

Session 2.5: SBE Assessments – Green Neighbourhoods (2)

Value Management as Tool for Delivering Sustainable Rail Projects

Ayodeji Emmanuel OKE^a, Clinton Ohis AIGBAVBOA^b, Njabulo Sydney NGUBANE^c

^a University of Johannesburg South Africa, emayok@gmail.com

^a Federal University of Technology Akure, Nigeria, emayok@gmail.com

^b University of Johannesburg South Africa, calgbavboa@uj.ac.za

^c University of Johannesburg South Africa, njabulons@gmail.com

ABSTRACT

Value Management (VM) is a multi-disciplinary tool developed to ensure that projects are delivered to the best function at the lowest possible overall whole life cycle cost. This implies that VM will not only provide value for money for construction projects but will also enhance projects that are financially, socially and environmentally sustainable. This research therefore, explores the drivers, barriers, benefits and factors affecting application of VM to rail construction projects. Using quantitative approach, data were collected through well structure close-ended questionnaires that were personally distributed and administered on built environment professionals. It was ensured that the respondents have ample experience of construction projects and adequate knowledge of value management concept. Findings from the study revealed that, professionals in rail environment are aware of VM and agreed that its application will not only eliminate unnecessary costs in design, materials and labours but will enhance that projects are conceived and executed in sustainable manner. This is as a result of the fact that VM creates change on purpose rather than letting change happen accidentally. The rate of application of VM to rail construction projects is very low and this is due to reluctance to change as well as lack of guidelines, information, knowledge and experience of the discipline among professionals and other stakeholders in the industry. It is therefore expedient for stakeholders involved in rail construction to pay special attention to the application of VM in their quest to enhance project success and deliver projects that are sustainable in all ramifications.

Keywords: *infrastructure development, sustainable neighbourhood, value engineering*

1. INTRODUCTION

Value management (VM) is an intensive, interdisciplinary problem solving activity that focuses on improving the value of functions that are required to accomplish the goal, or objective of any product, process, service, or organization (Elayache, 2010). The technique helps in determining the unnecessary costs which can be eliminated to save costs while not jeopardizing the function and quality of the final product. According to Chougule, et al., (2014), the technique was introduced by an engineer named Larry Miles as value analysis in 1947. The term has been used synonymously with value engineering and value analysis. However, Oke and Ogunsemi (2013a) noted that some school of thought believe that value management is a combination of value engineering and analysis. The process is referred to as value analysis at the pre-construction stage and value engineering at construction and evaluation stage. It is not a cost-cutting exercise but the purpose is to improve the value project by eliminating unnecessary costs, which could result in production of product/project at a minimal cost (Oke, et al, 2015).

Value management was initially introduced for manufacturing firms but it has gained wider popularity in the construction industry due to its ability to reduce project cost thus enhancing project value (Bowen, et al., 2010). Oke and Ogunsemi (2011) observed that value management is widely accepted as an important tool in the management of construction projects. While this may be so for construction industries in developed countries, Bowen et al. (2010) noted that the situation is by no means so clear for developing nations like South Africa. This indicate that the technique of value management can aid production and sustenance of sustainable projects. In view of this, this study examined the level of application of value management in rail projects in South Africa and benefits associated with the usage in the quest for continuous delivery of sustainable projects.

2. CONCEPT AND BENEFITS OF VALUE MANAGEMENT

Saving money and, at the same time, providing better value is a concept that is necessary and important in satisfying owners of construction projects and other stakeholders (Bharathi and Paranthaman, 2014). Behncke, et al., (2014) stated that value management is not just focusing on cost reduction, but on the principle of increased value. The principle of value management then becomes necessary in quest for achieving better value of construction projects. An important construction process where effective planning and assurance of value for money are ensured is the design stage. Based on traditional procurement approach, design process begins with the architect's asset, core competencies and desire to create a product that ideally matches the client's priorities (Al-Yousefi, 2007). This indicate that value management should be adopted right from this stage. Rich (2000) noted that the technique assist in terms of achieving the best practice with which to develop an optimal design. More so, in cases where the designer see the need to change the design, the technique allows the changes to be incorporated formally.

Value management has been introduced in the 1950's in the United States and since its introduction, it has been employed in various countries around the world (Chen, et al., 2009). Value Engineering (VE) was developed during World War II as a method to find alternative methods and materials for processes and products that were limited and challenged by rationing. Since its creation, the use of the VE process has extended to the construction industry as a way to maximize the value of a project (Seidel, 2012).

