

Adoption of Value Management in Construction Projects in Rwanda

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Abstract: Value management has been practiced for long time as of now. However, in Rwanda, most constructors and experts are just ambiguously acquainted with this subject and don't understand the advantages of value management and that it very well can be an esteem adding tool to the client. Rwanda, as a developing country, is investing a lot in construction infrastructures and its construction industry is growing on time basis. Value management, as one of the tools contributing to the performance of construction projects, is still unknown to some of people involved in construction projects and that concept will still be unknown and not used in construction as long as there will still be the gap in researches about it in Rwanda. The aim of this exploration was to set up the appropriation of value management in construction project in Rwanda, to identify the construction project performance which would be accomplished through the practice of value management, investigate the present condition of the act of value management in construction industry in Rwanda, the advantages of utilizing it at various stages and its impact to the improvement of the performance of construction projects. This study adopted questionnaires which were submitted to different people involved in construction in a sample randomly selected from a total of 182 construction project managers, consultants, developers and implementers. The Ministry in charge of construction in Rwanda would benefit from implementing the process for adoption discussed in this study. This study therefore recommended different approaches to adopt value management in construction project in Rwanda among them, Developing VM module and teaching Value Management in construction high schools, developing and facilitating CPDs and trainings on Value Management in construction boards institute and council, Practicing Value Management on different construction project were the 3 keys adoption methods identified by this study.

Index Terms: Value Management Adoption, Construction Projects.

I. INTRODUCTION

In Rwanda, construction industry has grown to high scale and between 2010-2015, the sector grew on average 9.3% annually, outperforming the overall economy at 7% (Swedish trade and investment council, 2017).

Rwanda has been investing in construction which made construction industry the likely lead factor of economic development of the country. From the data received from the Ministry of Finance and Economic planning, Rwanda has utilized 784.1billion Rwanda Francs on development construction projects in the year of 2014-2015, and this is equivalent to 44.7% of the whole budget which was planned

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for that period. From the above figures, it is seen that most of the expenditure of the Government of Rwanda is taken into construction, which requires most attentions and adequate strategies to have all of those project performed well with the expected outcome. Developers as well as construction engineers are more being interested in the use of value management as management tool. And its practice is attracting clients who at the end request the constant practice of this discipline in the whole lifecycle of the construction project. Nowadays, value management is becoming a recommended tool to be used in the construction processes in developed countries like USA, Australia, Canada, United Kingdom and others.

Unfortunately in Rwanda the benefits of value management have not been realized yet by all in the construction industry and most of professionals involved in construction are either unaware of its practices or vaguely informed. Studies which have been conducted in construction industry, have been focusing mainly on construction project and contract management and procurement in general. Few, if not none was conducted to reveal the practice of value management, its benefits and contribution to the improved performance in construction industry in Rwanda.

II. BACKGROUND

Rwanda, as a developing country, is mostly investing in construction of infrastructures which are considered as foundation and basis of development. Some of those construction are not completed and hence abandoned because the identification of its needs was not done professionally. Other construction projects are completed but are not used for their intention and purpose for which they were designed and constructed for. This is becoming a big problem to the Rwanda and it decreases the economy of the country because appropriate technics and tools especially value management were not used before starting such construction project. While the practice of Value management has been proved to improve the performance of different construction projects, this subject is mostly needed to be integrated within construction industry in Rwanda in order to address those losses which are increasing on period basis and maximize the performance of those construction project as well. Value management and its benefits are still unknown in construction industry in Rwanda. Researches on practice of value management in Rwanda have not yet been done, and awareness of it to professionals is essential especially to Rwanda as a developing country with a lot of investment in construction industry.

But also and importantly, some of constructions are not used for the purpose of which they were designed and made for and this is ruining a fortune and budget which is allocated into construction industry by the government with a small outcome.

This research will benefit all stakeholders of construction industry in Rwanda and especially the developers of the government projects in order to improve the performance of current construction projects and those intended to be developed and avoid any further loss for budget which are allocated into construction industry. This research contemplated and investigated the adoption of value management in Rwanda while featuring the advantages from its utilization towards the improved performance of construction project.

