respondents was inadequate knowledge and practice followed by lack of guidelines. The challenge that ranked lowest was interruption to normal work flow.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents the summary, conclusions and recommendations of the study including the main purpose of the study and the methods used. The summaries of findings are presented in accordance with the research questions.

5.2 REVIEW OF OBJECTIVES

The first research objective sought to find out the perception of construction professionals about Value Engineering. To answer this question, a series of items were constructed in the questionnaire to help document their perceptions about value engineering. In the questionnaire the views were put on a Likert-scale from strongly agree to strongly disagree.

The results have been discussed using frequencies, percentages, means and standard deviations presented in tables and charts. The statements were also ranked in ascending order however. One striking revelation in this finding is that a greater number of the respondents were in doubt as to whether the concept is a farfetched idea, 71(86.6%) respondents perceived that value engineering makes a difference to the way a project is conceived and executed.

The research question two sought to find out the knowledge level of the respondents about value engineering. Concepts in value engineering were put in statement and respondents required to rate themselves on the scale of expert to no knowledge. the figure demanded that respondents answered yes or no to the question posed.

Figure 4.2.2 displays a pie chart which shows only a few respondents (6.1%) of the entire respondents indicating they were not aware of value engineering with the majority, 93.9% being aware of it. The findings hint that a greater number of respondents knew something about value engineering.

Research question three sought to find out the level of acceptability and implementation of value engineering among construction officers, Series of items were constructed on a likert-scale. Respondents were expected to respond on a scale of Always to never. It can be gleaned from the Table 4.2.4 that majority, 40 respondents representing 48.8% intimated that they often applied Value Engineering in their entire projects with 21 indicating that they always apply value engineering in all their projects. Seventeen (17) were of the view that they seldom apply Value Engineering with 4 responding that they never apply value engineering in any of their projects. This result suggests that majority of construction officers apply value engineering in all their projects and

Research question four sought to find out the factors hindering the acceptability and implementation of value engineering. A mean score of 1.9 indicates that majority of the respondents agree that lack of guidelines and information is a factor that hinder them from successfully accepting and implementing Value Engineering. A mean of 2.3 indicates that lack of management support is another key factor that hinders the smooth implementation of Value Engineering. When the mean score was calculated on the issue of resistance to change, it generated a score of 2.1 which is an indication that value engineering cannot be accepted and implemented when construction officers resist change.

5.3 SUMMARY OF FINDINGS

Most construction professionals have positive perceptions about Value Engineering (VE) and thereby will be willing to implement Value Engineering. The respondents agreed that value engineering is a very good concept which helps to effectively execute a project.

Construction professionals have knowledge in Value Engineering but are not experts in the area. The construction officers are familiar with the concept of value engineering. They understand the approach and the techniques as well as the benefits of value engineering.

The findings suggest that construction professionals accept Value Engineering and are willing to implement it in their construction projects. They are only need to be given enough education to sharpen their skills about the concept.

Several factors such as lack of management support, inadequate guidelines and practice, resistance to change negative attitude, lack of communication, inadequate knowledge and training are factors hindering construction professionals from accepting and implementing VE in projects successfully.

5.4 CONCLUSIONS

The study established that construction professionals have positive perception about Value Engineering. This means that construction professionals acknowledge the immense benefit of VE. Construction professionals have knowledge adequate enough to execute any project using Value Engineering and even willing to learn more in order to become experts who will be in the position to transfer the knowledge to others. The study has therefore highlighted the need for constant training on value engineering to be given in order to boost the knowledge level of the construction professionals. Knowledge is a very important determinant when it comes to application of a concept. The study also brought to light the need for construction professionals to constantly practice the concept of Value Engineering. As it came out strongly that lack of management support is one key hindrance to the successful implementation of value engineering it means most organizations do have Value Engineering inculcated into their organizational policies as has been done by many organisations in other countries such as the USA, Japan, UK and others. Also, the government has also failed to draw policies that will regulate the implementation of value engineering in public organisations' projects. Resistance to change was also seen to be a major factor hindering VE implementation. This means that enough education has not been given to construction professionals within the organisation on the immense benefit of VE, With regards to the acceptability and implementation of value engineering there seems to be a high potential if the needed education, resources and support is given to construction professionals.

