FRAMEWORK FOR VALUE MANAGEMENT IMPLEMENTATION IN ABUJA CONSTRUCTION COMPANIES, NIGERIA.

ABSTRACT

Value Management (VM) has played a broad role in supporting effective decision making on construction projects, increased project performance and quality, balance project objectives, and manage community expectations in many countries around the world. But applicability of VM in Nigeria construction industry has experienced setbacks compared with rest of the world. It is on this basis that the study examined the factors responsible for the setbacks with a view to recommending sustainable solutions. Primary data was collected from construction professionals (architects, quantity surveyors, civil engineers and estate surveyors) through closed ended questionnaires. The study sampled 235 professionals across the construction firms in Abuja through simple random sampling technique. The study employed descriptive statistics and factor analysis to analyze the data collected from the respondents. Descriptive statistics (mean item score and relative importance index) identified four (4) value management tools used in VM practice. These include brainstorming, life cycle cost analysis, function analysis and evaluation matrix. Fourteen (14) benefit factors of VM were identified which constituted 66.169% variance in original variables. These include performance benefit, technological benefit, effective cost, quality standard, functional performance, innovative benefits, professional benefits, wastage avoidance, functional quality, cost benefit, efficient benefit, technical benefits and client value management. The result of factor analysis revealed six factors which constituted about 65.690% variance in the original factors hindering value management application, which include technical and public policy factors, professional negligence, non- complacency and management defects, human factors and inflexibility, lack of manpower and project focus, and poor knowledge. The study recommends that workshops and seminars be organized by professional bodies from time to time so as to create more awareness of value management in the construction industry. The result of factor analysis was used to develop a framework. The researcher recommends that the framework developed in this study be used by government for VM implementation. Project stakeholders should be proactive in addressing the aforementioned factors as they posed critical setbacks to value management implementation by Nigerian construction professionals.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study.

Value Management (VM) is a management strategy principally dedicated to motivating people, developing skills and promoting synergies and innovation, with the aim of maximizing the overall performance of an organization. This, however, has not been fully embraced in Nigerian construction industry (Oke and Ogunsemi, 2016).

Construction industry all over the globe has not been static and the reasons for this include clients' growing demand, complexity of construction projects, advancement in technology, introduction of new innovations and environmental sustainability issues amongst others.

Aghimien *et al.,* (2015) established that value management identifies and eliminates areas of needless designs which affects cost but has no efficient benefits, reduces construction cost and time and enhances worth for money thereby giving an overall satisfaction to the client.

Olawumi *et al.,* (2016) describes value management as a process whereby the project is subjected to scrutiny to obtain maximum value for money by following prescribed methodologies. It focuses on the value, rather than cost, in relation to the function performed by the elements of the project under contemplation. Robertson and Sterlin (1996) defines value management as an organized multidisciplinary team study of purposes to creatively produce alternatives which will satisfy the users' needs at the lowest life cycle price.

Oke and Aigbavboa (2017) describes Value Management as a procedure that involves the control, monitoring and managing of project team members, redesigning of spaces and components, appropriate choice of materials, as well as the optimization of the method of producing a product in order to meet the stated development goals.

Value management can increase the value of a property by providing the required project purposes but at a lower cost, by providing other functions without increasing the price, and by providing additional functions and at the same time to decrease the cost. For instance, if two or more designs of a project are compared, each producing the same functional and aesthetic requirements, then the difference would most likely be an unnecessary cost, which could be as a result of unnecessary components, materials, project buildability and life cycle costs.

Value Management is important to the success of projects as it offers a basis for improving value for money in construction (Ashworth and Hogg 2000). It focuses on value rather than cost and seeks to achieve an ideal balance between time, cost and quality (Kelly, 2007). Liman (2010) defines value management as a mixture of planning tools and approaches to find the optimum balance of project benefits in relation to project cost and hazards. Demand for value management all over the globe is on the increase as noted by Maro and Kikwasi, 2009) and Nigeria will soon be fully part of it.

According to College of Estate Management (1995), value management is getting an increasing amount of attention within the construction industry and global project management community that clients are insisting that value management should be practical to their construction projects and such could probably be attributed to the usefulness of value management as a tool for guaranteeing value for money. Also clients are gradually enquiring and demanding that it is used during the main stages of their construction projects and the existence of greater rivalry in the market place ever before, therefore it is important that resources are useful as efficiently as possible and wastes in any form reduced to a minimum.

Currently, VM has been widely practised in many countries around the world. However, concepts and applications of VM do not seem to be well embraced in the construction sector of the majority of developing countries (Bowen et al., 2010). For example, in Malaysia and China, VM is still at its early stages and it has not been well-accepted (Jaapar, 2009; Li and Ma, 2012). VM is seldom applied in the Southeast Asia construction industry (Cheah and Ting, 2005). It is also less commonly practiced in South Africa. Malla (2013) discovered that the concept of VM is very much new in Nepal. The practice of VM in Myanmar and Nigerian construction industry is very low and it is not popular among construction professionals (Phyo and Cho, 2014; Aduze, 2014).

The case of Nigeria as one of the emerging nations of the world is different as the concept of value management is gaining ground among Nigerian construction professionals. A good number of professionals in Nigeria built environment have been involved in the practice of VM. This was revealed by Olarenwaju and Khairuddin (2007), where about 36%, 30%, 11% and 19% of the research population that are familiar with value management are quantity surveyors, engineers, architects and estate managers respectively.

Thus, in order to promote the application of VM practice in Nigerian construction industry, this study will identify the extent of value management practice among construction firms, the factors hindering the successful implementation of VM among the firms and assess the benefits associated with the implementation of VM in Nigerian construction industry.

1.2 Statement of the Problem.

In recent times, not only in Nigeria but the rest of the world has been facing tough economic challenges. It is therefore, important that available resources are utilised to optimize value for money for project stakeholders. Client expectation of value of products in the Nigerian Construction Industry has not been adequately achieved (Sabiu and Agarwal, 2016). The failure of such of clients in achieving their expected value causes them to be disappointed with their investment in the Nigerian Construction Industry. Construction industry is generally identified with poor productivity, postponement in project duration and cost overruns. Production outputs attributed to construction sector has been comparatively low compared to manufacturing industry (Adebowale,2014). Though attempts have been made to improve the situation, the problem still persists. As an alternative to Nigeria's existing practice, efforts have been made by previous researches recommending the adoption of VM in order to facilitate the achievement of the client value system, but the implementation is yet to be welcomed due to the absence of a framework on VM practice and lack of government policy on VM implementation in the Nigerian construction industry.

Despite the huge number of benefits of VM as widely proclaimed by many international construction industries in advanced countries, which includes improved products and services, encouraging the use of local resources, elimination of unnecessary designs, and adoption of new construction techniques amongst others, value management has not been fully incorporated in Nigerian construction industry (Oke and Ogunsemi,2016).

Therefore, the study assesses the extent of value management practice by construction professionals in Abuja with a view to identifying the impediments facing its implementation so that a framework can be developed for its practice in the Nigerian construction industry.

1.3 Aim and Objectives of the Study

1.3.1 Aim of the Study

The aim of the study is to assess the extent of value management practice by construction firms in Abuja, with a view to developing a framework for its implementation in the Nigerian Construction Industry.

1.3.2 Objectives of the Study

1. To identify tools used in VM practice in Abuja construction companies.
2. To examine the extent of the application of VM by construction professionals in Abuja.
3. To assess the factors hindering the application of VM practice in the construction companies.
4. To examine the benefits associated with the practice of VM in construction firms in Abuja, Nigeria.
5. To develop a framework for implementation of VM in Nigerian construction industry.

1.4 Research Questions

1. What are the tools used in VM practice by construction professionals?
2. To what extent is the application of VM in Abuja Construction firms?
3. What are the factors hindering the application of VM in Abuja construction companies?
4. What are the benefits associated with implementation of VM in Abuja?
5. How can a framework be developed for implementation of VM in Nigerian construction industry?

1.5 Justification for the study

Nigerian construction industry has suffered many setbacks in terms of completion of projects at stipulated time and within budgets (Mohammed and Isah, 2012). This, however, may be largely due to non-implementation of VM practice, which aids timely completion of construction projects and enhances value for money for building clients in the construction industry.

A VM process was carried out by four (4) different value management teams for four (4) different proposed projects in Ondo State, Nigeria (Aghimien and Oke, 2015). The research found that, apart from providing a more functional design, value management can also lead to great savings in cost of construction of any project, as there was 28% saving for case study one (1), 38% for case study two (2), 31% for case study three (3) and 15% saving for case study four (4).

Value management plays a vital role in the construction industry's pursuit for continuous improvement and innovation" (The Institute of Value Management, 2009). It thus becomes imperative for stakeholders in the construction industry to embrace the practice of value management which encourages the use of minimum resources to achieve project objectives and enhances value for money for building clients.

In Abuja in particular and Nigeria in general, VM is not yet a concept well known and practiced by all the parties involved in the building industry. It is important for Nigerian construction industry professionals to become aware of and familiarize themselves with VM practice. Nigeria is a few steps behind in VM practice compared to some of the industrialised countries like Britain, Australia, North America and China.VM is a function-oriented method that has proven to be an effective management instrument for achieving improved design, construction and cost effectiveness in various construction and transportation projects around the globe. It is anticipated that the successful implementation of a VM agenda will result in additional benefits beyond improved design and cost savings. Benefits include constant updating of standards and policies, accelerated combination of new materials and construction techniques; employee interest from participation in decisions and increased skills obtained from team involvement.

1.6 Scope of the Study

The study covers the practice of value management by construction professionals in Abuja construction firms. The study looks at the extent to which value management is being applied to construction projects by construction professionals in Abuja, the Federal Capital City of Nigeria. The study also looks into various tools/processes of VM practice employed by the construction professionals in construction projects in Abuja, in order to enhance the value of construction projects, not necessarily only by cutting costs. Processes and steps employed by the construction firms to deliver the building project that is value-oriented will be examined in this study. The study identified inherent factors hindering the application of VM in the study area. The study also examined the benefits of application of VM in Abuja construction companies.

The fundamental reason why Abuja is selected for this study is hinged on the fact that Abuja is the capital city of Nigeria and it is fastest growing city in Nigeria in terms of construction development. This confirms why there is large concentration of construction firms in Abuja and the outcome of this study can be a true reflection of what obtains in the entire country.

1.7 The Study Area

Abuja is the study area and it is the capital city of Nigeria. Abuja is selected for study on the basis of the existence of heavy property market transaction and due to presence of high level housing infrastructural services provision and development which cannot be compared with any city within the country.

Abuja Municipal Area Council (AMAC) was designed into four phases (I-IV) of development, and located in the northern part of the Federal Capital Territory (F.C.T.)

FCT comprised landmass of 275.30 and 7,315 square kilometres respectively. Furthermore, FCT is divided into four phases of development, phase 1 and phase 2 are well developed in housing infrastructure and majority of districts in phase 3 and 4 are also well developed.

Abuja, the Federal Capital Territory is on the longitude 6^0 $44^’$ to 7^0 $37^’$ E (East of the Greenwich Meridian) and latitude 8^0 $23^’$ to 9^0 $28^’$ N (North of the Equator). The city is bounded to the North by Kaduna state, to the south by Kogi state, to the east by Nassarawa state and to the west by Niger state. By existing roads, the distance of FCT is approximately 150km from Kaduna, 156km from Bida and 112 km to Minna.

In 1976 FCT was carved out from part of Nassarawa, Niger and Kogi states in the central part of the country. The city is confined by a rock called Aso Rock, and the city experiences two annual climatic conditions in a year; the raining and the dry seasons. The city is located at sub region of Guinea Forest-Savanna of West Africa. The landscape the city is characterized with plain, gullies and rough terrain. The major gullies and rough terrain is found around Gwagwa plains where the pitches of rain forest occurrence are predominant. The annual range of rainfall is 127.3mm-118.5mm with average temperature between 21.2^0 C and 31.9^0C.

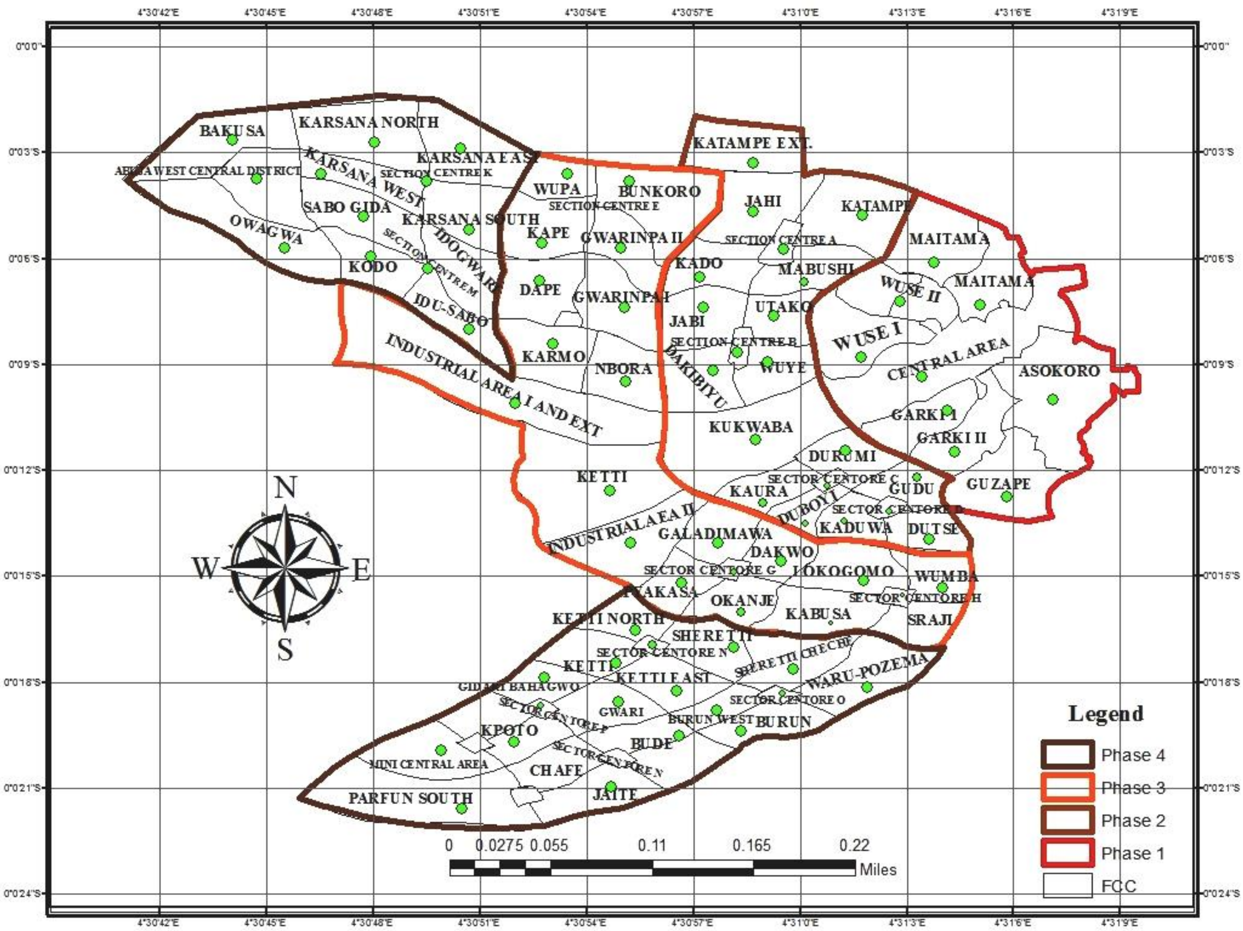


Figure 1.1Abuja, Nigeria (The study area) source: FCDA, 2012.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Historical Development of Value Management.