Value management has been considered as an organized approach which can obtain the most optimum value of the unit cost, while assures the quality, safety, reliability, and maintainability of a construction project (Oke, et al., 2015). It is a systematic application of recognized techniques by multidiscipline teams which identify the function of a product or service; establish a worth for that function; generates alternatives through the use of creative thinking; and provides the needed function, reliabilities, at the lowest overall cost or Life Cycle Cost (Simpkins, 2000). Basically, value management is finding alternative ways of eliminating unnecessary cost without having any effect on the quality and functionality of the project. According to Aghimien and Oke (2015), the approach is a strategic thinking process that involves the systematic and objective assessment of project component alternatives. Oke, et al., (2015) explained that value management can be considered as a systematic and innovative multidisciplinary method that examines the functional needs of a product, service and project design as well as facility and system in achieving greater value and optimum cost without affecting the level of performance in the programme and project.

Value management has been internationally recognized as an efficient modern management methods and it has unique benefits of reducing costs while improving product value. Domestic and international practice shows that the application and promotion of value engineering can get great economic benefits (Oke and Ogunsemi, 2011). According to Bowen, et al., (2009), one of the benefits of VM is the provision of good engineering judgement to produce better projects to the clients. It was further revealed that application of VM in any project actually lowers the project cost with a certain percentage which is a benefit to clients. Practitioners apply VM methodology to products and in industries such as the following: corporations and manufacturing, construction, transportation, government, health care and environmental engineering. This is due to the fact that VM methodology easily produces savings of 30 % of the estimated cost for manufacturing a product, constructing a project or providing a service (Chougule, et al., 2014). Chavan (2013) noted that the principle aid correct and cost effective solutions to various construction problems by ensuring functional correctness before deciding on the solution to be implemented.

According to Oke and Ogunsemi (2013b), value management has been practiced for half a century in the construction industry with an intention to bring into existence innovative ideas and solutions for enhancing project value. It concentrates on effectiveness through stating functions, goals, objectives, needs, requirement and desires, then define the quality features that make the product more acceptable (Al-Yousefi, 2007). At the end the value management exercise, it is expected that report and proposal emanating from the process should meet functional requirements at the least possible whole life cost.

3. RESEARCH METHODOLOGY

Due to the nature of this research and information obtained from existing literature in the area of value management and sustainable construction, a descriptive survey design was adopted. This is in line with the assertion of Polit and Hungler (1993) as well as Mouton (2001) that surveys may be used for descriptive, explanatory and exploratory research. More so, the method is useful for obtaining basic characteristics data relating to behaviour, beliefs, abilities, knowledge and opinions of a individual, group of people or situation. Quantitative research technique was preferred in soliciting required information from respondents since needed variables are available in literature. The population include professionals who are directly employed by various organizations specializing in rail projects and consultants working as clients representatives for the projects. Purposive sampling was used in sampling the respondents with a view to involving only individuals with relevant and adequate experience of value management principles and rail construction in the study area.

Close-ended questionnaire was designed for the study due to the advantage of high response rate. The questionnaire was designed in English language as all the respondents were expected to understand the language and could read and answer the questions. In the cover letter, they were given assurance of their anonymity in responding to the questions and that the outcome of the study will solely be used for academic purpose. Instructions and guidelines to completing the instruments as well as the average duration it will require to respond to the questions were also provided. The first part of the instrument was aimed at gaining demographic data relating to level of experience, education etc. of respondents for the purpose of better interpretation of the findings. The other part was structured to obtain information on the application and implementation of value management in rail construction projects.

Due to the require experience of rail projects, the instruments were administered through personal hand delivery and electronic mail on identified respondents. The instruments were retrieved through the same means. 107 questionnaires were distributed but at the end of the collection period, 89 were returned while 82 were correctly and completely completed and found worthy of further analysis. Frequencies and percentage were adopted to analyse questions regarding background information of respondents. 5-point Likert scale was adopted for the main aspect of the instrument and mean item score (MIS) was employed to analyse the data. This is to identify the level of importance of the identified variables in order to rank them accordingly.

4. RESULTS AND DISCUSSION

4.1. Biographical information of respondents

Academic qualification of respondents reveals that 22%, 49% and 29% possess post-graduate degree, bachelor's degree and post matric diploma or certificate respectively. In term of their professional qualification, 24% are construction project managers, 12% are construction managers, 15% are project managers, 17% are engineers, 15% are quantity surveyors, 5% are architects while the remaining 12% are experts in the field of general management, planning, materials procurement, etc. All the respondents have more than 5 years experience in the construction industry and the larger percentage have been in the industry for more than 16 years. All of them are aware of value management principles through seminars, workshops and practical application on construction projects. These findings indicate that information supplied by the respondents are reliable and trustworthy to draw conclusion concerning value management and sustainability of rail projects.

4.2. Benefits of value management for rail projects

Value management is currently utilized in the organisation of about 63% of the respondents, while the reaming 37% are yet to adopt the technique in the development and planning of their projects. More so, 37% have not adopted the technique in any projects, 22% have applied the principle in approximately 1 to 5 projects, about 20% have used the method in approximately 5 to 10 projects, 12% have employed it in approximately 10 to 15 projects while the reaming 10% have applied the principle in more than 15 projects.