5.5 RECOMMENDATIONS

Based on the findings of the study, the following recommendations are made as measures necessary for Value Engineering to be successfully accepted and implemented in the construction industry.

Management of organisations should develop positive attitude towards Value Engineering**.**

They should draw up strategic policies that would encourage value engineering.

Management should draw incentive schemes to staff who will be willing to apply value engineering.

Enough education should be given to people within the organisations about the VE and immense benefits.

Training should be given to construction officers from time to time to sharpen their understanding of value engineering.

Technical Universities and Polytechnics should give more room for the teaching and learning of Value Engineering in their curriculum.

Government should make VE a policy in the country so that any contract given to anyone by the government will be guided by that policy.

Stringent rules and regulations set to regularize the activities of construction professionals.

5.6 RECOMMENDATION FOR FURTHER RESEARCH

The recommendations are meant to provide widespread and deeper insight into the relationship of the variable studied.

The research should be expanded to cover other regions of Ghana, this is because of the differences that may exist among the other regions which will bring about the differences in findings; and

The research should be expanded to include a quantitative aspect that could lead to a greater insight into why construction professionals performs their task in a particular way; such information may lead to recommendations that might improve practice and policy in the construction industry.

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APPENDICES

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY COLLEGE OF ARTS & BUILT ENVIRONMENT DEPARTMENT OF BUILDING TECHNOLOGY MSc. CONSTRUCTION MANAGEMENT

Dear Respondent.

This study is conducted as part of the requirements for the award of a Master of Science Construction Management by the College of Arts and Built Environment, Kwame Nkrumah University of Science and Technology, Kumasi. The information you provide will therefore be used for academic purposes only and will be treated with confidentiality.

RESEARCH TOPIC:

EXPLORING THE LEVEL OF ACCEPTABILITY AND IMPLEMENTATION OF VALUE ENGINEERING IN THE CONSTRUCTION INDUSTRY IN GHANA: A CASE OF TAMALE METROPOLIS.

Thank you.

Please kindly answer the following questions:

SECTION A: DEMOGRAPHIC DATA OF RESPONDENTS

Please circle the appropriate one in this section

1. Position/Current Job Title

a. Civil Engineer b. Quantity Surveyor c. Architect

d. Lecturer e. Others (please specify)……..

2. Qualification

a. PhD b. Msc. /MPhil c. Bsc. d. HND

e. Other (please specify)…….

3. Type of firm

a. Consultancy firm b. University c. Polytechnic

d. Department of Urban/feeder Roads e. Construction firm

f. Others (please specify)……..

SECTION B: PERCEPTIONS OF CONSTRUCTION OFFICERS ABOUT VALUE ENGINEERING

The following statements explain your perception towards value engineering. Please indicate to what extent you agree to the statements by ticking [√] the appropriate response to each of the statements on a scale of "strongly agree" to strongly disagree.

Strongly Agree (SA) = 1
Agree (A) = 2

Undecided (U) = 3

Disagree (D) = 4
Strongly Disagree (SD) = 5

	STATEMENT Value Engineering:	SA 1	A 2	U 3	D 4	SD 5
1.	Is merely a cost cutting technique					
2,	Increases functions and lifecycle costs					
3.	A far-fetch idea for country like Ghana, and has no scope					
4.	makes a difference to the way a project is conceived and executed.					
5.	Is appropriate at the early stage of construction.					
6.	Improves product value.					
7.	Typically a contractor-led initiative.					
8.	Competes with my technical					
	expertise.					