Value management was initially called value analysis (Kelly and Male, 2006) and latter Value Engineering was used to describe the traditional approach to the discipline. According to The College of Estate Management (1995), value management was introduced in the United States during the 1940s and was first applied to construction projects in the 1960s, mainly by public sector. Value engineering was developed during the World War II and it began as search for substitute products/components, a shortage of which had developed as a result of the war.

Due to the war, however, these alternative components were often equally absent and this led to a search not for alternative components, but to a means of fulfilling the purpose of the components by an alternative method. It was later revealed that this process of "functional analysis" created low-cost products without reducing quality and, after the war, the system was maintained as a means of removing needless cost from products and improving design.

This led to the birth of value engineering process based on analysis of function. By the 1970s, the use of value engineering in most developed countries of the world had become prevalent that it was often obligatory for general services administration contracts in the United States, and considerable success in its use was recorded and it is believed that Nigeria will soon be part of the development.

Ellis *et al.* (2005) stated that value management (VM) is an evolving paradigm that focuses on constantly increasing the value provided to the client, taking evidence from the development of VM which has been widely accepted at international level as an important instrument in the management of construction projects.

Value management is mainly divided into three stages and they are value planning (VP), value engineering(VE) and value analysis (VA) (Finnigan, 2001).

Jaapar (2006) defined VM, as a multidisciplinary; team based, structured, systematic process and analysis function, which pursues best value through the design and construction process to meet client basic needs. De-Leeuw (2006) opined that the process has more to do with "value" and "management" rather than "value" and "engineering". The main role of the value manager as opined by Male and Kelly (2008) is to decide on structure and bring a study style tailored to a specific value problem or value challenge, be it for a project, project programme, service or managerial function.

VM is also known as Value Engineering (VE) or Value Analysis (VA) (SAVE, 2014). In advanced countries, value management, or more accurately, value methodology, has been used to increase construction and transportation projects for more than 30 years. Traditionally, VM has been used by transportation agencies and public organizations to reduce or avoid excess capital construction costs. However, VM plays a comprehensive role to support effective decision making to construction projects, increase project performance and quality, balance project objectives and manage public expectations.

2.2 Concept of Value and Value Management (VM)

Value was described by Kelly (2007) as the correspondence of a component which is expressed in subjective or objective units of currency, power, exchange, or a qualified scale; it reflects stakeholder's desire to gain or keep that element. In other words, the quantities of objective or subjective measures are often interpreted into a financial value as an understandable scale. To analyse the value of the project, there are various criteria including cost, profit return, energy cost, practical performance, reliability, maintenance ability, quality, environment protection and aesthetics, owner requirements and safety. Kelly (2007) claimed further that totally increasing the fulfilment or decreasing the cost of a project can expand the value.

Having considered the concept of value, the next part contends how this concept began and spread as a new method around the globe. This new approach is called Value Management (VM) and it is a simple and important process. VM intends to maximize the functional value of a product or project against a value system determined by the owner. As a short definition, VM aims to maximize the value of a product or output of the projects by a value system (Abidin and Pasquire,2006).

Australian Standard (2005) described Value Management (VM) is a regulated, logical and systematic procedure that follows to achieve all the essential functions at the lowest cost with required quality levels and performance. VM provides an extremely influential way of discovering the client's needs in depth to improve the quality and value of projects.

The Institute of Value Management, UK (2008) defined VM as a strategy of management particularly dedicated to motivate people, develop skills and promote synergies and innovation, with the aim of maximising the overall performance of an organisation. The concept of VM according to Society of American Value Engineers (2008) is defined as a methodical, multi-disciplinary effort directed towards examining the functions of projects for the purpose of realizing the best value at the lowest overall life cycle cost (LCC).

VM study includes systematic steps and phases based on function analysis, which assures that the problem is carefully studied; then innovative alternatives are created and assessed, and finally best alternatives are carefully chosen.

Kelly and Male (2004) also recognised VM in UK construction industry as a term used to describe the total process of enhancing value for client from a project the phases of concept through to operation and use.

VM is defined by Kelly and Male (2006) as a service that maximises the functional value of a project by managing its development from the beginning of a project to use through the audit of all decisions against a value system determined by the client.

The Office of Government Commerce (2007) describes value management as “a well-established procedure for defining and maximising value for money”. As incomplete this definition may be, it suggests that the discipline of value management can be applied to any type of project regardless of size or timeframe and at all stages i.e. throughout the life cycle of the project from inception to completion.

VM is ‘a multi-disciplinary, team orientated, structured, analytical process and systematic analysis of function which pursues best value via the design and construction process to meet the client’s perceived needs’ (Jaapar, 2006; Jaapar and Torrance, 2007), a proactive, creative, problem-solving service, using a multi-disciplinary team oriented approach to make explicit the client’s value system, at targeted stages through the development of a project or the life of a facility.

It is also a process which encompasses better understanding as well as providing solutions to business projects.

Ellis *et al.* (2005) stated that VM is an emerging paradigm that focuses on constantly increasing the value provided to the client. Jaapar (2006) defined VM, as a multidisciplinary; team oriented, structured, analytical process and systematic analysis function, which seeks best value via the design and construction process.

This may be contrary to the general belief that value management must and can only be applied at the design stage of construction project. This means that value management is becoming dynamic and various forms of its application in the construction industry are springing up. This discrepancy is further explained by Kelly and Male (2006) where value engineering is said to be a sub-set of value management in that the former deals mainly with the design processes while the latter deals with the overall management of value throughout the contract.

Odeyinka (2006) defined value management as “a service, which maximises the purposeful value of a project by managing its development from concept to completion and commissioning through the audit (examination) of all decisions against a value system determined by the client”.

In summary, value management can therefore, be seen as “an organised and multi-disciplinary process directed towards analysing the functions of projects from its inception to completion and commissioning (through auditing or investigation) for the purpose of achieving best value and return on investment at lowest possible overall life cycle cost (See Figure 2.1).

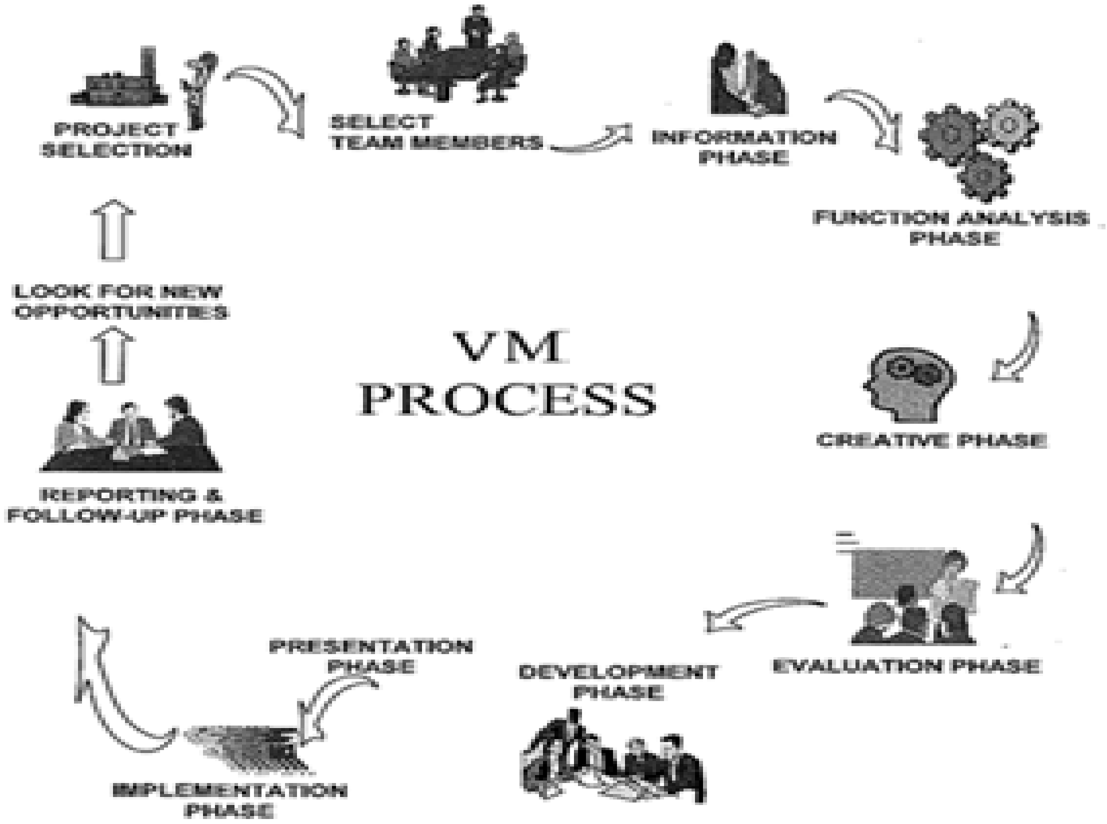


Figure 2.1: Value Management Process (Job Plan)

Source: Jaapar &Torrence (2007)

Odeyinka (2006) has further defined VM as a service, which maximises the functional value of a project by managing its development from conception to completion and commissioning through the audit (examination) of all decisions against a value system determined by the client. Value is made up by matching cost, time and function/quality of the product/project. Value can also be seen as the benefit the client or the occupants of such a building or structure enjoy. According to Odeyinka (2006), there are three major ways to improve value by applying VM. These are:

1. To provide for the required project functions but at a lower cost.

2. To provide additional functions without increasing the cost.

3. To provide additional functions and at the same time to lower the cost.

2.2.1 Terms Used in Value Management

There are some important terms and words which should be understood for implementing an effective VM study which include function, cost, worth and value. These terms are described below;

1. Function.

The normal, characteristic or typical action that can be performed by a product or service is function. It is a typical activity precisely to be utilized or implemented for something. Function is always defined and expressed in a verb-noun. If something is designed mainly according to the requirements of use, it is functional. There are two types of functions including "basic functions" and "secondary functions". The most important action that is performed by a product or service is the basic function. The secondary function is performance characteristic of the practical solution which is selected other than the required basic function (Spaulding, 2005).

2. Cost.

Cost is the amount of money or the price that is required to pay for something or some services. Cost of a project can be shared and distributed among elements or functions of that project (Ashworth, 2002).

3. Worth.

Worth is not cost because cost is the actual amount of money paid for something but worth is what owners are ready to pay for something and service or how the owners rate something in their minds or hearts (Ashworth, 2002).

4. Value

The value results from a balance between cost, time and function or quality of the products or project's outputs (figure 2.2). The value of a product or project's output will be understood in different ways. Indeed, it is a high level of performance, emotive demand, capability, style, which is relative to price and cost. This can also be determined as maximizing the function of a project or product relative to its cost, as in equation 1:

Value = (Performance + Capability)/Cost = Function (objective)/Cost------equation 1

The equation above reveals that value is not a matter of reducing cost. In many cases the value of a project's outputs can be added upon by improving its function (capability or performance), so in this case function can increase more than its added cost.

Australian Standard, (2007) stated that there are three main ways that value can be improved by using VM. These are as follows:

1- providing required project functions with lower cost.

2- providing additional functions without cost increase.

3- providing additional functions at same time to lower the cost.

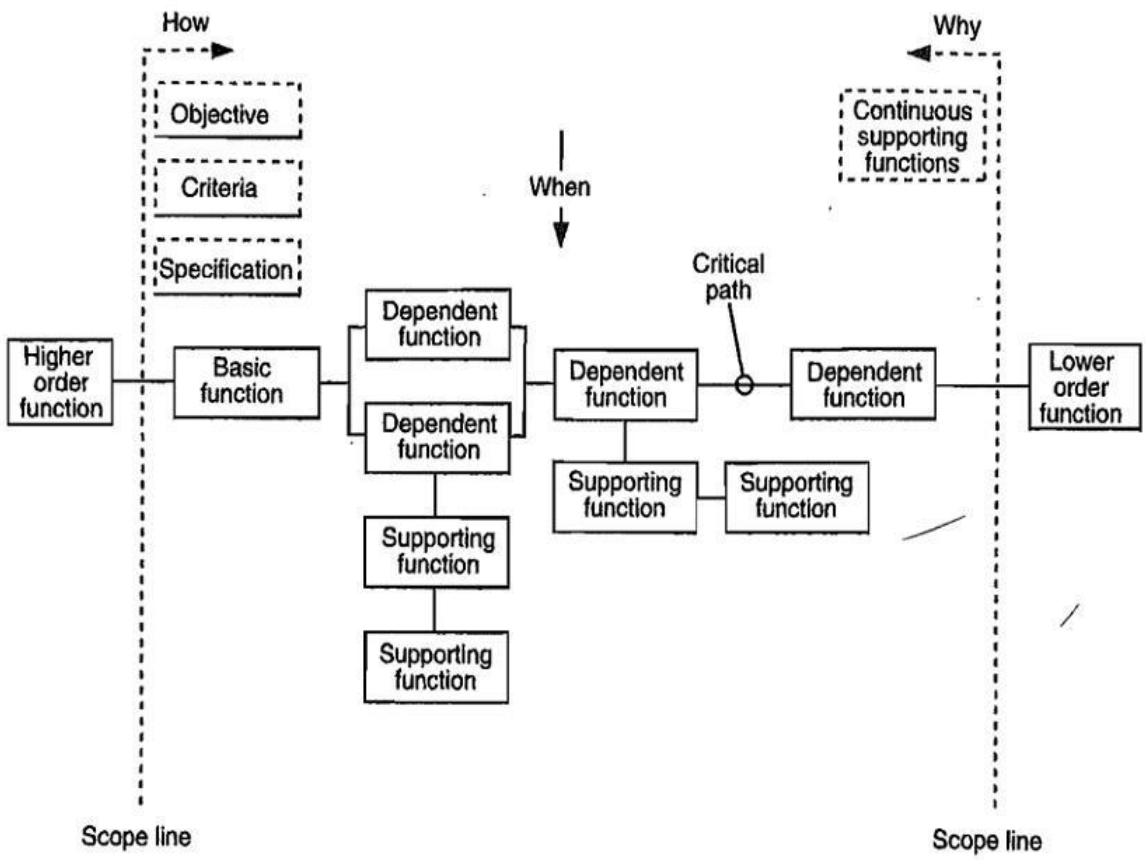


Figure 2.2 A sample of Fast diagram

Source: (Celic, 2010)

2.3 Value Management Process (Job Plan).

There are various techniques and phases to obtain an effective VM study. Jaapar and Torrence (2007) stated that these stages are as a job plan which is a well-ordered approach including sequenced stages that help the VM team to answer questions and decide the project's problems and challenges. One of the main characteristics of VM is that an approved job plan must be followed. Figure 2:1 shows the common stages and processes that would be followed in a typical study. Generally, main seven stages or phases are common in all VM studies which are stated in following:

2.3.1 Pre-Study (Orientation) Phase.

The main aim of Pre-study phase is to make sure that the study is done and is targeted, correctly. Based on Ashworth (2005), this phase is including some activities such as bellow:

- Coordinating the meeting
- Settling the structure of team
- Determining the study duration

Determining location and conditions of the study

- Gathering Information and data
- Estimating investment cost and also life cycle cost

2.3.2 Information Phase.

Getting a great understanding about all aspects of the project by VM team's members to extend their views of the project's objectives is the main goal of this phase. Ellis et al (2005) stated that, a significant part of this phase is answering these questions: 'what does it do?' and 'what else does it do? '. In order to answer above questions, there are several techniques such as FAST diagram. Therefore, the information phase can be grouped into two main activities, "Function analysis" and "Presentations".

A brief description of the project and its objectives, specifications of the design plan will be presented by design team in this phase. Moreover, Current design is described in the presentation stage of this phase. Designer team should describe and provide reasoning and background with details for VM team. After the presentations, there viewing of drawings and other documentation must be done by VM team in this phase (Ellis et al 2005).

2.3.3 Creativity Phase.

"Providing opportunity for all team members to suggest their idea about beneficial changes is the most important aim of creativity phase" (Thomas, 2005). In this phase team members are encouraged to utilize creative thinking techniques such as brainstorming to find innovative solutions. Brainstorming is the positive method of this phase that it provides a great productivity based on the group and team work.