III. LITERATURE REVIEW

A. History of Value Management

It is in Nineteen Forties that Value Management discipline was developed by using the Value Analysis as a term resulted from the Second World War which caused the material shortage. Therefore, manufactories decided to find the replacement of materials and for those substituted materials, the cost was overlooked in terms of management but also to maximize the performance of those new product.

Therefore, in 1954, owing to its implementation in the U.S. army, the word Value Engineering had used instead of Value Analysis. Due to its key operation, the UK building sector altered the word from Value Engineering to Value Management in the Nineteen Eighties to meet the demands for quality assessment rather than price assessment and incorporate feature assessment as the key exercise.

During the Second World War in the United States, Lawrence D. Miles established Value Analysis (VA) at General Electric Company while looking for alternative item parts to compensate for material shortages. It was found that reduced item expenses could be accomplished without decreasing its value by looking for alternative techniques to perform the component's role.

This method, called 'Value Analysis,' was retained after the conflict as a means of reducing unnecessary expenses and enhancing architecture from goods.

The Navy's Bureau of Ships, U.S. Department of Defense, introduced Value Analysis in 1954 and renamed Value Engineering.

In Nineteen Sixty Three, when Dell'Isola brought it to the Navy's Facilities Engineering Command, this method was first applied to the building sector. Shortly afterwards, the U.S. General Service Administration (GSA) started using Value Engineering. The word Value Management was derived from the United States agricultural production industry. The U.S. GSA integrated the use of Value Management facilities in its construction agreements in Nineteen Seventy Three. In the UK, since the establishment of the Institute of Value Management in Nineteen Sixty Six, Value Management began to penetrate the industry.

Several significant changes have been produced in the strategy since Mile's job.

B. Definition of Value Management

There are a multitude of definitions in existence for Value Management, four common definitions of Value Management are:

'A systematic, multidisciplinary attempt to analyze project features in order to achieve the highest quality at the smallest general project price of the life process'. Norton & McElligott.

'A proactive, innovative, problem-solving or problem-solving service that maximizes a project's operational importance by handling its growth from idea to use through organized, team-oriented research that create later choices explicitly and evaluate the customer's value demands'. Kelly & Male. 'Is concerned with making explicit the whole life package of benefits a client requires from a project at an appropriate cost'. Kelly & Male.

C. Concepts of Value Management

While Value Management offers an organized and systematic strategy at the smallest subsequent price to achieve the required project tasks, traditional Value Engineering (VE), which relies solely on design and building, value management is a thorough assessment of all elements of the project from project feasibility research, project layout, funding schedule, expenses and construction and implementation of the project. Value management therefore encompasses the entire variety of accessible value methods.

D. The Approaches for Value Management

Value Management's achievement resides in its methodological strategy. Value Management's focus, however, is not on price, but on feature and optimum quality for cash. It is an ongoing method and should be used against client requirements to continually evaluate all elements of the venture. Using the entire project team and involving end customers as suitable and where necessary, there are many client advantages. These include the benefits of improved teamwork throughout the project and end-result customers having a part.

There are a range of preconditions for ensuring the smooth running of methods such as ready involvement, leadership help, a suitable research group and skilled facilitator. In general,

there are many proven Value Management processes. Below are addressed those of the most common methods.

a. The charrette

The above mentioned process is carried out towards the end of the briefing, after the appointment of the design team but before starting the design. Representatives of the client and the team in charge of design meet under the coordination of the value manager for around two days. Then, since the value manager is chairing this process, he is then called the value management team coordinator.

b. The 40 hour workshop

This workshop is of 40 hour and consists of five day workshop with the client representative, the value manager and the designing team.

Since it is an intensive and quick workshop, it is recognized as a formal method since it is also economical. Therefore, a second design team is built up and review the design at 35% of design or sketch design stage.

c. *The Value Management Audit*

This approach performs the same operation as either a charrette approach or the 40 hours workshop. Its aim is to offer a definite idea of the value of a subsidiary-inspired plan or growth to a corporate or public customer. In consultation with the affiliate business staff and their development team, the parent organisation may then designate a value manager to carry out a charrette.

On the other hand, after the suggested plan has been created to outline the design phase, the parent business may designate a quality leadership group to perform a complete feasibility survey.