9.	Is a waste of time.					
10.	Interrupts with my already designed process.					
11.	Clients do not approve of the method since they see it as a risky methodology.					
12.	Improves quality.					
13.	I will recommend value engineering to my colleagues					
14.	I will recommend value engineering to all my clients					

15. If other please state

……

……

SECTION C: KNOWLEDGE OF VALUE ENGINEERING

This section wishes to find out your knowledge of value engineering.

1. Are you aware of Value Engineering (VE) technique for construction projects?
   A. Yes
   B. No
2. If your answer to (1) is "YES" where did you learn about the technique of VE?
   A. Professional seminars B. Publications, journals etc.
   C. Colleague, friends :
   D. Read as a course/subject:
   E. Others(please specify):……

The following questions indicate your level of knowledge in value engineering methodology. The statements have been put on a scale of "Expert" to "no knowledge". You are required to tick the appropriate statement.
Expert = 1

Very good = 2
Good = 3
Fair = 4
None = 5

S/N	STATEMENT	1	2	3	4	5
3.	It involves the regulating of the lifecycle cost of a construction project.					
4.	It is most applicable in the design stage of construction.					
5.	It is a cost effective methodology.					
6.	It should be done in a team					
7.	It eliminates, without impairing essential functions, anything that increases acquisition, operations or support cost.					
8.	40hour/5days workshop approach is the best formal approach.					
9.	The Charette is the best formal approach.					
10.	The Value Engineering Change Proposal (VECP) is the best approach.					
11.	It helps to minimise cost.					
12.	It helps in finishing the jobs before the time schedule					
13.	It helps to eliminate mistakes and deficiencies in construction projects.					
14.	It helps construction firms to gain competitive advantage.					
15.	It helps to refine and improve construction project concepts.					
16.	It improves quality and performance					

17. Do you know of any concepts which are not captured? Please state

……

……

SECTION D: ACCEPTABILITY AND IMPLEMENTATION OF VE

The section wishes to find out the level at which you accept and implement VE. The following statements indicate the level of acceptance and implementation. The statements have been put on a scale of "always" to "never". Please answer by ticking the appropriate box to indicate your level of acceptance and implementation.

Always = 1

Often = 2

Seldom = 3

Never = 4

S/N	Statement	1	2	3	4
1.	I apply Value Engineering in all my projects.				
2.	I recommend value engineering to my organisation.				
3.	I recommend value engineering to all my clients.				
4.	I teach my colleagues/students who are ignorant about the benefits of value engineering.				
5.	I apply value engineering throughout the life-cycle of all my projects.				
6.	I will gladly join a Value Engineering society to learn more and apply.				
7.	I will be willing to attend seminars, workshops and awareness training programs on value engineering.				

8. What were the types of projects on which VE/VM was applied?

……

……

……

SECTION E: FACTORS HINDERING THE ACCEPTABILITY AND IMPLEMENTATION OF

VALUE ENGINEERING

The following statements explain the factors that hinder your acceptability and implementation of value engineering. Please indicate to what extent you agree to the statements by ticking [√] the appropriate response to each of the statements on a scale of "strongly agree" to strongly disagree.

Strongly Agree (SA) = 1
Agree (A) = 2
Undecided (U) = 3
Disagree (D) = 4
Strongly Disagree (SD) = 5

S/N	STATEMENT	SA 1	A 2	U 3	D 4	SD 5

1.	Lack of local guidelines and information about VE					
2.	inadequate knowledge and practices in VE					
3.	Interruption to normal work schedule					
4.	Too expensive to carry out VE					
5.	Lack of management support					
6.	Lack of inventive ideas					
7.	Lack of communication and human relations					
8.	Resistance to change					
9.	Negative attitude and failure to recognise creativity or innovativeness.					

10.	Rigid procedures and policy.					
11.	Risk aversion					
12.	Over-design and overestimating					

13. Please do you know of any challenge that was not captured? Please state

……

……