Moreover, optimistic environment is required in this phase to persuade people for thinking about other ideas; it leads to eliminating the negative thoughts and improve decisions. Suggesting possible new ideas and improving old ideas that it seems they are initially unbelievable but are worthy in depth are occurred in this phase.VM facilitator is a basic role in this Phase. The role of leader or facilitator of team is to provide a good environment for team to be familiar with analytical thinking modes (Whyte and Cammarano, 2012).

2.3.4 Evaluation Phase.

In this phase, VM team will assess all alternatives to select best one in terms of improving the project's value (Stewart, 2010). The team members should evaluate ideas objectively and must consider both advantages and disadvantages of each idea and should not accept an idea very soon. The main parts of evaluation phase are Procedure, Criteria of Evaluation, and Evaluation techniques.

a. **Procedure:** In this part, usually there are many different practices that can be done with flexible guidelines and methods. In a typically recognized method, the facilitators assess each idea and then call the idea inventors to clarify the reasons behind the suggested idea. After that an evaluating technique is used to eradicate unreasonable ideas and hold the other ones that could be valuable for the project. Before evaluating ideas, criteria evaluation must be applied and chosen (Stewart, 2010).

b. **Criteria of Evaluation:** Criteria evaluation depends on each project and its type must be chosen. The usual, practical and methodological criteria that can be chosen are as follows:

   i. **Cost:** for example, savings potential such as initial capital cost savings, the cost of maintenance, operating costs etc.

   ii. **Function:** for example, aesthetics, safety and security, expansion possibilities of future, safety of occupancy and etc.

   iii. **Time:** for example, the required time to finish design or construction programe (Stewart, 2010).

   iv. **General:** for example, the flexibility, safety matters, political issues and jurisdictional factors.

   v. **Evaluation Techniques:** There are many evaluation techniques to evaluate alternative ideas in terms of criteria; each technique has some advantages and shortfalls, the common one is the evaluation matrix.

2.3.5 Development Phase.

Selecting the accepted ideas for more development to access the technical and economic viability is done in this phase of VM process. Proposals descriptions must be detailed and backup data should support them because all decision makers must understand proposals descriptions correctly. The normal contents of a proposal are listed below:

- Original design description
- Design of proposed alternative description
- Proposal advantages and benefit
- Proposal disadvantages and limitations.
- Discussion on proposal topic and content
- Implications of life cycle cost

- Technical backup supports

2.3.6 Presentation Phase.

The main purpose of this phase is providing a proposal with a good presentation that is understandable for all VM team members. All drawings, calculations and costs that are offered by the VM team to support proposed ideas are presented at this phase. To raise the quality of presentation phases; The VM members must study the skills of presentation before starting this phase. Furthermore, using visual tools such as graphs and pictures are helpful to access a clear view of the developed idea (Graham *et al.* 2006).

2.3.7 Post-Study (Feedback) Phase.

In fact, after completing the physical VM workshop, this process is not yet completed. In order to achieve maximum benefits of the VM practice, post-study activities must be carried out at the end of VM process. The post-study activities guarantee the feasibility and advantages of selected proposals and which can enhance value of project. Generally, the post study phase is divided into three stages:

1- Preparing reports and reviewing stage

2- Implementing stage

3- Surveying stage

After finishing the VM study, facilitators make a report about all steps of the process and the results obtained from the VM study. This will be the initial report that consists of some information such as executive summary and a brief of the proposals. In addition, a final report of VM is gathered giving the character and specifications of the proposals and lessons that were learned during the VM workshops, this report will be made in “preparing reports and reviewing stage” (Australia standard,2007).

In the implementation stage, a programme must be planned by the project manager or another representative of other parts of projects to overcome the difficulties and limitations of project against executing accepted alternatives. Moreover, considering all the proposals and ideas that are still left open after the implementation phase and investigating on the ways of VM workshops improvement must be done in surveying phase (Graham *et al.*, 2006).

2.4 Common Methods of VM Process (Tools).

Several methods and techniques can be applied during VM process according to the specifications and conditions of the project. Furthermore, Study team members and organization's skills and knowledge are other criteria to select and then use these tools during VM study. The size, cost and time of the project and also the training background of the VM members, and the potential and facilities of the stakeholders are the important factors to select the proper procedure and tools for a VM process. The various innovative techniques can be created and designed by the VM team based on specifications of the project to evaluate the new ideas and alternatives which among them, "Brainstorming, function analysis (FAST), Life cycle cost analysis and Evaluation matrix are most important techniques that are always used in VM process.

2.4.1 Function Analysis.

Function analysis is a joint language and method, crossing all skills and technologies used in the VM process. It allows multi-disciplinary members of VM team to add equally in VM workshops and connect with each other through addressing the problem accurately, without bias or fixed conclusions (Celik, 2010). According to Celik, (2010). Defining functions of a project has four steps:

1- **Task:** It is the first stage those stakeholder remarks problems.

2- **Space:** A brief of the project is prepared by brain storming method.

3- **Elements:** Structural form for function building is assumed in this stage.

4- **Point:** An identity is determined for each element based on built form.

Then Functions are classified in to level including basic or secondary; this step is a difficult and subjective work. After defining all functions, the cost of each function must be calculated.

2.4.2 Functional analysis system technique (FAST)

FAST diagram (figure 2.2) is another technique which is used widely in VM studies to analyse the functions. This method breaks a problem down into smaller units to find all possible solutions. In order to achieve the FAST chart's purpose, the VM team should ask consequently several questions started with "how", "why" and "when" through brainstorming technique, while drawing FAST chart. Finding the proper answers for those questions helps the VM team to find the place of each project's function in the FAST chart.

Figure 2.2 illustrates a sample of FAST chart (Celik, 2010).

2.4.3 Brainstorming

Brainstorming is the most prevalent method that is used in all stages and phases of VM studies, especially to create new ideas in the creativity phase. Brainstorming is a cluster or individual creativity method by which one tries to find an inference and answer for a problem or question by gathering a series of ideas logically contributed by the members of the VM team (Value Management Guidelines, 2005).

This technique of VM study is based on group work. The VM team as a group evaluates a project's functions and then gives its propositions and comments. Every suggestion in simple or complicated format is recorded; in fact, any idea that comes to mind is recorded. (Kelly, 2007)

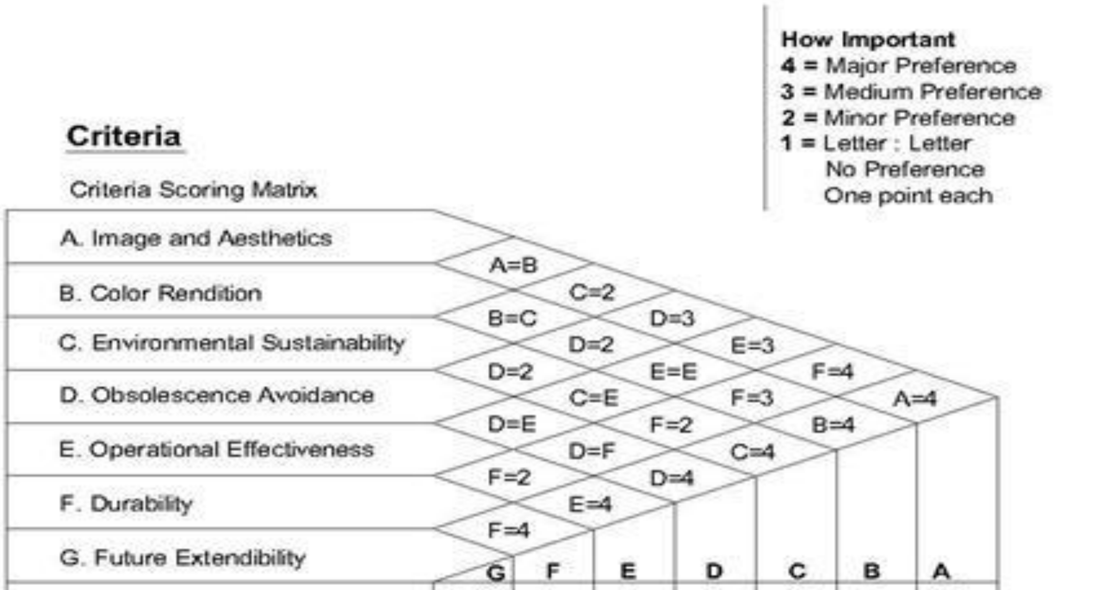
2.4.4 Life cycle cost analysis (LCCA).

Life cycle cost analysis (LCCA) is an exact method in appraising the design alternatives economically with different investment, operating costs, maintenance costs and different life spans. Particularly, LCCA method is applied when a project needs high initial investment costs to identify if the project is economically feasible. There are two reasons to apply LCCA process in construction projects that one reason is to compare different systems or alternatives and the second reason is to determine the most cost-effective plan, system and equipment (Cloete, 2008). Life Cycle Costs (LCC) are all costs related directly with construction and operation, maintenance and disposal phase (whole cost from beginning of construction to demolishing a project).

2.4.5 Evaluation matrix.

Evaluation Matrix is the other common and popular method which is widely used in VM studies. In this method non-monetary benefits that can be important to decision makers are usually considered. Alternatives can be evaluated by the weighting evaluation method.
This method consists of four steps including determining criteria, weighting the criteria, evaluating the design alternatives according to criteria, ranking and selecting the alternatives. This technique is a creativity method so it should be done in brainstorming process.

All criteria to evaluate new ideas are chosen based on the objectives and conditions of the project, for example the most popular criteria for construction projects are aesthetics, colour rendition, environmental sustainability, obsolescence avoidance, operational efficiency, durability and future extendibility. In this method, each pair of criteria is compared together, and the stronger of them is scored to infer how important each of them is. Then each alternative is rated based on a defined scale (e.g. in figure 2.3, the scale is 1 to 5) to be identified to what extend it provides each benefit (Celik, 2010).



	G	F	E	D	C	B	A	
Row Score	0	16	10	13	8	7	5	
Alternatives Analysis Matrix	1	10	6	8	5	4	3	Total
1. Heavy-duty Insulation Systems	3 / 3	20 / 2	24 / 4	8 / 1	15 / 3	8 / 2	6 / 2	84
2. Masonry Wall System	2 / 2	50 / 5	24 / 4	10 / 3	25 / 5	20 / 5	12 / 4	173
3. Metal Panel Wall System	4 / 4	40 / 4	24 / 4	32 / 4	20 / 4	16 / 4	9 / 3	145
4. Glass curtain Wall	5 / 5	40 / 4	18 / 3	32 / 4	20 / 4	20 / 5	12 / 4	147

Excellent .5 , Very Good .4 , Good .3 , Fair .2 , Poor .1

Figure 2.3 A Sample of Evaluation Matrix

Source: (Celik, 2010).

2.5 Value Management Improvements.

Poor quality of information and lack of enough familiarity with VM process always are main barriers against VM study in construction, and that influences the decisions that are made negatively. There are innovative problem solving tools that can be used to improve the efficiency of the VM study. Regarding the application and benefits of some particular software worked based on Knowledge Management systems such as Expert Systems, it seems they would be a worthy and applicable way to eliminate some problems with VM study such as managing knowledge and providing required information and guidance and also specific trainings for unskilled persons. (Yazdanpanah, 2010).

2.6 Benefits of value management.

The Institute of Value Management (2008) observed that the most visible benefits arising out of the application of value management include: better business decisions by providing decision makers a sounds basis for their choice; improved products and services to external customers by clearly understanding and giving due priority to their real needs; enhanced competitiveness by facilitating technical and organizational innovation; a common value culture, thus enhancing every member's understanding of the organization's goals; improved internal communication and common knowledge of the main success factors for the organization; simultaneously enhancing communication and efficiency by developing multidisciplinary and multitask teamwork; and decisions which can be supported by the stakeholders. Others are, encouraging the use of local materials in construction; adoption of new construction techniques/innovations; cost effectiveness; effective delivery system to meet completion period; aids conflict management; quality of work; promotes adaptability and flexibility; gives true worth or value of money to client; enhances competitive edge for the contractor; enhances quality performance of construction projects; eliminates unnecessary design; improves functional space quality of projects. These benefits are available to providers and consumers in all sectors of society: The industrial sector including manufacturing, construction and processing; the services sector, both public and private and government, health, education and other public activities.

Olanrewaju (2013) stated that VM makes client value system explicitly clear at the project's conceptual stage and it seeks to obtain the best functional balance between cost, quality, reliability, safety and aesthetics. According to Kelly, (2007), the application of VM provides immense benefits such as: providing an unbiased outside opinion and senior expertise inputs to the design process, thereby increasing the resources available to develop the project; documenting all reasonable measures being taken to minimize project cost and maximize the return on investment for delivery; identifying design criteria that are of poor value, thereby allowing the project decision makers and stakeholders to re-evaluate project criteria; enhancing and promoting team spirit; identification of constraints, issues and problems which might not otherwise be obvious or have been considered; it improves understanding and ownership of outcomes; elimination of unnecessary functions and features and incorrect assumptions regarding other requirements.

Oke *et al.,* (2015) observed that enormous economic sustainability can be achieved when VM is used on a project as participants have opportunities to ensure that construction projects create opportunity for achieving value for money. However, in doing this, care must be taken not to create an imbalance between the three pillars of sustainability (environmental, economic and social). Yeomans (2002) observed that sustainable construction with respect to the three sustainability pillars can be achieved through VM as it is the most vigorous mechanism to deliver a balance between the society, environment and economy. In a similar vein, Abidin and Ijias (2006) submitted that application of VM helps in effective decision making, and it holds a strategic position in integrating sustainability issues into construction projects.

Hayles (2004) carried out three case studies and concluded that the use of VM tools can contribute toward achieving sustainable construction solutions and strategies. Noor *et al*. (2015) opined that the overall objectives of VM and sustainability tend towards the same direction. While VM tries to achieve optimum value based on the projects objectives, sustainability strives to achieve value not just economically, but as well as environment and social aspects of the projects.

Aghimien and Oke (2015) described VM as a technique which identifies and removes areas of unnecessary designs which affects cost and has no functional benefits, reduces construction cost and time and enhances value for money, thereby giving an overall satisfaction to the client. By doing this, not only is economic sustainability attained, but also environmental sustainability is achieved as wastage is reduced through the elimination of unnecessary designs.

2.7 Factors hindering the sustainable application of Value Management.

Cheah and Ting (2005) conducted a survey to examine VM awareness and applications in Hong Kong’s construction industry and discovered three most important reasons for not using VM at work, including lack of knowledge to implement VM, no confidence to introduce VM to clients, and lack of time to implement VM. He found out that the low level of applications is probably associated with the low level of awareness of VM among senior management in clients’ organizations. Lack of time to implement VM and lack of knowledge about VM are also two main causes hindering VM application to Southeast Asia.

Lai (2006) identified ten factors hindering the application of VM in the Malaysian construction industry. The key factors are lack of knowledge about VM, lack of support from parties with authority such as government and owners, and lack of local VM implementation guideline. Not amazingly, lack of knowledge about VM continues to be a significant problem, whereas lack of time to implement VM is not a factor causing significant obstacles in Malaysia. For the case of China, Li and Ma (2012) also arrived at a similar conclusion that lack of time to implement VM is not a severe problem and main hindrance factors come from lack of expertise knowledge about VM, lack of technical norms and standards and lack of VM experts.

Issues related to VM have received much attention in other countries as well, especially in developing nations. Perera and Karunasena (2004) showed that in Sri Lanka, the application of VM in construction organizations is relatively new and very little proof on its application in the construction industry. Some reasons for the absence of VM application could be lack of standard procedures for VM process, lack of encouragement, advice or guidance on projects for practicing VM from the construction industry regulatory body, and no guidance or knowledge about the benefits. According to AI-Yami (2008), lack of information such as specifications, standards, historical data, lack of leadership, lack of time to implement VM, lack of awareness about VM and client commitment were the five major obstacles hindering the application of VM in the Saudi public sector.