E. **Value Management Benefits globally**

Value management approach can improve client fulfillment and contribute quality to the investment of an organization in any company or financial environment, according to studies conducted by SAVE. Practitioners in value management apply Value Management approach to goods in sectors such as: Manufacturing, construction, transport, public, healthcare and environmental engineering companies. In addition to the studies, they discovered that VM approach readily saves 30% of the projected price of producing an item, building a project or supplying a service. The return on capital derived from the implementation of VM programs by government and private organisations averages 10 to 1. That is, 10 dollars in net saving results for each dollar invested in a Value Management study, including the time and implementation costs of participants.

F. **Effectives techniques and tools in Value Management**

Value Management adopts different methods to patently help produce the workshop's highest outcomes. Here are shortly described two of the methods. First is the FAST (Function Analysis System Technique) diagram, commonly used in a Value Management study's feature assessment phase. Blytheway created it in Nineteen Sixty Five. The instrument is helpful in understanding what is being tried to accomplish in a manner that shifts away from preconceived concepts. The tasks are organized in a 'tree' structure in the FAST diagram that radiates out of the feature of the job. It is possible to verify the feature structure logic by wondering 'why' when shifting to the left and 'how' when shifting to the right.

Asking 'how' issues helps to determine the problem's particular answer. Asking 'why' issues contributes to the project's general intent.

SMART (Simple Multi Attribute Rating Technique), which is a part value tree diagram and part matrix evaluation technique, is another efficient instrument used in Value Management. It is used to define the customers' greatest choice. The approach, comparable to the FAST diagram, is based on the building of a hierarchical value tree to reflect the project goals. After the tree diagram has been completed. The group is requested to decide on a weighting of significance for each goal (the tree branches and twigs), so

that the value summation is equal to 1. Values are increased for each branch and its branches. The alternatives are evaluated against each of the value tree characteristics and results between 0 and 100 are assigned. The results are entered into the matrix and multiplied by the appropriate weights of significance, resulting in an overall service score for each choice. The most appropriate choice can be reached by comparing the complete results of the different alternatives.

G. **Value Management Phases**

Various facilitators use distinct methodologies for VM, but usually the following phases are:

a. *Information phase*

The study's original section is dedicated to the development of an extensive project knowledge and suggestions. All appropriate project data is collected from all sides.

b. *Objectives phase*

Detailed assessment of the project is carried out using the data supplied as a basis in the information phase. The method of Value Management relies on the assessment of goals that the project must fulfill.

c. *Functional analysis Phase*

Functional assessment forces a wider and more detailed knowledge of the venture by causing severe debate and forcing the team to consider elements that might not usually have been taken into consideration. Functional System Techniques Analysis (FAST) diagram is used as the function assessment method.

d. *Creativity phase*

Appropriate methods are used to concentrate on the objectives / functions recognized during the earlier stage to help the team produce alternative thoughts to achieve the necessary results. The emphasis in this section of the research is on generating a big amount of concepts with debate and evaluation carried to the next level of the method.

Normally, brainstorming stage which is the creativity phase is likely the most significant stage of an activity in value management.

However, it should be stressed that all stages should be handled correctly.

e. *Evaluation phase*

Detailed evaluation of feasible options recognized during the phase of creativity takes place during this stage. Ideas are examined from a variety of angles including investment expenses, recurrent / maintenance expenses, service distribution effect, aesthetics, functionality, and general efficiency.

Views and suggestions to be recommended for application or further inquiry will be recognized with accountability for such research assigned to the respondents in Value Management.

f. Development phase

During the development phase, the respondents of the specialist group develop and analyze the suggestions and views recognized in the evaluation phase.

g. Reporting and recommendation phase

Participants agree on the results and suggestions emerging from the research in this stage of the Value Management research and define intervention needed to maintain the project on traction and fulfill important milestones. Each suggestion must be evaluated against the goals set previously.

IV. RESEARCH METHODOLOGY

This research adopted questionnaires as the research instrument which was used in collecting data.

To promote the collection of information for this study, a questionnaire composed of five parts was used. The first chapter is aimed at collecting the respondents' details and background data, such as: their era, sex, present situation, background in schooling, job knowledge and professional history. The second section included the respondents' opinion on the aspects of the value management and how they are practicing it in construction work. The third section explores in which phases the value management is practiced. The fourth section include an investigation of the benefits of value management to the whole performance of the project. The fifth section of the questionnaire explores the consequences of not using value management in construction industry.