Table 1 represents the advantages of the application of VM in the rail environment. The major benefits are concerned with the elimination of unnecessary costs and costly design elements. The study further shows that value management fosters innovation and makes a difference to the way a project is conceived and executed. It could be deduced that all the identified benefits are important judging by the least calculated mean item score of

3.72 (out of the possible 5.00). This supports the findings of Oke and Ogunsemi (2011) that value management mainly focuses on eliminating unnecessary costs and costly design elements, and also do foster innovation within the industry. Wilson (2005) also stated that the right application of the principle improve the quality of project, reduce duration, lower cost and enhance overall function through the provision of alternatives.

Benefits	MIS	Rank
VE has a certain scope in the rail environment in South Africa	4.52	1
Eliminates unnecessary costs and costly design elements.	4.52	1
Fostering innovation.	4.44	3
Certainly makes a difference to the way a project is conceived and executed.	4.42	4
Provides cost effective solutions to the problems faced within the project.	4.40	5
Is with advancement in project management tools.	4.37	6
VE enhances the value of the project.	4.34	7
The project cost reduces to a certain percentage.	4.34	7
Provides good engineering judgement to produce better project.	4.32	9
Better defines the purpose of the project.	4.27	10
Provides alternatives of executing the project.	4.25	11
The function of the project gets improved.	4.22	12
Define project functions, goals, objectives, requirements, design criteria and scope of work.	4.17	13
Reduce complicated projects into basic components by analysing its functions.	4.14	14
Improve project quality.	4.09	15
Lowers life cycle cost of the project.	4.07	16
Develop implementation procedures.	4.07	16
The project period will reduce.	3.72	18

Table 1: Application of VE in rail projects

4.3. Influences to implementing VM in rail projects

This section explores various factors affecting the implementation of VM techniques. It could be observed from table 2 that lack of guidelines and information as well as lack of knowledge and practice of the technique of VM are the most important factors influencing the choice and adoption of the practice for construction projects. These factors are followed by reluctance to change, lack of training opportunities, negative attitude, lack of commitment and conflict of objectives by stakeholders. The least influencing factors are concerned with the impression that it interrupt normal work schedule, notion that it not suitable for low cost projects and believe that it is too expensive to carry out. This support the findings of Oke, et al., (2015) as well as Bowen, et al (2010). The top 5 hindrances of value management were identified to include lack of local guidelines and information, lack of knowledge and practices, reluctance to change, lack of training opportunities and negative attitudes and failure to recognize creativity or innovativeness

Factors	MIS	Rank
Lack of guidelines and information about VE/ VM.	4.27	1
Lack of knowledge and practice in VE/ VM.	4.20	2
Reluctance to change.	4.10	3
Lack of training opportunities in VE/ VM.	4.01	4
Negative attitudes and failure to recognize creativity or innovativeness.	3.99	5
Lack of commitment of leadership/ management.	3.93	6
Lack of trained professionals in VE/ VM.	3.93	6
Lack of good communication, misunderstanding, jealousy, and normal friction between professional team.	3.84	8
Conflict of objectives by different stake holders.	3.79	9
Speculations on the project team members and jumping to conclusions, without properly gathering information.	3.77	10
Lack of involvement of the higher management.	3.65	11
Non conducive environment for team work in a project.	3.53	12
The "problem" not describable in function terms.	3.36	13
Human relations are not respected during the VE study.	3.19	14
Interruption to normal work schedule.	3.02	15
Not suitable for low cost projects.	2.35	16
Too expensive to carry out.	2.06	17

Table 2: Factors affecting implementation of VM techniques

5. CONCLUSION AND RECOMMENDATIONS

This research is intended to give ideas to the organizations working within the rail environment on the application of value management for improvement of value and function of their projects. The study evaluated the level of application of value management in construction projects and despite the level of awareness, knowledge and understanding of value management by construction professionals, it was clear that most project managers do not apply the technique for their projects and in their organizations. Value management has proven to be one of the best tool for enhancing value of construction projects by eliminating unnecessary costs.

The findings revealed a number of factors that affects the application of VM techniques, the most important ones are related to lack of guidelines and information about VM; Lack of knowledge and practice in VM; Reluctance to change; Lack of training opportunities in VM; negative attitudes; and failure to recognize creativity or innovativeness. These are therefore essential factors that should be evaluated by organisations and stakeholders in the rail environment in their quest for adoption of value management for sustainable project. More so, Organisations in the rail environment should be concerned about the training of their employees through VM workshops where the employees will be equipped with knowledge about the technique. Professionals involved in rail construction projects should also be ready to adopt changes and innovation by accepting new ideas and technologies.

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