Latief and Untoro (2009) studied the application of VM in the infrastructure services of Indonesia’s public works department. They outlined thirty-one (31) factors influencing the readiness of implementing VM from various references and found five (5) main factors, namely, the number of personnel with VM certification, VM implementation regulation, personnel composition, comprehension level of VM techniques and management and personnel’s level of education.

Jaapar *et al.*, (2009) examined the impact of VM application in Malaysia and confirmed that lack of VM knowledge and practice, the resistance to change by the involved parties, and the conflicting objectives of the project among parties are the main problems faced during VM workshops.

Another study was also conducted on infrastructure projects by Whyte and Cammarano (2012). They used the semi-structured interview method to investigate the extent of VM implementation in the Western Australian engineering industry. The study indicated that time limitations, lack of understanding and participation of individuals in the team will influence negatively the level of success of the VM workshop.

Fard *et al*, (2013) conducted a study on the context of Iran and found five items considered as the main factors hindering VM implementation in the construction industry, namely, outdated standards and specifications, habitual thinking and negative attitude, lack of local guidelines and information, lack of knowledge and practices, and change in owners' requirements.

Malla (2013) made recommendations to promote VM application in the Nepalese construction industry instead of finding out the inhibiting factors of VM. The recommendations were given out as incentive clauses for VM re-proposal in contract documents, commitment from top management, forming a VM team with experienced members, and sufficient time to apply VM

Aduze (2014) carried out a study of the prospects and challenges of VM in the Nigerian construction projects. The study concluded that lack of programme as government legislation, client's negative reception, and lack of knowledge about VM are some factors hindering VM application. Lack of awareness about VM in Saudi, Iran and Nigeria could be noticed that it is not the most obstructing factor as found in Hong Kong, Malaysia, and China.

Each of the above-mentioned studies had different inferences about hindrance factors. However, most of the studies revealed that lack of knowledge and awareness about VM is one of the major obstacles for its limited application in the construction industry. Lack of time to implement VM has no consensus as one of the greatest hindrances compared between the studies. Some other noteworthy factors are lack of support from government and parties, especially owners and lack of VM implementation guidelines.

VM simply recognizes that social, psychological and economic conditions may prevent good value. The following are some of the more common hindrances against VM practice in building projects as stipulated in different literature.

2.7.1 Wrong Choice of Procurement Route.

The wrong choice of procurement is a menace to value efficiency. Majority of construction projects in Tanzania have been carried out using relatively small number of projects being employed by other procurement systems (Maro, and Kikwasi, 2009). Strict distinctions between design and construction phases in traditional contracting methods have caused challenging attitudes between design and construction teams, which are in fact, major obstacles to apply VM successfully (Fong and Shen, 2000).

2.7.2 Lack of Awareness about VM by Construction Industry Practitioners.

There is little understanding of VM in among construction industry stakeholders such as clients and some consultants and contractors. So far in Tanzania construction industry very few people have put a hand to do research on VM (Fong and Shen, 2000). In Tanzania, there are no construction institutions that offer courses in VM except for Ardhi University and only in the School of Construction Economics and Management. In Nigeria, there is no known institution that offers value management as a course.

2.7.3 Failure to admit ignorance of certain specialized aspects of Project Development.

Most construction industry designers in Tanzania especially architects become proud and uncooperative when they are advised to make design changes which would bring optimum design [Craig, 1996]. Mostly designers would think of one parameter i.e. architectural beauty and engineering aspects but take no attention in reduction of unnecessary cost. The principal aim of VM is to reduce unnecessary cost while maintaining or increasing the function of the structure.

2.7.4 Lack of Good Communication among Project Stakeholders.

(Cheah, and Ting, 2005) opined that construction projects involve many people with different professionals as well as functions. These may be the client, consultants (architect, Quantity Surveyor, engineer, project manager and construction manager) and contractors. Others are subcontractors, material suppliers, bankers, insurance companies and other public agencies. Collaborations of a team during design stage means exchange of information from one part or design profession to the other, this leads to involved decisions and may result into making better decisions on the designs (Craig, 1996).

During construction stage there has to be a flow of information either from the employer through his consultants or within consultants and contractors. Lack of good communication among project participants have been a barrier to VM. In early works i.e. pre-construction activities, there is both an explicit and implicit charge that poor communication has been a fundamental problem for many years (Cheah, and Ting, 2005).

Communication within the construction team has suffered because inadequate information was available, information was incomplete, rushed and not available in time therefore, this would result to poor value of the project output.

In construction, information is usually prepared by individuals from diverse backgrounds, such as Architects, Quantity Surveyors, Engineers, Subcontractors and Specialist Suppliers, often using different terms and methods of graphical representation. Failure of information, poor quality of information or inappropriate communication modes between different participants in construction projects have been an obstacle to value effectiveness and this causes of poor-quality of final product (Cheah, and Ting, 2005). If there is no good communication among project participants, then VM is believed to be ineffective.

2.7.5 Other Obstacles.

Luvara (2010) depicted other obstacles to VM implementation to include poor human relation, rigid application of standards and traditions without consideration of changing function, technology and value, lack of contractual enactment to support VM, lack of trained value managers in construction industry and conflicts of interest among project stakeholders. Odeyika (2006) recommended the following as the major barriers to the application of value management to construction projects in Nigeria : ambiguous design; time of completion/delay; conflict management; finance; Construction methodology, inadequate knowledge of benefits of value management; lack of involvement of professionals i.e. specialists right from the onset; greediness of the contractors and consultants; lack of total quality management principles in construction firms, professional incompetence; technology level; finance/fund; procurement style; government factor; human factor; communication gap; government policy; unstable economy; poor management especially on the part of the client; lack of professional competence; use of wrong professionals for construction works; lack of understanding of the concept and lack of information.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Methodological processes

This chapter presents the research methodological processes of achieving the objectives of this study. This requires the presentation of research design, population of the study, data sources, sampling techniques and analytical methods. The flow chart for the methodology of the study is presented below:

Figure 3.1 the study methodological flow chart on methodology adopted

Source: Author's Compilation, 2019

3.2. Research Design.

Quantitative approach was used for this study. The research is based on survey study, where a sample of the population is selected and information is collected from this sample. This study investigates the tools being used the construction professionals in the study area, the level of involvement of construction professionals in VM exercise in the study area, the constraints or factors hindering application of VM were identified and examined. The study also identified the benefits associated with the application of VM in construction projects by the professionals in Abuja, Nigeria. Data was collected through closed-ended questionnaires administered to professionals in the built environment. The study utilized descriptive and inferential methods of analysis such as mean, ranking as well as factor analysis, which is data reduction technique that reduces large sets of data to manageable size.

3.3 Population for the Study.

The population for this study comprises of 665 construction professionals in Abuja the capital city of Nigeria. These construction professionals comprise of professionals within the built environment to include builders, architects, quantity surveyors, civil engineers and estate surveyors who are registered with Abuja chapter of their respective professional bodies. Information relating to level of awareness of VM, the extent of the application of VM in construction projects, barriers or factors hindering sustainable application of VM in construction projects and benefits that are derived from the application of VM practice in the study area was sought.

The total number of registered construction professionals in Abuja is put at 665. This total number comprises of construction professionals who are registered with Abuja chapter of their respective professional bodies. (see table 3.1)

3.4 Sample Size

The population of construction professionals in Abuja is unknown. The number of questionnaires to be administered and the sample size for the study population (665, obtained from the professional bodies registered in Abuja) was determined using Yamma's formula model expressed as follows:

$$n = \frac{N}{1 + N(e)^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

Where;

n= Sample size

N= Sample population

e= confidence levels

From the population of 665, the sample size is 250. This number represents the number of respondents that were interviewed.

Table 3.1 Professional composition of population of the study.

S/N	Professional Body	Number
1	Nigerian Institute of Quantity Surveyors (NIQS)	125
2	Nigeria Institute of Builders (NIOB)	110
3	Nigerian Institute of Architects (NIA)	158
4	Nigerian Institution of Estate Surveyors and Value (NIESV)	151
5	Nigeria institute of Civil Engineers (NICE)	121

Total	665

Source: From Professional Bodies, Abuja chapter, 2019.

Table 3.2 Questionnaires Retrieved.

Questionnaires	Number of questionnaire	Percentage
Questionnaire not retrieved	15	6%
Questionnaires retrieved	235	94%
Total Questionnaires administered	250	100

Source: Researcher's field work, 2019

3.4 Data Sources.

3.4.1 Primary Data.

Primary data was collected from construction professionals within the built environment (builders, architects, quantity surveyors, civil engineers and estate surveyors) in Abuja through closed ended questionnaires. The study collected quantitative data through closed ended questionnaires administered to construction professionals in the study area.

3.5 Method of Data Collection.

3.5.1 Questionnaire design

The researcher designed a structured, close-ended questionnaire to obtain relevant data from the respondents for this study. The structured questionnaire was designed to collect information relating to level of awareness of VM, the extent of the application of VM in building projects, barriers or factors hindering sustainable application of VM in construction projects and benefits to be derived from the application of VM practice in the study area.

3.6 Sampling Technique.

The study employed simple random sampling technique to select construction professionals in Abuja. Due to the homogenous nature of information sought from the professionals in the study area, simple random sampling was adopted to select experienced professionals in the construction firms in the study area.

3.7 Method of Data Analyses and Techniques.

The study adopted relevant analytical techniques which include descriptive and inferential techniques, as well as factor analysis. Results were presented mostly using tables and figures.

3.7.1 Descriptive statistics

To examine the use of VM tools by the construction professionals, simple descriptive techniques. These include Mean Item Score (MIS) and Relative Importance Index (RII). This was used to analyse the objective one of this study.

3.7.2 Mean Item Score

This was used to determine the extent at which the construction professionals have applied VM in some of their construction projects. This was carried out to determine the extent at which firms have been using various VM tools in the construction industry. This was measured on 3-point likert scale. Very High Extent (3), High Extent (2), and Low Extent (1).

3.7.3 Mean Likert scale

Mean likert scale is a technique used to measure the mean level of opinion of respondents. This was adopted for objective three to determine the relative importance index of barriers or factors hindering the sustainable application of value management in Abuja construction firms. The rating point for the study shall be as follows: Strongly Agree (SA) = 5, Agree (A)

= 4, Indifferent (I) = 3, Disagree (D) = 2, Strongly Disagree (SD)=1 Values from questions were weighed and Relative Index was derived in line to provide the consensus opinion of the respondents. The sum on each item was divided by the totality of respondents to derive the average or mean value.

The MS was estimated using the formula in equation (1) below

$$MS = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{N} \quad (3.2)$$

The relative importance index (RII) is also determined as follows: RII = MS/HRF (Highest Rating factor)

Where n is the score given by the stakeholders based on five-point scale of 1to 5 and N the number of respondents.

3.7.4 Kaiser's criterion:

One of the most commonly used techniques in factor analysis is known as Kaiser's criterion, or the eigenvalue rule. Using this rule, only factors with an eigenvalue of 1.0 or more are retained for further investigation. The eigenvalue of a factor represents the amount of the total variance explained by that factor.

3.7.5 Scree test:

This involves plotting each of the eigenvalues of the factors (by SPSS) and inspecting the plot to find a point at which the slope of the curve changes direction and becomes horizontal.

Table 3.3: Objectives of the Study, Methods of analysis and Analytical techniques.

Objectives of Study	Method	Analytical techniques
To identify tools used in VM practice in the construction industry.	Descriptive /inferential	Mean, RII and chi-square test
To examine the extent of the application of VM among building professionals in Abuja.	Descriptive/ Inferential	Mean, RII & chi-square test
To assess the factors hindering the application of VM practice in construction industry.		Factor analysis
To examine the benefits associated with the implementation of VM practice in construction firms practising in Abuja, Nigeria.		Factor analysis

Source: Researcher's compilation, 2019

3.8 KMO and Bartlett's Test

KMO (Kaiser-Mayer-Olkin measure of sampling adequacy) and Bartlett's test of sphericity are validity and reliability tests. It is considered important to test sampling adequacy for the purpose of further analysis and to test hypothesis of non- correlation matrix in factor analysis. Factor analysis is a data reduction technique. It takes a large set of variables and looks for a way the data may be reduced or summarized using a smaller set of factors or components.

Table 3.4 shows the result of KMO (Kaiser-Mayer-Olkin measure of sampling adequacy) test and Bartlett's test of sphericity. In order to establish the strength of the factor analysis solution, it is essential to establish the reliability and validity of the reduction of data through KMO and Bartlett's test of sphericity. Bartlett's test of sphericity should be significant ($p<.05$), while the KMO index ranges from 0 to 1, with 0.6 suggested as the minimum value for a good factor analysis.

From Table 3.4, *p*-value is 0.000 which is less than 0 .05 and KMO value is .633 indicating that factor analysis can be used for the given set of data; in other words, the sample is adequate for factor analysis.

Table 3.4 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.633
Bartlett's Test of Sphericity	Approx. Chi-Square	4573.936
	Df	1128
	Sig.	.000

Source: Researcher's analysis, 2019

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION.

4.1. Presentation and Discussion of Results

4.2.1 Demographic Information on Respondents.

The demographic information of respondents is presented in Table 4.1. From the table, 43.4% of the respondents had their first degree as their academic qualification; most of the respondents comprised of builders (43%) and followed by quantity surveyors (30.6%). Most of these respondents are corporate members of their professional bodies and 61.7% of the sampled respondents had over 21years work experience in the built environment profession. This information indicated that the sampled respondents were the right and qualified professionals from which the right information on the subject matter was sought.

Table4.1Demographic information on respondents

Information of Respondents		Frequency	Percentage
	HND	73	31.1
	PGD	10	4.3
	B.sc/B.tech	102	43.4
Educational Qualification	M.SC	8	3.4
	PhD	6	2.6
	ND	36	15.3
	Total	235	100.0
	Architecture	18	7.7
	Building	101	43.0
Profession of Respondents	Quantity surveying	72	30.6
	Civil Engineering	32	13.6
	Estate Surveying	12	5.1
	Total	235	100.0
	Graduate	10	4.3
Professional Qualification	Probationer	22	9.4
	Corporate	177	75.3
	Fellow	26	11.1
	Total	235	100.0
	below 5years	10	4.3
Year of Experience	6-10yrs	20	8.5
	11-20yrs	60	25.5
	21yrs and above	145	61.7
	Total	235	100.0

Source: Field Survey, 2019

4.2.2 Identification of VM tools used in Construction

The extent of the use of Value Management tools is presented in Table 4.2. The result revealed that the entire value management tools have high relative importance index, indicating that all the VM tools were always used in construction projects. The relative importance index for brainstorming is ranked first indicating that it is mostly used than the others while life cycle cost analysis is used more than function analysis and evaluation matrix. The result of chi-square test is used to determine if the opinion of professionals is statistically related or not. Therefore, the chi-square statistics at 20.11 is statistically significant as p-value at 0.00 is less than 0.05 level of error (level of precision), this indicates that the opinion of the professionals on the use of VM tools were significantly related.

Table 4.2 Extent of the Use of Value Management Tools

	N	Minimum	Maximum	Mean	Std. Deviation	RII	Rk	Chi-sq	p-value
Brainstorming	235	1.00	5.00	4.4426	.72198	0.89	1	20.11	0.000
function analysis(FAST)	235	1.00	5.00	4.4085	.70645	0.88	3		
Life cycle cost analysis	235	1.00	5.00	4.1745	1.07387	0.89	2		
Evaluation matrix	235	1.00	5.00	4.1319	1.13776	0.88	3		
Valid N (listwise)	235								

Source: Researcher's analysis, 2019

4.2.3 Application of Value Management

The result of descriptive analysis of awareness of value management application in construction presented on three-point likert scale (very high-3, high-2 and low-1) showed the mean, standard deviation and ranking of value management (VM) in the study area. The ranking revealed that there is very high level of awareness of value management by the respondents as all the items maintained a very high ranking.