The questions were designed on a likert scale of 1 to 5 indicating the presence or absence of the attribute being measured. The scale also measures the level of significance of various characteristics.

A Likert scale is a type of psychometric response scale used in questionnaires, and is widely used scale in survey research. The scale is named after Rensis Likert, who published a report describing its use (Likert, 1932). When responding to a Likert questionnaire item, respondents indicated their attitude on risk likelihood of occurrence and impact on project objectives.

Open-ended questions are exploratory in nature and allow the respondent to provide any answer they choose without forcing them to select from concrete options (Creswell, 2013). Open-ended questions provide rich qualitative data and provide the researcher with an opportunity to gain insight on all the opinions on a topic under research (Maxwell, 2012).

One open-ended question was provided in the last section to allow the respondents express their views regarding on how value management can be adopted in construction project in Rwanda towards the project performance. This data would be analysed qualitatively as opposed to all other previous questions which were close-ended and which were to be analysed quantitatively.

A suitable sample size was determined using the following formula extracted from Ankrah (2007) and originally postulated by Czaja and Blair (1996). The same formula has also been adopted by Mugenda and Mugenda (1999). This formula is applicable when the population ranges from 10,000 to infinity.

Formula for calculating the sample size as per Fisher et al (1972):

$$N = \frac{z^2}{e^2} pq$$

Where:

N = sample size

z = standardized variable (standard normal deviate usually set at 1.96 which corresponds to 95% confidence level)

p = percentage picking a choice, expressed as a decimal (Proportion of the target population estimated to have a particular characteristic. If there is no reasonable estimate, 50% or 0.5 is used.)

q=1- p = proportion of the target population not having the particular characteristics.

e² = degree of accuracy / level of precision (set at +/- 7% or 0.07)

According to Ankrah (2007), most researchers commonly adopt a confidence level of 95%. The same was adopted for this research. This means that the significance level of = 0.05 and z = 1.96. There is always the need to strike a balance between level of precision required, resource availability and reliability of the findings (Israel, 1992). It is for this reason that a degree of accuracy (e²) of ±7% was assumed. According to Czaja and Blair (1996), when determining the sample size for any given level of accuracy, the worst case percentage picking a choice (p) should be assumed; this is given as 30% or 0.3. The sample size was then determined based on these assumptions.

$$N = \frac{(1.96)^2}{(0.07)^2} (0.3) \cdot (0.7)$$

$$N = 165$$

This sample size formula provides the number of responses that need to be obtained assuming that there is no problem with non-response or missing values. The sample size was increased by 10% to compensate for this (Cochran, 1963).

Thus the number of administered questionnaires was:

$$= 165 + \frac{10}{100} \times 165$$

$$N = 182$$

I adopted p=30% given that for the results to be significant, sample should be people working on significant and considerable projects and it was assumed to be 30 percent of the whole population which consisted of 14,414 as above mentioned.



A sample design is a definite plan for obtaining a sample from the sampling frame. It refers to the techniques or procedures the researcher would adopt in selecting sampling units from which inference about the population are drawn (Kothari, 2004).

V. RESEARCH RESULTS AND FINDINGS

From the data analysis which was done from the questionnaires collected, results admitted the lack of awareness of Value Management and insufficient practice of VM in construction industry in Rwanda. Therefore, the study suggested different technics and methods to be used in order to adopt Value Management in construction project in Rwanda. To assist the research objectives, the study collected responses from different construction stakeholders on causes of the lack of VM, contribution of VM in construction performance, and recommendations on how Value Management can be adopted in construction industry in Rwanda.

Apart from the main objective, this study also addressed the following:

- (i) The level of importance attached to the process of value management practice during construction projects in Rwanda was explored. From the results the mean weight for the practice of value management in construction industry in Rwanda was 2.42. This indicates clearly that value management is not practiced in construction industry in Rwanda. From the results, as the mean weight is below 50%, this conclude that value management is not practiced in construction project in Rwanda in general.
- (ii) We also examined on how value management technics are applied in construction industry in Rwanda. On questionnaire, where respondents were asked to which extent they do the project function identification before starting the construction, which is one of stages of value management for a construction project, the mean weight was 3.67. From the results received from respondents, the majority practice the project function identification before starting a construction project. This is understandable since the majority of the respondents are occupying managerial roles of their organisations and construction projects. However, on another question where respondents were asked to which extent they practice value management in different phases of the project, which can be said as the practice of value management as a whole process, the majority of respondents mentioned that they don't do it and the mean weight was 1.89. From the results got on this question, it shows clearly that respondents don't practice value management as a whole process since the majority responded that they never practice it as a whole process.
- (iii) Causes of the lack of value management in construction industry in Rwanda were also explored. Lack of awareness of value management by practitioners in construction industry in Rwanda has been rated the first cause of the lack of practice of value management. Then the type of procurement process used in construction industry in Rwanda came on the second rank. Then the lack of trained value managers in

construction industry in Rwanda came on the third rank. Then the lack of communication among project stakeholders was the fourth, the conflict of interest among project stakeholders on the fifth and then the failure to admit ignorance by practitioners in construction industry in Rwanda and the lack of contractual provisions supporting value management came on the sixth and seventh rank respectively. This show the importance of trainings in value management in order to have stakeholders of the construction industry practicing value management in Rwanda.

- (iv) The study also researched on how value management should be adopted in construction project in Rwanda. From the results, value management should be planned as module and training to different stakeholders of the construction industry. This means that there is a need of training and workshops to be planned for all stakeholders of the construction industry especially engineers and architects and this should be planned in the policy of different construction organisations. Also, from the questionnaire, where respondents were asked at which degree of intensity the construction authority of Rwanda should encourage and enforce the practice of value management in construction industry, the majority responses agreed to this statement. The following big number also strongly agreed that Rwandan authorities in charge of construction should encourage and enforce the practice of value management in construction industry. The mean weight was 4.17. This means that the government of Rwanda should adopt strategies to have value management practiced in construction industry. Not only policies, but encouraging different construction stakeholders to practice value management. Therefore, a framework was designed and put in place of adoption of value management in construction project in Rwanda, which is illustrated in the figure 1 below.

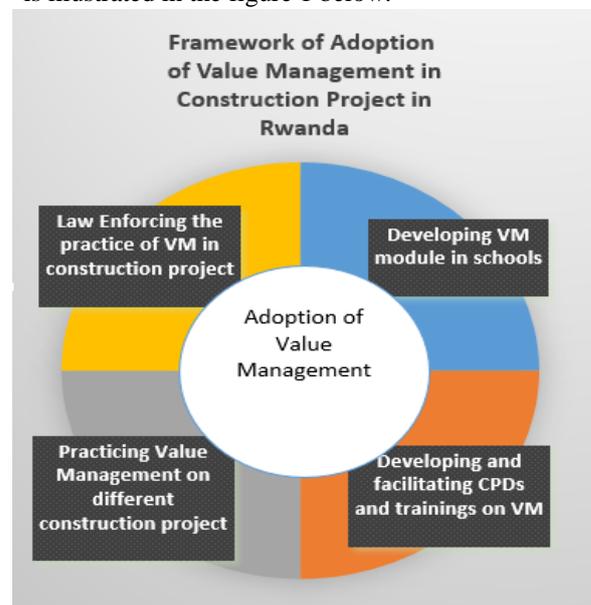


Figure 1: Adoption framework of VM in construction project in Rwanda

Source: Author, 2019

VI. CONCLUSION

To conclude, the following general statement were made from the summary of findings of this research:

- People are only vaguely familiar with value management but don't have enough knowledge on the full concept of value management and its technics (how it is used and the procedure of its use).
- Despite the need of value management in construction industry, there hasn't been effort to integrate and adopt value management in order to improve construction performance of projects.
- Value management, once well practiced will improve the performance of construction projects.
- Value management technics will definitely improve the performance of construction industry in Rwanda.
- The main causes of lack of value management in construction industry in Rwanda are the awareness of the concept of value management and the lack of trained people on value management.
- Government policy strategies on value management and development of training and modules on values management have been identified as the main keys towards the adoption of value management in construction industry in Rwanda.

In order to integrate and adopt value management in construction industry in Rwanda, there are some strategies needed from the government of Rwanda which are the development of value management module to be integrated and taught in high schools, making policies encouraging and enforcing the use of value management and monitoring its use in different organisation.

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