Table 4.3 Application of Value Management in Construction

	N	Minimum	Maximum	Mean	Std. Deviation	Rk
level of awareness of value management	235	1.00	3.00	2.70	.58159	4
Adoption of value management in your organization	235	1.00	3.00	2.72	.57203	3
Involvement in value management exercise	235	1.00	3.00	2.65	.59696	5
Level of Cost effectiveness measure in VM	235	1.00	3.00	2.77	.55102	2
Level of safety and security measures in VM	235	1.00	3.00	2.62	.65141	6
Time management in VM	235	1.00	3.00	2.70	.58159	4
Level of adoption of Quality control and management	235	1.00	3.00	2.84	.46765	1
Valid N (listwise)	235					

Source: Researcher’s analysis, 2019

4.2.4 Establishing the benefits of Value Management.

The descriptive analysis of the benefits of value management is measured on five-point likert scale (strongly agree-5 Agree-4, indifferent-3 disagree-2 and strongly disagree-1). The average benchmark at 3.00 (5+4+3+2+1=15/5=3.00) is a minimum consideration for each of the items to be considered the perceived benefits. Therefore, all the benefits of value management were strongly considered as benefits of value management.

4.3. Factors hindering the application of VM practice in the construction industry.

The result of the factors hindering the application of value management (VM) practice in construction is measured on five-point likert scale (strongly agree-5 Agree-4, indifferent-3 disagree-2 and strongly disagree-1). The average benchmark at 3.00 (5+4+3+2+1=15/5=3.00) is minimum consideration for the each of the items to be considered as hindering factors. Therefore, all the factors hindering the application of VM practice were strongly considered as hindrances to value management practice in the study area.

Table 4.4 Factors hindering the application of VM practice in Construction Industry.

S\N	VARIABLES	MEAN	RANK
1	Technical and public policy	4.660	1
2	Professional negligence	4.631	2
3	Non-complacency and management defects	4.630	3
4	Human factor and inflexibility	4.520	4
5	Lack of manpower	4.491	5
6	Poor knowledge	4.468	6

Source: Researcher's analysis, 2019

4.4 Hindrance factors to Value Management

The result of total variance of factor analysis is presented in Table 4.8 (Appendix C). It showed the result of total variance of extraction loading after rotation. The cumulative variance of the six most correlated hindrance factors of value management in Abuja is presented in table 4.7. The eigenvalue in the table, and the total eigenvalue revealed the amount of total variance in the original variables accounted for by each of the components. The variance is simply the ratio of variance accounted for by each of the components to the total variance of the variables. The analysis required the first six components to be extracted from extracted solution and the most highly emphasized six the most correlated hindrance factors of value management in Abuja. The extraction of sum of the square loadings in the second section explained the variability in original 28 variables. The extracted components explained 65.690% variability in the original variables. Therefore, this study considerably reduced the data by selecting the extracted components as the most emphasized factors or components with minimum of 34.31% loss of information.

Table 4.5 Total Variance of Hindrance Factors to Value Management

++Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.078	28.851	28.851	8.078	28.851	28.851	4.084	14.587	14.587
2	3.300	11.786	40.637	3.300	11.786	40.637	3.484	12.444	27.031
3	2.385	8.519	49.156	2.385	8.519	49.156	3.383	12.082	39.112
4	2.082	7.435	56.591	2.082	7.435	56.591	2.886	10.306	49.418
5	1.387	4.953	61.544	1.387	4.953	61.544	2.845	10.161	59.580
6	1.161	4.146	65.690	1.161	4.146	65.690	1.711	6.110	65.690
7	.986	3.520	69.210						
8	.892	3.184	72.394						
9	.852	3.044	75.438						
10	.800	2.856	78.294						
11	.727	2.598	80.892						
12	.679	2.425	83.317						
13	.637	2.276	85.593						
14	.511	1.825	87.417						
15	.480	1.713	89.130						
16	.462	1.650	90.780						
17	.363	1.295	92.075						
18	.341	1.216	93.291						
19	.292	1.044	94.335						
20	.271	.968	95.303						
21	.264	.944	96.247						
22	.217	.775	97.022						
23	.196	.702	97.723						
24	.178	.637	98.360						
25	.151	.538	98.898						
26	.112	.400	99.297						
27	.106	.379	99.677						
28	.091	.323	100.000						

Extraction Method: Principal Component Analysis.

4.5 Scree Plot of components analysis of hindering factors of Value Management

The result of scree plot analysis hindrance factor to value management in Abuja is presented in figure 4:2. It showed eigenvalue of each component of the initial solution. The extraction of fourteen components is done at slope and contributed about 65.690% cumulative variance, and therefore the components at shallow slope contribute little to the solution (ab0ut 34.31%). The last drop occurs between fifth and sixth components.

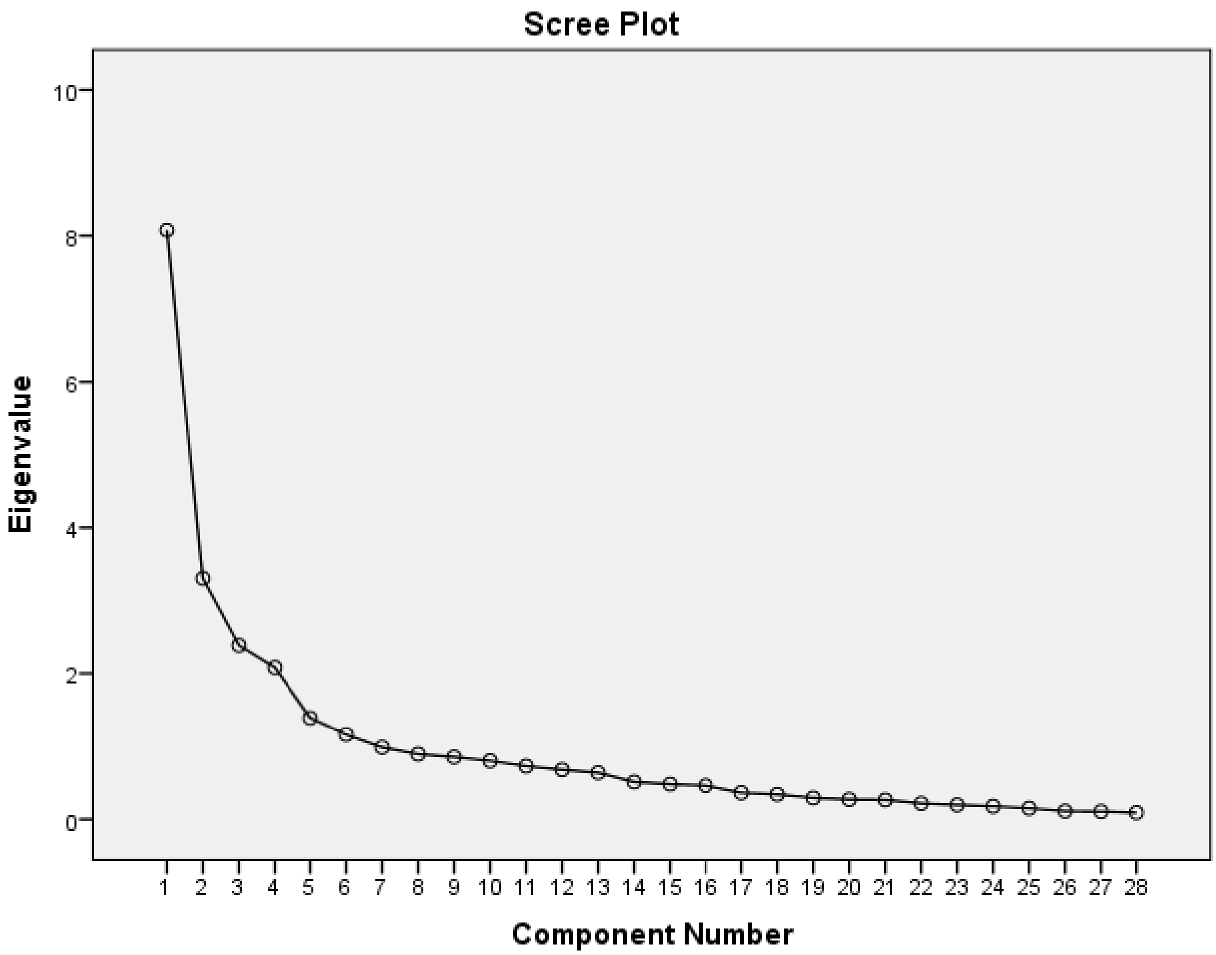


Figure 4.1: Scree Plot of components analysis of hindrance factors of VM.
Source: Researcher's analysis, 2019

4.6 Factor Loading Analysis of hindrance factors to VM in construction.

The result of factor loading analysis of hindrance factors is presented in table 4.8 (Appendix C). The result revealed that the six factors were loaded which constituted about 65.690% variance in the factors hindering value management application. The cut-off point for this study is taken 0.5 and above as general rule of thumb. The most important factor one (1) is technical and public policy factors and it explained about 14.587% variance in the determination of factors hindering value management application.

Factor (2) is professional negligence and it explained 12.444% variance in the factor hindering value management application, factor (3) is named as Non- complacency and management defect and it explained 12.082% variance in the determination of factors hindering value management application. Factor four (4) is named as Human factor and inflexibility, and it explained 10.306% variance in determining the factors hindering value management application. Factor (5) is named as lack of manpower and project focus, and it explained 10.161% variance in the determination of factors hindering value management application. Factor (6) is named as poor knowledge, and it explained 6.11% variance in the determination of factors hindering value management application.

4.7 Factor loading analysis of benefits of Value Management

The result of total variance of factor analysis showed the total variance of extraction loading after rotation.

The cumulative variance of fourteen (14) of the most correlated benefit factors of value management in Abuja is presented in table 4.7a and table 4,7b (Appendix B). The eigenvalues in the table, and the total eigenvalue revealed the amount of total variance in the original variables accounted for by each of the components. The variance is simply the ratio of variance accounted for by each of the components to the total variance of the variables. The analysis required the first seven components to be extracted and the first fourteen components form extracted solution and the most highly emphasized fourteen the most correlated benefit factors of value management in Abuja. The extraction of sum of the square loadings in the second section explained the variability in original 47 variables. The extracted components explained 66.169% variability in the original variables. Therefore, this study considerably reduced the data by selecting the extracted components as the most emphasized factors or components with the minimum of 33.83% loss of information.

Table 4.6 Total Variance of factor a+nalysis of Benefits of Value Management

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.629	11.976	11.976	5.629	11.976	11.976	3.563	7.582	7.582
2	3.714	7.902	19.878	3.714	7.902	19.878	3.208	6.825	14.406
3	3.348	7.123	27.001	3.348	7.123	27.001	3.027	6.440	20.846
4	2.611	5.555	32.556	2.611	5.555	32.556	2.775	5.905	26.751
5	2.577	5.483	38.039	2.577	5.483	38.039	2.549	5.423	32.175
6	2.036	4.332	42.371	2.036	4.332	42.371	2.466	5.246	37.421
7	1.890	4.021	46.393	1.890	4.021	46.393	2.251	4.789	42.210
8	1.624	3.454	49.847	1.624	3.454	49.847	2.217	4.716	46.927
9	1.593	3.389	53.236	1.593	3.389	53.236	1.646	3.502	50.428
10	1.336	2.843	56.079	1.336	2.843	56.079	1.630	3.468	53.896
11	1.263	2.688	58.767	1.263	2.688	58.767	1.529	3.253	57.149
12	1.217	2.588	61.356	1.217	2.588	61.356	1.439	3.062	60.211
13	1.185	2.522	63.878	1.185	2.522	63.878	1.422	3.025	63.236
14	1.077	2.291	66.169	1.077	2.291	66.169	1.378	2.933	66.169
15	.981	2.088	68.257						
16	.947	2.015	70.272						
17	.912	1.940	72.212						
18	.879	1.870	74.083						
19	.818	1.741	75.824						
20	.814	1.732	77.556						
21	.778	1.656	79.212						
22	.728	1.550	80.762						
23	.672	1.430	82.192						
24	.640	1.362	83.554						
25	.604	1.285	84.839						
26	.590	1.256	86.095						
27	.549	1.169	87.264						
28	.532	1.131	88.394						
29	.467	.994	89.388						
30	.465	.988	90.377						
31	.429	.913	91.290						
32	.407	.866	92.156						
33	.393	.836	92.992						
34	.370	.787	93.779						
35	.337	.717	94.495						
36	.323	.687	95.182						
37	.309	.658	95.841						
38	.286	.608	96.448						
39	.259	.551	96.999						
40	.256	.544	97.543						
41	.229	.487	98.030						
42	.217	.463	98.493						
43	.201	.428	98.921						
44	.189	.402	99.323						
45	.138	.293	99.616						
46	.109	.231	99.847						
47	.072	.153	100.000						

Extraction Method: Principal Component Analysis.

4.8 Scree plot of benefits of Value Management.

The result of scree plot analysis of benefit factors of value management in Abuja is presented in figure 4:1. It showed eigenvalue of each component of the initial solution. The extraction of fourteen components is done at slope and contributed about 66.169% cumulative variance, and therefore the components at shallow slope contribute little to the solution (about 33.831%). The last drop occurs between thirteen and fourteen components.

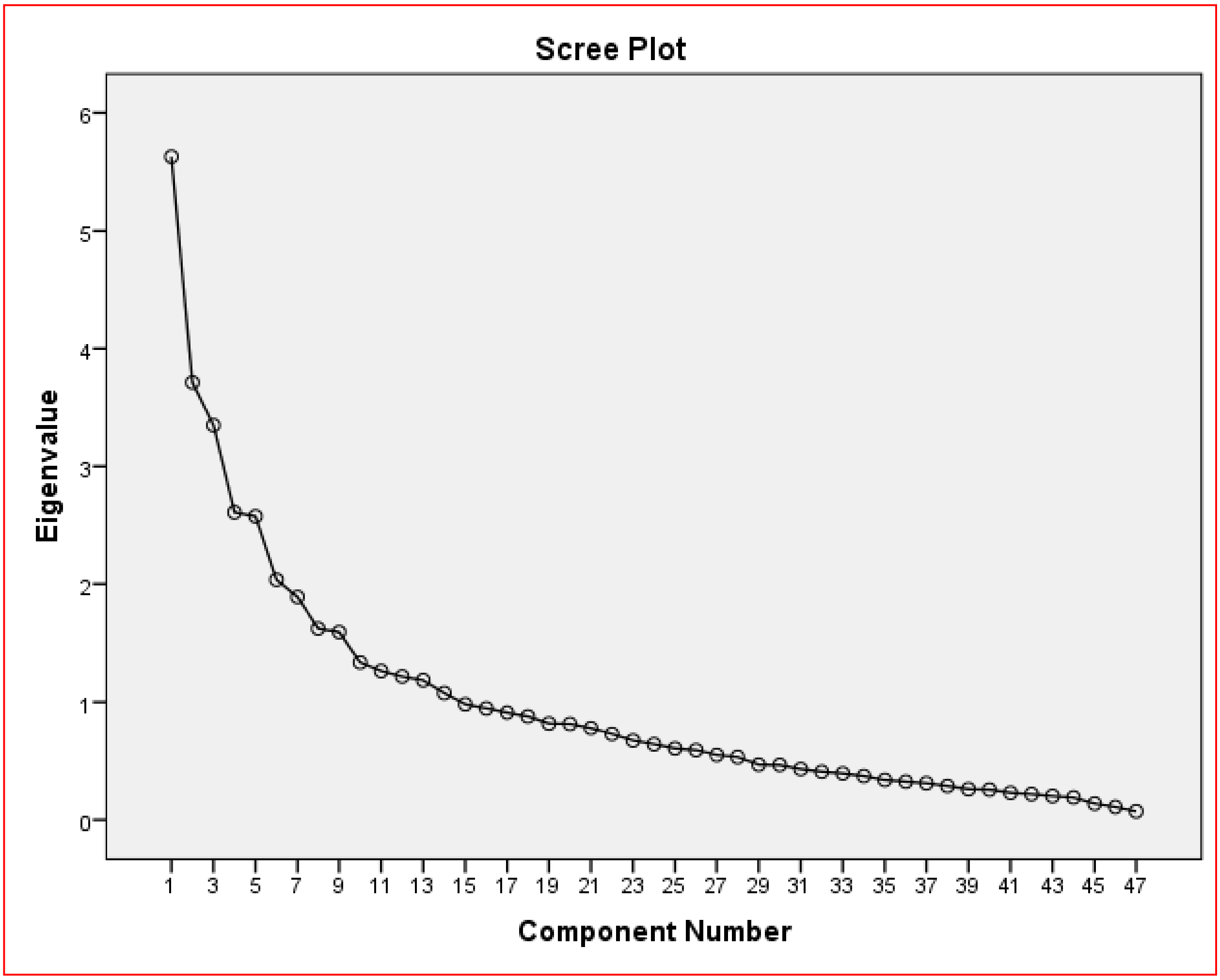


Figure 4.2 Scree Plot of Components Analysis of Benefit Factors of Value Management.

4.9 Factor loading analysis of VM benefits in construction

The result of factor analysis of VM benefits is presented in table 4.8a and table 4.8b (Appendix B). It revealed that fourteen benefit factors were loaded which constituted about 66.169% variance in the benefit factors of value management. The cut-off point for this study is taken 0.5 and above as general rule of thumb. The most important benefit Factor one (1) is Performance Benefit and it explained about 7.582% variance in the determination of benefit factors of value management. Factor (2) is Technological and productive Benefit and it explained 6.825% variance in the benefit factors of value management, Factor (3) is named as Effective Cost and value Benefit and it explained 6.440% variance in the determination of benefit factors of value management. Factor four (4) is named as Quality standard benefit, and it explained 5.905% variance in the determining the benefit factors of value management. Factor (5) is named as Innovative Benefit, and it explained 5.423% variance in the determination of benefit factors of value management. Factor (6) is named as Functional Performance Benefit, and it explained 5.246% variance in the determination of benefit factors of value management. Factor (7) is named as Resource management benefit, and it explained 4.789% variance in the determination of benefit factors of value management. Factor (8) is named as Professional Benefit, and it explained 4.716% variance in the determination of benefit factors of value management.

Factor (9) is named as Wastage avoidance benefit, and it explained3.502% variance in the determination of benefit factors of value management. Factor (10) is named as Functional benefit, and it explained 3.468% % variance in the determination of benefit factors of value management. Factor (11) is named as Value management, and it explained 3.253% variance in the determination of benefit factors of value management. Factor (12) is named as Efficient Benefit, and it explained 3.062% variance in the determination of benefit factors of value management. Factor (13) is named as Technical benefit, and it explained 3.025% variance in the determination of benefit factors of value management. Factor (14) is named as Client value management, and it explained 2.933% variance in the determination of benefit factors of value management.

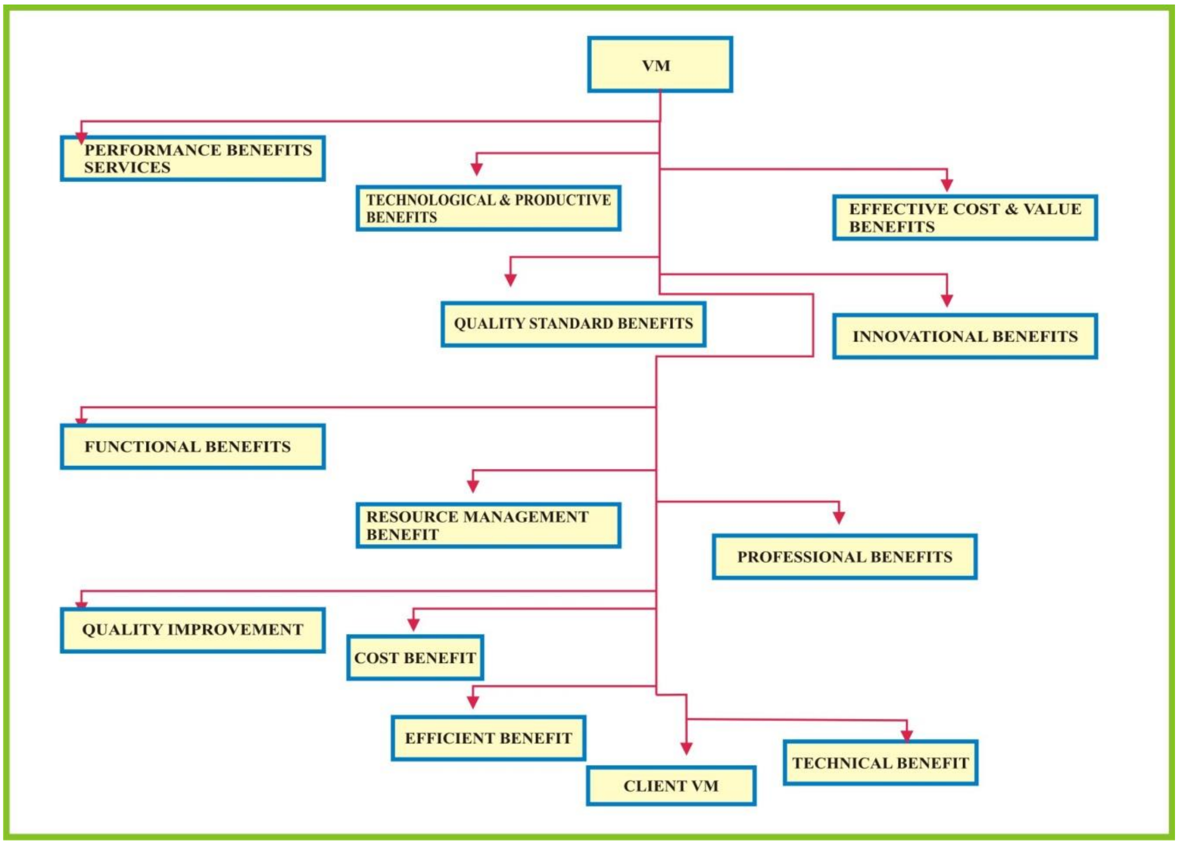


Figure 4.3 Benefits of Value Management.

Source: Researcher's analysis, 2019

4.10 Framework for VM implementation

A proposed framework the for the implementation of value management in the construction industry is shown on figure 4.5

This section presents the factors hindering the application of value management, the strategies (tools) used in VM practice and the inherent benefits that can be derived from VM implementation. The result of factor analysis of hindrance factors to VM practice is shown on table 4.7. The result revealed that six (6) factors were loaded which constituted about 65.690% variance in original twenty-eight (28) factors hindering VM implementation. These emphasized (rotated) factors are as follows; technical and public policy factors (8.078), professional negligence (3.300), non-complacency and management defects (2.385), human factors and inflexibility (2.082), lack of manpower and project focus (1.387) and poor knowledge (1.161).

The strategies (tools) used in overcoming the aforementioned hindrances or challenges are as follows; brainstorming, function analysis, life cycle cost analysis and evaluation matrix. Effective use of these VM tools can result in overcoming the aforementioned hindrances or challenges, thereby yielding value for money to project stakeholders in the construction industry.

The result of factor analysis of benefits of VM is presented on table 4.9a and 4.9b.

The result showed that fourteen (14) benefit factors were loaded, which constituted 66.169% in the original forty –seven (47) variables. These benefit factors are as follows; performance benefits (5.629), technological and productive benefits (3.714),effective cost and value benefits (3.348), quality standard benefits (2.611), innovative benefits (2.577), functional performance benefits (2.036), resource management benefits (1.890), professional benefits (1.624), wastage avoidance benefits (1.593), functional quality benefit (1.336), cost benefit (1.263), efficient benefits (1.217), technical benefits (1.185) and client value management (1.077).

In order to achieve these benefits, construction stakeholders should be proactive in handling the aforementioned hindrances to VM by using the strategies (tools) described so that clients and projects stakeholders can have value for building projects in the Nigerian construction industry.

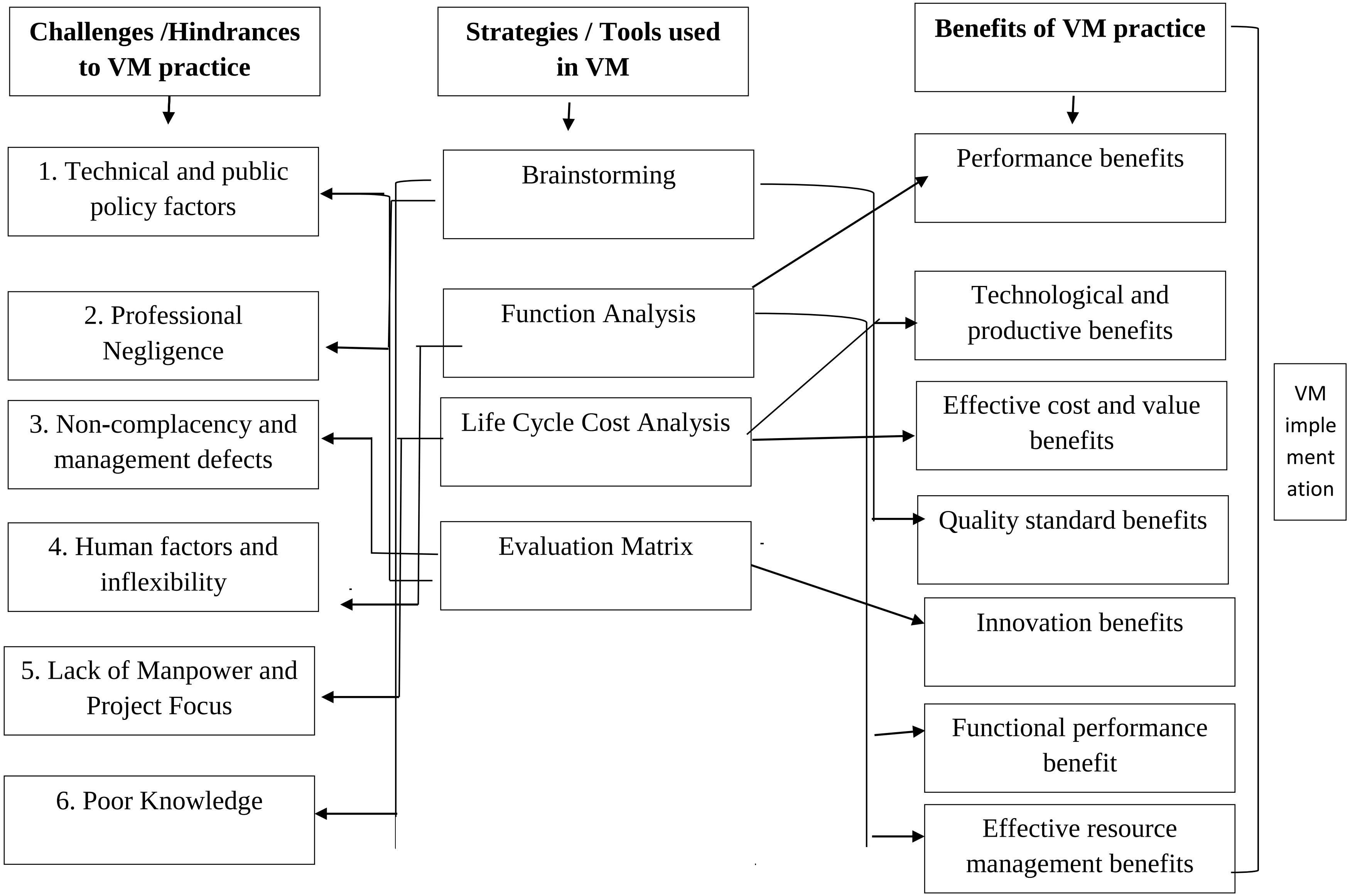


Figure 4.4 Framework for VM Implementation

Sourcce: Researcher's compilation, 2019

4.11 Summary of Findings

1. Objective one: (Tools used in Value Management practice)

The study identified four (4) Value Management tools being used by the construction professionals in the study area. These include brainstorming, function analysis technique, life cycle cost analysis and evaluation matrix. However, brainstorming and function analysis are more frequently used than life cycle cost analysis and evaluation matrix as indicated by the high relative importance index (RII) of brainstorming and function analysis.

2. Objective two: (Extent of the application of Value Management by construction professionals)

This objective has to do with the level of participation in Value Management practice by construction professionals. The result of the descriptive analysis on the extent of application of Value Management in construction showed that the professionals involvement in the following; level of awareness of Value Management, adoption of Value Management in professional’s organization, professional’s involvement in Value Management exercise, level of cost effectiveness measure in Value Management, level of safety and security measure, time management and level of adoption of quality control and management.

From table 4.3, all the items showed high ranking, indicating that all the items are usually considered as benefits by the professionals in Value Management practice

3. Objective 3: (Hindrance Factors to Value Management).

The descriptive analysis of the factors hindering the application of Value Management practice in construction is shown on table 4.6

The average benchmark of 3.00 is a minimum consideration for each of the items to be considered as a hindering factor to Value Management practice.

From table 4.6, all the items have a minimum value of over 3.00, indicating that all the items were strongly considered as factors hindering Value Management practice by the professionals in the study area.

The result of factor loading analysis of hindrance factors is presented on table 4.7

The result revealed that six (6) factors were loaded which constituted about 65.69% variance in the original twenty-eight (28) factors hindering value management application. These factors are stated as follows, with their eigenvalues: Public policy factors (8.078), professional negligence (3.300), non-complacency and management defects (2.385)), human factors (2.082)), lack of manpower and project focus (1.387) and high cost of conducting VM workshops (1.161).

4. Objective 4: Benefit factors of Value Management Practice.

The result of factor loading analysis of benefit factors of Value Management practice is presented on table 4.10 and table 4.11. The result revealed that fourteen (14) benefit factors were loaded which constituted 66.169% variance in the original forty-seven (47) variables. These benefit factors are stated as follows, with their eigen values: performance benefits (5.629), technological and productive benefits(3.714), effective cost and value benefits (3.348), quality standard benefits (2.611), innovative benefits (2.577), functional performance benefits(2.036), resource management benefits(1.890), professional benefits(1.624), waste avoidance benefits(1.593), functional quality benefits(1.336), cost benefits(1.263), efficient benefits (1.217), technical benefits(1.185) and client value management(1.077).

5. Objective five: Proposed Framework for Value Management Implementation.

The framework presents the factors hindering the application of value management, the strategies (tools) used in VM practice and the inherent benefits that can be derived from VM implementation. The result of factor analysis of hindrance factors to VM practice is shown on table 4.7. The result revealed that six (6) factors were loaded which constituted about 65.690%

variance in original twenty-nine (29) factors hindering VM implementation. These emphasized (rotated) factors are as follows; technical and public policy factors (8.078), professional negligence (3.300), non-complacency and management defects (2.385), human factors and inflexibility (2.082), lack of manpower and project focus (1.387) and poor knowledge (1.161).

The strategies (tools) used in overcoming the aforementioned hindrances or challenges are as follows; brainstorming, function analysis, life cycle cost analysis and evaluation matrix. Effective use of these VM tools can result in overcoming the aforementioned hindrances or challenges, thereby yielding value for money to project stakeholders in the construction industry.

The result of factor analysis of benefits of VM is presented on table 4.9a and 4.9b.

The result showed that fourteen (14) benefit factors were loaded, which constituted 66.169% in the original forty –seven (47) variables. These benefit factors are as follows; performance benefits (5.629), technological and productive benefits (3.714),effective cost and value benefits (3.348), quality standard benefits (2.611), innovative benefits (2.577), functional performance benefits (2.036), resource management benefits (1.890), professional benefits (1.624), wastage avoidance benefits (1.593), functional quality benefit (1.336), cost benefit (1.263), efficient benefits (1.217), technical benefits (1.185) and client value management (1.077).

In order to achieve these benefits, construction stakeholders should be proactive in handling the aforementioned hindrances to VM by using the strategies (tools) described so that clients and projects stakeholders can have value for building projects in the Nigerian construction

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS.

5.1 Conclusion.

The study examined the application of value management in construction industry Abuja, with a view to developing a framework for Value Management implementation in Nigerian Construction Industry. Primary data was collected from construction professionals (architects, quantity surveyors, engineers and estate surveyors) in the study area through closed ended questionnaires.

Descriptive statistics (mean item score and relative importance index) were used to identify value management tools, respondents' level of involvement in value management practice, while factor analysis was used to determine the factors hindering value management practice as well as the benefits associated with value management practice. The result revealed that six (6) factors were identified as hindering factors, which constituted 65.690% variance in the original factors hindering value management application. These factors include technical and public policy factors, professional negligence, non-complacency and management defects, human factors, lack of manpower and project focus and poor knowledge. Four (4) tools identified and being used as tools in VM practice include brainstorming, function analysis (FAST), Life cycle cost analysis and evaluation matrix. The study further identified seven important benefits of value management which include performance benefit, technological and productive benefit, effective cost and value benefit, quality standard benefit, innovative benefit, functional performance and effective resource management. The result of factor analysis was used to develop a framework for value management, which if implemented, will enhance efficient project delivery and value for money for construction stakeholders.

In the process of implementing value management, these hindering factors identified by the professionals posed challenges to value management implementation. The project manager is required to be proactive in addressing the aforementioned factors as they posed critical set back to value management implementation in Nigerian construction industry. Failure to address these factors imply that construction projects will continue to suffer time and cost overruns in the Nigerian Construction Industry

5.2 Recommendations.

From the findings of this study, the following recommendations are made:

1. The use of life cycle cost analysis and evaluation matrix as value management tools should be encouraged because they are less frequently used by the construction professionals in the study area.

2. The researcher recommends that refresher courses and workshops be organized by professional bodies in Nigeria, this will increase the awareness level and practice of value management by construction professionals.

3. Hindrance factors of value management: One of the major risks to adoption of value management is the initial period it takes to complete the exercise. The most common approach is the 40-hour workshop which is about a working week (using normal eight (8) hours in a day). Most intending value management participants find it difficult to be away from their day-day activities for a whole week.

The researcher therefore, recommends the use of the three-day workshop approach which is shorter than the 40-hour approach.

Based on the findings from this study, the researcher developed a framework for value management implementation. The researcher therefore, recommends the use of this framework to encourage Value Management practice in Nigerian construction industry.

5.3 Suggested Areas for Further Study.

1.The researcher suggests that Value Management be carried out on an ongoing project. Such research will reveal whether or not Value Management has some influence on a construction project.

2. Research on Value Management practice should be carried out in different parts of the country. This will ascertain the level of value management practice in the entire country.

5.4 Contribution to Knowledge.

The findings from the study have the following as contribution to knowledge:

1. VM tools used by construction professionals were identified by the study. These include brainstorming, function analysis, life cycle cost analysis and evaluation matrix. Effective use of these VM tools will lead to efficiency in building projects and aid in meeting the clients' needs in the construction industry.

2. Factors hindering the successful application of VM were identified. These include professional negligence, technical and public policy factors, non-complacency and management defects, inadequate manpower and lack of project focus, human factors and high cost of conducting VM workshops. If emphasis is focused on how these hindering factors can be eliminated, there is going to be improvement in project delivery by construction stakeholders.

3. Benefit factors were also identified by the study. These include performance benefits, technological and productive benefits, effective cost and value benefits, quality standard benefits, innovation benefits, functional benefits, resource management benefits, professional benefits, quality improvement benefits, cost benefits, efficient benefits, technical benefits and client value benefits. These benefit factors can enhance project buildability and improve projects' value in the construction industry.

4. A framework has been developed by the researcher, which if implemented in value management practice, would enhance timely delivery of projects and ensure that project stakeholders have value for money.

REFERENCES

Abidin, N.Z. & Pasquire, C.L. (2006). Revolutionize value management: a mode towards sustainability. *International journal of project management.* 12 October 2006, 2(3).275-279

Adebowale, O, J. & Fapohundah, J. A. (2014). Adverse impacts of design team on construction workforce productivity. *Proceedings of 8th Construction Industry Development Board postgraduate conference*,10-11 February,2014, University of Witwatersrand, Johannesburg, South Africa,111-119.

Aduze, O.C. (2014). A Study of the Prospects and Challenges of Value Engineering in Construction Projects in Delta and Edo States of Nigeria. MSc diss., NnamdiAzikiwe University. *www.value-eng.org. [Accessed on 3 August 2014.*

Aghimien, D. O, Oke, A.E, & Aigbavboa, C.O (2018). Value Management for Sustainable Built Environment in Nigeria. *Proceedings of the International Conference on Industrial Engineering and Operations Management Bandung, Indonesia, March 6-8, 2018.*© IEOM Society International

AI-Yami, A. (2008). An integrated approach to value management and sustainable construction during strategic briefing in Saudi construction projects. PhD Thesis., Loughborough University.

Ashworth, A. & Hogg, F., (2010) The development of a value management approach for the Saudi public sector. *RICS COBRA Research Conference, University of Cape Town,* 60-70

Ashworth, A.S., (2005). Pre-contract studies*: Development economics, tendering and estimating*. Oxford. Blackwell publishing

Australian Standard (2007), http://www.ncc.or.tz/service.html retrieved on 14th January,2017

Bowen, P., Cattell, K., Edwards, P. & Jay, I. (2010). Value Management practice by South African quantity surveyors. *Facilities,* 28(12): 46-63.

Celik, T. (2010). *Value Management*. Lecture note. Department of Civil Engineering, Eastern Mediterranean University (EMU).

Cheah, C.Y.J. & Ting, S.K. (2005). Appraisal of Value Engineering in construction in Southeast Asia. *International Journal of Project Management,* 23(2): 151-158.

Cloete, C.E. (2008). Classnotes- Value management and life cycle costing. University of Pretoria, from http://www.ivm.org.uk/what_vm.htm

Craig, S. 1996, *Optimization of Designs in Construction*, Brick Wells & Specers,

De Leeuw, C. P. (2006). Value management – The new frontier for the quantity surveyors. *Paper presented at the 22nd Biennial conference/general meeting on Quantity surveying in The 21st Century – Agenda for the Future.* Nigerian Institute of Quantity Surveyors.

Ellis, R. C. T., Wood, D. G., & Keel, D. A. (2005). Value Management practices of leading UK cost consultants. *Construction Management and Economics, 23*, 483-493. Englewood Cliffs, NJ: Prentice Hall.

Fard, A.B., Rad, K.G., Sabet, P.G.P. & Aadal, H. (2013). Evaluating Effective Factors on Value Engineering Implementation in the Context of Iran. *Journal of Basic and Applied Scientific Research,* 3(10): 430-436

Finnigan, A. (2001). Value engineering. The University of Queensland. Design methods factsheet. Retrieved May 12 from http://www.mech.uq.edu.au/courses/mech4551/

Fong, P.S & Shen, Q. (2000). 'Is the Hong Kong Construction Industry Ready for Value Management?' *International Journal of Project Management,* 18(5), 317-326.

Graham, D. Gronqvist, M. Kelly, J. Males,S. (2006). Managing value as a management style for projects. *Value solutions*,4(2) 21-32.

Hayles, C. (2004) The role of value management in the construction of sustainable communities. *The Value Manager,* 10(1), 15-19

Jaapar, A. (2006). *T*he Application of Value Management in the Malaysian Construction Industry and Development of Prototype Value Management Guidelines. Universiti Teknologi MARA, Shah Alam, Selangor.

Jaapar, A., & Torrance, J. V. (2007). Prototype Value Management Guidelines for the Malaysian Construction Industry. *Paper presented at the QSIC 2007- Enhancing and Empowering the Profession, Crown Plaza Mutiara Hotel, Kuala Lumpur, Malaysia*.

Kelly, J. (2007). Making client values explicit in value management workshops. *Construction Management and Economics, 25(4): 435-442*

Kelly, J., & Male, S. (2006). Value management. Best value in construction, United Kingdom: Blackwell publishing, 77-99

Lai, N.K. (2006). Value Management in Construction Industry. MSc thesis., Technology University Malaysia.

Latief, Y. & Untoro K. I.V. (2009). Implementation of Value Engineering in the Infrastructure Services of Indonesia's Public Works Department. *SAVE International, 32(3): 10-14.*

Li, X. & Ma, W. (2012). Appraisal of Value Engineering Application to Construction Industry in China. Y.Zang (Ed.): Future Wireless Networks and Information Systems, LNEE 144: 303-311

Liman, D,(2010) Value management in project definition and goals, www.mymanagementguide.com, Retrieved on 16 August,2018.

Luvara, V.G.M. (2010), Towards Value Management Practice in Building Projects of Tanzania. Master's thesis, Archi University, Da res Salam.

Male, S. & Kelly J. (2008). A re-appraisal of value methodologies in construction. Retrieved November 10, 2008 from http://www.ivm.org.uk/

Malla, S. (2013). Application of Value Engineering in Nepalese Building Construction Industry. Retrieved from: http://professionalprojectmanagement.blogspot

Maro, G. & Kikwasi, G.J. 2009, Appropriate Skills for Project Management System and Its Adoption in Tanzania Construction Sector, in ASOCSA. *Proceedings, 4th Built Environment Conference, ASOCSA, 17-19 May, Livingstone-Zambia*.

Noor, N.F., Kamruzzaman,S.N. & Ghaffar,N.A.2015, Sustainability concern in value management: A study on Government building projects, *International Journal of Current Research and Academic Review,* Special Issue(2), 72-83

Odeyinka, H. A. (2006). The role of the quantity surveyor in value management. *Paper presented at the 22nd Biennial conference/general meeting on Quantity surveying in the 21st Century – Agenda for the Future.* Nigerian Institute of Quantity Surveyors.

Oke, A.E & Aigbavboa C.O(2017) *Sustainable Value Management for Construction Projects.* Springer International Publishing Company.

Oke, A.E & Ogunsemi D.R (2016) Value Management in the Nigerian Construction Industry: Militating Factors and the Perceived Benefits: *Second International Conference on Advances in Engineering and Technology.*

Oke, A.E, Aghimien, D.O. & Olatungi, S.O. (2015), Implementation of Value Management as an Economic Sustainability Tool for Building Construction in Nigeria, *International Journal of Managing Value and Supply Chain*,6(4), 55-64.

Olanrewaju, A. L., & Khairuddin, A. R. (2007). Value management: New direction for Nigerian quantity surveyors. *Proceedings of a conference on Leading through innovation. Malaysian Institute of Quantity Surveyors*. 102-109

Olarenwaju, A. L. (2013). Value management: New direction for Nigerian quantity surveyors. *Proceedings of a conference on Leading through innovation. Malaysian Institute of Quantity Surveyors*. 102-109

Olawumi, T.O., Akinrata,E.B., & Arijeloye,B.T,(2016) Value management; creating functional value for construction projects. *World scientific news.* 40-43

Perera, S. & Karunasena, G. (2004). Application of Value Management in the Construction Industry of Sri Lanka. *The Value Manager,* 10(2): 4-8.

Phyo, W.W.M. & Cho, A.M. (2014). Awareness and Practice of Value Engineering in Myanmar Construction Industry. *International Journal of Scientific Engineering and Technology Research,* 3(10): 2022-2027.

Robertson, S.K & Sterling, C.D, (1996) Value Engineering in AACE certificate.

Sabiu, B.Y & Agarwal,V. C. (2016), Minimizing the factors hindering the practice of value management in the Nigerian construction industry. *International Journal of Science, Engineering and Technology Research (IJSETR),5(10), October 2016.*

Shen, Q. & Liu, G. (2003). Critical success factors for value management studies in construction. *Journal of Construction Engineering and Management*, 129(5): 485–491.

Society of American Value Engineers (2008) What is value engineering? Avaiworkshople: http//www.value-org/ (Accessed: February 25th, 2008

Society of American Value Engineers International (2014) Value methodology standard and body of knowledge. *SAVE International Value Standard of value society.*

Spaulding, W. (2005). The use of function analysis as the basis of value management in the Australian construction industry. *Construction Management and Economics*,23 (7)

Stewart, P.S, 2010, Health and Safety Risk Management on Building Construction Sites in Tanzania: The Practice of Risk Assessment, Communication and Control, Licentiate, Chalmers University of Technology.

The College of Estate Management. (1995). Value Management. Retrieved June 12, 1996 from http//www.cem.ac.uk/postalcourses.

The College of Estate Management. (2005) Value engineering. Retrieved May 12,2008 from http://www.cem.ac.uk/postalcourses

The Institute of Value management (2008). What is value management? Retrieved May 12,2008. Retrieved from http://www.ivm.org.uk/what_vm.htm

The Office of Government Commerce. (2007). Value Management in Construction, London. Retrieved May 12, 2018, from http://www.ogc.gov.uk

Thomas, G. (2005). Construction partnering and integrated team working. Oxford: Blackwell publishing Ltd.

Value Management Guideline. (2008) What is Value management: New direction for Nigerian quantity surveyors. Retrieved May 12,2008 from http/www.ivm.org.uk/what vm.htm

Value Management Guidelines. (2005), Communication modes of the design team,

Whyte, A. & Cammarano, C. (2012). Value management in infrastructure projects in Western Australia: techniques and staging. *Proceedings of 28th Annual ARCOM Conference, 3-5 September 2012, Edinburgh, UK, Association of Researchers in Construction Management, 797-80.*

Wilson, D. 2005, Value Engineering in Transportation, NCHRP Synthesis 352.362

Yazdanpanah, A. (2010). Proposed Model for Implementation Expert System for the Planning of Strategic Construction Projects as a Tool for Knowledge Management *.12th IPM congress*

Yeomans,G,A, (2012), Towards Value Management Practice in Building Projects of Tanzania, Master's thesis, Ardhi University, Dares Salaam.

APPENDIX A

SAMPLE OF QUESTIONAIRE

DEPARTMENT OF QUANTITY SURVEYING,

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA NIGER STATE

Dear Sir/Ma,

This questionnaire is designed to collect information for an M.Tech. research titled: **'Framework for Implementation of Value Management practice in Abuja Construction Companies'.** It will be highly appreciated if you kindly complete the attached questionnaire. Please be assured that the questionnaire is completely anonymous and all information received will be treated in strict confidence and used for research purposes only. For any further information or clarification, please feel free to contact the researcher using the contact details provided below. Thank you for your anticipated cooperation.

Name: Danjuma Jacob

Phone No: +2348059029349

Email:jacobkazai75@gmail.com

Section A:

Demographic Information on Respondents

Name of construction firm____

1. Profession of Respondents: Architecture [ ] Building [ ] Quantity surveying [ ] Civil Engineering [ ] Estate Surveying[ ]

2. Academic qualification: HND [ ] PGD [ ] Bachelor [ ] Masters [ ] Ph.D. [ ]

3. Professional membership type: Graduate [ ] Probationer [ ] Corporate[ ] Fellow [ ]

4. Year of Experience: Below 5years [ ] 6-10yrs [ ] 11-20yrs [ ] 21year and above

Section A How Often Do You Use These VM Tools?

1. Brainstorming" always used [ ] sometimes used [ ] occasionally used [ ] rarely used [ ] Never used [ ]

2. function analysis(FAST)", always used [ ] sometimes used [ ] occasionally used [ ] rarely used [ ] Never used [ ]

3. "Life cycle cost analysis: Always used [ ] sometimes used [ ] occasionally used [ ] rarely used [ ] Never used [ ]

4. "Evaluation matrix: always used [ ] sometimes used [ ] occasionally used [ ] rarely used [ ] Never used [ ]

Section B: **Awareness of Value Management.**

1. Kindly indicate your level of awareness of value management: Low [ ] Uncertain[ ] High [ ] Very High [ ]

2. Adoption of value management in your organization: Low [ ] Uncertain[ ] High [ ] Very High [ ]

3. Involvement in value management exercise: Low [ ] Uncertain[ ] High [ ] Very High [ ]

4. Level of Cost effectiveness measure in VM : Low [ ] Uncertain[ ] High [ ] Very High [ ]

5. Level of safety and security measures in VM: Low [ ] Uncertain [ ] High [ ] Very High [ ]

6. Time management in VM: Low [ ] Uncertain[ ] High [ ] Very High [ ]

7. Level of adoption of Quality control and management: Low [ ] Uncertain[ ] High [ ] Very High [ ]

Section C: Factors hindering the application of VM Practice in Construction Industry.

Factors	Extremely High hinder	Highly hindered	Indifferent	Low hinder	Never hinder
Wrong choice of procurement route					
Failure to admit ignorance in certain specialized aspects on project development					
Lack of awareness of VM by practitioners in the construction industry					
Lack of contractual provisions to support VM					
Poor human relation					
Rigid application of standards and tradition without consideration of changing function, technology and value					
Lack of good communication among project stakeholders					
Lack of trained value managers in construction industry					
Conflicts of interest among project stakeholders					
Ambiguous design;					
Time of completion/delay;					
Conflict management					
Inadequate knowledge of benefits of value management					
Lack of involvement of professionals					
Lack of total quality management principles in construction firm					
Greediness of the contractors and consultants					
Lack of total quality management principles in construction firm					
Professional incompetence					
Poor management especially on the part of the client;					

Use of wrong/quack professionals for construction Works					
Technology Level					
Government policy					
Lack of information					
Lack of finance					
Human factors					
Lack of finance					
Communication gap					

Section D: Benefits Associated with The Application of VM Practice in The Construction Industry.

Benefits	Strongly agree	Agree	indifferent	Disagree	Strongly disagree
Ability to identify possible problems early in the project					
Eliminates unnecessary designs and reduces wastes and defects					
Ensures that the project is delivered in the most cost-effective way					
Improves communications and enhance mutual trust, relationship and confidence.					
Eliminate unnecessary cost and achieve value for money					
Enhanced value and benefits for end users					
Encourage the use of local sustainable materials in construction					
Improves efficiency/effectiveness in the utilization of resources					

THANK YOU.

Clearer briefs and improved decision modes					
Reduces project abandonment					
Better quality system and performance					
It enhances the competitive edge for the contractor					
Improves functional space quality of projects					
Future profitability can be assessed if the life cycle cost is known at an earlier stage					
Encourage use of local materials in construction					
Adoption of new construction techniques/innovation					
Promotes adaptability and flexibility					
Effective delivery System and meeting completion period					
It gives the true worth or value for money to client					
It enhances quality performance of construction Projects					
Eliminates unnecessary design					
Improves functional space quality of projects					
Reduce cost and improve value;					
It will increase the level of performance in construction industries					
It will help in decision making					
Enhance construction professionals					
Enough room for motivation and high technical advancement;					
enhance good quality of work					
enhance mutual relationship and confidence					
ensure standard delivery					

Increase performance of the construction industry					
Unnecessary spending will be avoided					
Technological advancement;					
Effective project delivery services					
reduce project abandonment					
Enhance economic investment					
Improves functional space quality of projects					
Technological advancement					
Effective project delivery services					
Aids conflict management					
promotes adaptability and flexibility					

APPENDIX B

Table 4.7a Factor Loading Analysis of VM Benefits in Construction.

Factors	**Factor loading**	**Eigen value**	**% variance**
Benefit Factor 1: Performance Benefit		5.629	7.582
Increase performance in construction industries	.783		
Encourage use of local materials in construction	.670		
Adoption of new construction techniques/innovation	.537		
Promotes adaptability and flexibility	.666		
It enhances quality performance of construction	.531		
Benefit Factor 2: Technological and productive Benefit		3.714	5.825
Technological advancement	.821		
Effective project delivery services	.695		
Aids conflict management	.704		
Enhance economic investment	.837		
Benefit Factor 3: Effective Cost and value Benefit		3.348	5.440
Improves communications and enhance mutual trust, relationship a confidence.	.812		
Eliminate unnecessary cost and achieve value for money	.687		
Enhanced value and benefits for end users	.723		
Encourage the use of local sustainable materials in construction	.746		
Benefit Factor 4: Quality standard benefit		2.611	5.905
Enhance good quality of work	.718		
Ensure standard delivery	.673		
Performance of the construction industry	.694		
Benefit Factor 5: Innovative Benefit		2.577	5.423
Technological advancement;	.729		
Effective project delivery services	.634		
reduce project abandonment	.777		
promotes adaptability and flexibility	.631		

Benefit Factor 6: Functional performance Benefit		2.036	5.246
Better quality system and performance	.653		
It enhances the competitive edge for the contractor	.737		
Improves functional space quality of projects	.825		
Benefit Factor 7: Resource management benefit		1.890	4.789
Eliminates unnecessary designs and reduces waste and defect	.828		
Ensures that the project is delivered in the most cost-effective wa	.798		

Table 4.7b Factor Loading Analysis of VM Benefits in Construction

Factors	Factor loading	Eigen value	% variance
Benefit Factor 8: Professional Benefits		1.624	4.716
Enhance Construction professionalism	.803		
Benefit Factor 9: Wastage avoidance benefit		1.593	3.502
Unnecessary spending will be avoided	.627		
Benefit Factor 10: Functional Quality benefit		1.336	3.468
Improves functional space quality of project	.725		
Benefit Factor 11: cost benefits		1.263	3.253
Reduces cost and improves value;	.618		
Benefit Factor 12: Efficient Benefits		1.217	3.062
Improves efficiency/effectiveness in the utilization of resources	-.771		
Benefit Factor 13: Technical benefits		1.185	3.025
Technical advancement;	.736		
Benefit Factor 14: Client value management		1.077	2.933
It gives true worth or value of money to client	-.736		

Source: Researcher’s analysis, 2019

APPENDIX C

Table 4.8 Hindrance factors to VM in Construction

Factors	Factor lo	Eigen value	% of variance
Factor 1: Technical and public policy factors		8.078	14.587
Technology level	.713		
Government policy	.618		
Lack of good communication among project stakeholders	.657		
Conflict management	.655		
Lack of finance	.610		
Factor2: Professional negligence		3.300	12.444
Wrong choice of procurement route	.762		
Failure to admit ignorance in certain specialized aspects on project development	.856		
Lack of awareness of VM by practitioners in the construction industry	.797		
Ambiguous design;	.639		
Lack of involvement of professionals	.597		
Factors 3: Non- complacency and management defects		2.385	12.082
Lack of total quality management principles in construction firm	.675		
Greediness of the contractors and consultants	.664		
Lack of total quality management principles in construction firm	.797		
Poor management especially on the part of the client	.657		
Use of wrong/quack professionals for construction	.686		
Factor 4: Human factor and inflexibility		2.082	10.306
Lack of contractual provisions to support VM	.768		
Poor human relation	.713		
Rigid application of standards and tradition without consideration of changing functic technology and value	.596		
Factor 5: lack of manpower and project focus		1.387	10.161
Lack of trained value managers in construction industry	.765		
Conflicts of interest among project stakeholders	.845		
Factor 6: Poor Knowledge		1.161	6.110

Professional incompetence	.629

Source: Researcher's analysis, 2019

APPENDIX D

COMPONENT MATRIX

Benefit Factors of Value Management.

Component Matrix[a]

S/N		Component 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Ability to identify possible problems early in the project	.347	.295	.309	-.297	-.123	-.029	.280	.247	-.015	-.165	.217	158	-.121	-.15	-.07
2	Eliminates unnecessary designs and reduces waste and defect	.117	.409	.279	-.304	-.255	.108	.327	.287	-.002	-.076	.311	.168	.014	-.08	-.16
3	Ensures that the project is delivered in the most cost-effective way	.162	.484	.122	-.093	-.292	.217	.347	.340	.064	-.186	.004	.230	-.073	.104	-.03
4	Improves communications and enhance mutual trust, relationship and confidence.	.382	-.006	.272	-.451	.431	-.031	-.191	.036	.035	-.036	.061	-.195	-.086	-.090	003
5	Eliminate unnecessary cost and achieve value for money	.265	.090	.300	-.358	259	.204	-.106	-.131	-.004	-.048	.329	-.305	.217	-.201	40
6	Enhanced value and benefits for end users	.433	.004	.262	-.443	201	-.069	-.263	-.111	-.109	.021	.021	-.024	.005	.009	12
7	Encourage the use of local sustainable materials in construction	.474	.016	.243	-.494	362	-.007	-.050	-.062	-.043	.049	.003	.130	-.104	-.042	11
8	Improves efficiency/effectiveness in the utilization of resources	-.182	.026	.022	-.230	275	-.005	-.060	.112	.241	.462	.321	.241	.134	.237	09
9	Clearer briefs and improved decision modes	.332	-.027	.163	-.302	212	-.235	-.296	.167	-.071	.240	-.173	.272	.009	.128	-.13

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10	Reduces project abandonment	.505	.061	.130	.043	-.025	.221	.322	.033	.118	-.158	-.122	-.063	-.149	.07[illegible]	.21[illegible]
11	Better quality system and performance	.356	-.051	.060	.256	-.112	.301	-.220	.060	.389	.184	.221	.063	-.025	.13[illegible]	-.12[illegible]
12	It enhances the competitive edge for the contractor	.473	-.176	.167	.225	-.121	-.028	-.332	.220	.327	-.047	-.105	-.084	-.189	.02[illegible]	-.00[illegible]
13	Improves functional space quality of projects	.455	-.160	.187	.331	-.255	-.024	-.355	.177	.314	-.018	.239	-.047	-.067	-.06[illegible]	.17[illegible]
	Future profitability can be 14assessed if the life cycle cost is known at an earlier stage	.069	-.005	.023	-.148	.050	-.284	-.008	-.125	-.190	-.346	-.108	.340	.409	.05[illegible]	.00[illegible]
15	Encourage use of local materials in construction	.671	-.020	.128	.076	-.237	.110	.068	-.248	.143	.150	-.042	-.017	.070	-.10[illegible]	-.17[illegible]
16	Adoption of new construction techniques/innovation	.556	-.137	-.008	.203	-.129	.234	-.074	-.126	-.211	.109	.024	.044	.317	-.08[illegible]	-.12[illegible]

S/N		Component														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
17	Promotes adaptability and flexibility	.628	-.099	.084	-.039	-.022	.089	.205	-.071	.170	.167	-.280	-.046	.046	.098	-.069
18	Effective delivery system and meeting completion period	.547	-.076	.132	-.090	.118	-.017	-.173	.125	-.096	-.307	-.173	.001	-.209	-.079	-.212
19	It gives the true worth or value of money to client	.016	.124	.041	.045	-.131	.160	.078	-.283	.012	-.222	.370	-.287	-.020	.279	.109
20	It enhances quality performance of construction	.489	-.052	.240	-.055	-.067	.217	.087	-.116	-.041	-.019	-.163	-.119	.192	.115	.060
21	Eliminates unnecessary design	.513	-.199	.127	.269	-.289	-.133	-.338	.035	-.192	.048	.081	.104	.275	-.122	.112

22	Improves functional space quality of projects	.545	-.064	-.065	.040	.028	.016	.074	-.192	-.174	-.103	-.218	.059	-.168	-.070	.094
23	Reduce cost and improve value;	.255	.050	-.081	.260	-.001	.131	-.266	.289	-.196	-.115	.040	.394	.141	.292	.114
24	It will increase the level of	.463	-.018	-.134	.171	-.123	.130	.139	-.213	-.293	.113	.140	.091	-.023	.119	.193
25	performance in construction industries	.634	.011	-.060	.126	-.100	.134	.309	-.232	-.084	.140	-.088	.059	-.156	.147	-.026
26	It will help in decision making	.334	.029	-.323	-.078	.254	-.196	.293	-.121	.139	.342	-.009	.038	-.078	.123	-.161
27	Enhance	.086	.121	-.456	-.007	.549	.348	-.037	-.008	.096	-.052	-.064	.057	.024	.103	-.091
28	construction professionals	.111	.236	-.325	.035	.440	.362	.030	.283	-.016	-.172	.015	-.120	.201	.304	.067
29	Enough room for motivation and high	.361	-.097	-.402	.111	.221	-.207	-.083	.291	.221	-.336	.055	-.216	.124	.049	-.214
30	technical advancement;	.118	.108	.000	.028	.170	-.013	-.032	.218	-.491	.174	-.012	-.356	-.157	.283	-.030
31	enhance good quality of work	.448	-.009	-.295	.190	.145	-.474	.134	.148	.156	-.158	.029	-.057	-.073	.009	.078
32	enhance mutual	.334	.062	-.407	-.008	.142	-.371	.259	-.186	.341	.087	.165	.090	.131	-.177	-.081
33	relationship and confidence	-.089	.142	-.130	.099	.348	.272	-.013	-.278	.323	-.163	-.067	.286	-.060	-.112	.416
34	ensure standard delivery	.388	-.018	-.298	.159	.023	-.338	.185	.068	-.265	.038	.279	-.084	-.013	-.054	.206
35	Increase	-.030	.190	-.194	.128	.054	.448	-.183	.013	-.260	.138	.228	.097	-.203	-.294	-.209
36	performance of the construction industry	.362	-.011	-.434	.217	.202	-.192	.152	.167	-.258	.062	.220	.003	.021	-.180	.030
37	Unnecessary spending will be avoided	.044	.127	-.351	.289	.385	.332	-.150	-.010	-.082	-.034	-.033	.109	-.172	-.334	-.087
38	Technological advancement;	-.105	-.158	.419	.285	.337	.102	.268	-.102	.018	-.135	.050	-.043	.311	-.126	-.116
39	Effective project delivery services	-.125	-.483	.440	.283	.268	-.086	.200	.108	.009	-.084	.010	.079	-.064	-.025	.133
40	reduce project abandonment	-.083	-.374	.382	.256	.302	.150	.280	.294	-.041	.096	-.132	.031	.087	-.162	-.025

Extraction Method: Principal Component Analysis.

S/N		Component														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
41	Enhance economic investment	.065	.681	.235	.293	.211	-.116	-.102	-.157	.008	-.042	-.015	.029	.181	.014	-.139
42	Improves functional space quality of projects	-.115	-.022	.485	.296	.312	-.219	-.014	-.236	-.035	-.082	.222	.159	-.297	.150	-.061
43	Unnecessary spending will be avoided	-.037	.476	.465	.405	.237	-.249	-.050	-.182	-.029	-.049	.011	.040	-.136	.107	-.028
44	Technological advancement	-.014	.652	.294	.337	.096	-.140	-.095	-.183	-.054	.023	.027	-.048	-.016	.079	-.195
45	Effective project delivery services	.081	.841	-.156	-.005	-.152	-.106	-.166	.003	.046	.060	-.153	-.072	-.025	-.084	.119
46	Aids conflict management	.059	.791	-.057	-.009	-.110	-.042	-.065	.053	.113	.067	-.213	-.142	.207	-.122	.123
47	promotes adaptability and flexibility	-.052	.023	.426	.274	.209	.050	.201	.249	.070	.252	-.087	-.189	.189	-.015	-.026
48	VAR00069	-.056	.340	.163	.185	.098	-.090	.090	.340	-.068	.301	-.158	-.017	-.045	-.195	.354

Extraction Method: Principal Component Analysis.
a. 15 components extracted.