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Achieving Sustainability in Construction through Value Management

Douglas Aghimien, Ayodeji Oke, and Clinton Aigbavboa

Sustainable Human Settlement and Construction Research Centre,
Faculty of Engineering and the Built Environment,
University of Johannesburg, South Africa
aghimiendouglas@yahoo.com, emayok@gmail.com, caigbavboa@uj.ac.za

Abstract

The study assessed the ability of Value Management (VM) to deliver sustainability in construction using a mini case study of two private constructions wherein VM was adopted. Interview with key participants in the VM exercise was conducted in order to get a view of the activities carried out during the exercise and to also ascertain the sustainability implication of these activities. The study revealed that although VM exercise carried out were done in a semi-formal manner, the outcome shows that the use of VM helps in achieving sustainability within the bottom line of economic, environmental and social sustainability. This it does through identifying and eliminating unnecessary areas that will affect the sustainability of the project. Also, new ideas that will help promote sustainability in the project can be harnessed from participants during the exercise. The study also revealed that the inability of professionals to work together and see problems from a common stand, and client's unwillingness to fund separate gathering for VM exercise are major factors affecting VM. The study, therefore, recommends VM as a beneficial and sustainable project exercise, and advocates for its adoption as an integral part of sustainable construction within the country.

Keywords
Construction projects, Sustainable construction, Sustainability, Project performance, Value Management

1. Introduction

The call for sustainability in construction; a construction that satisfies the present needs without risking the ability to satisfy the needs of future generations, has necessitated the need for the use of innovative processes in the delivering construction works. One of such processes is Value Management (VM) which of recent is beginning to gain popularity among construction participants in developed and developing countries around the world. VM was born in the late 1940s out of the fact that there was a shortage of products component as a result of the World War II. During this period, alternative components were sort for production, but as a result of the war, these sort alternatives were scarce. Thus, alternative methods were sort, in a bid to fulfill the function of the required components. The result of this was a reduction in cost of productions which did not jeopardize quality. It was observed that this system produced low-cost products without reducing quality. After the war, maintaining this approach seemed reasonable as it helped eliminate unnecessary cost and also improves the design. This was the beginning of value engineering (as it was called at the time), a process based on analysis of function (Palmer *et al.,* 1996; Zimmerman and Hart, 1982).

Studies have defined VM from different approach. The Office of Government Commerce (2007) defined VM as "a well-established methodology for defining and maximizing value for money". Construction Industry Board (1997) described it as a structured method designed to determine in specific terms what a client considers as value, in a bid to meet his needs by agreeing on the project objectives and establishing how best to achieve them. Oke and Ogunsemi (2013) defined "VM as a systematic and multi-disciplinary process directed towards analyzing the

functions of projects from its inception to completion and commissioning for the purpose of achieving best value and return on investment at lowest possible overall life-cycle cost". According to Mariathasan (2002), VM allows all stakeholders in a project to be involved in the process of decision-making. It was further stated that the VM process involves proper scrutiny of relevant options for the design and construction, which will lead to an improvement of the design brief and identification of any budget constraints. Abidin and Pasquire (2005) concluded that in VM, although clients in most cases demand cost reduction on their projects, the goal of achieving value for money, better quality, profitability and positive business image, still remains the same.

In the past, VM and Sustainability were studied separately and were viewed from the separate academic lens. However, in the late 1990's, research relating to the role of sustainability in attaining value, and the ability of VM to promote sustainability, started emerging. Although VM has been linked with sustainability, and its potential to serve as a way of delivering sustainable construction has been identified, it is yet to be widely put into use in most countries around the world (Al-Saleh and Taleb, 2010). This is a confirmation of Oke and Ogunsemi (2009) submission that despite its advocacy, VM has not been fully embraced in Nigeria. Reasons for this can arguably be attributed to the level of knowledge of VM's ability to deliver sustainable construction among professionals in the construction industry. Hence, this study assessed the ability of VM to provide sustainability features in construction with a view to providing sustainable construction projects within the country through its usage.

2. Literature Review

The development of VM started during the 1940s in the United States, but its application in construction was only evident in the 1960s. It was initially called value analysis and later it was named value engineering (Kelly and Male, 2006). In the United States, it was mandatory to employ VM for the administration of general services contracts, and this led to considerable success (Oke and Ogunsemi, 2013). Alalshikh and Male (2009) observed that the United Kingdom adopted the United States VM approach but made some considerable changes to fit the country's unique characteristics. However, other countries like Saudi Arabia adopted same without making significant changes. The case is however different in Nigeria, as VM is yet to gain considerable recognition in the construction industry. Oke and Ogunsemi (2011) observed that few numbers of VM workshops have been organized so far, most of which were concluded prematurely. This is a pointer to the value placed on this obviously beneficial process within the country's construction industry.

Sustainability in construction has been described as a way of achieving value for construction projects (Oke *et al.* 2016). Akbiyikli *et al.,* (2009) stated that a sustainable construction is a pathway towards achieving sustainable development. This is because sustainable construction integrates the basic themes of sustainable development which are environmental, social, and economic awareness in construction (Chaharbaghi and Willis, 1999; Parkin, 2000; Raynsford, 2000; Sage 1998) Thus, a construction can be said to be sustainable when it encourages the preservation of the natural habitat, promotes social well-being of its occupants, and provides reasonable economic stand for its investors (Aghimien *et al.*, 2016). Bourdeau (1999) viewed sustainable construction as the process of creating and managing a healthy environment delivered through resource-efficient principles. Du Plessis (2002) further stated that sustainable construction is targeted at re-establishing and keeping harmony between the natural environment and the built environment, in a bid to create settlements that uphold human dignity and encourage economic equity.

Research shows that sustainability level in most developing countries is low (Alabi, 2012; Aje, 2015; Baron and Donath, 2016). Ofori (1998) suggested that if this is to change, there is a need for change in the thinking, behaviour, production, and consumption within the construction industry. Miyatake (1996) also suggested that to achieve sustainability in construction, the industry must be ready to jettison its linear process and adopt a more cyclic one. By doing this, an increased use of recycled, renewed and reused resources, and a decrease in the use of energy and other natural resources can be attained. Hayles and Fong (2008) submitted that most building projects take a conventional approach in terms of design, methods of construction and analysis with a huge dependence on off-the-shelf products and materials. In order to achieve anything different, the use of approaches that can assist in the implementation of the totality of sustainability in construction will be needed.

The role of VM in the delivery of sustainable construction has been observed by in research. Oke *et al.,* (2015) observed that huge economic sustainability can be achieved when VM is used on a project as participants have the opportunity to ensure that construction projects create an avenue for achieving value for money. However, in doing this, care must be taken not to create an imbalance between the economic pillar and the remaining two pillars, which

is environmental and social. Yeomans (2002) observed that sustainable construction with respect to the three sustainability pillars can be achieved through VM. In a similar vein, Abidin and Ijias (2006) submitted that application of VM helps in effective decision making, and it is important in incorporating sustainability issues into construction projects. Hayles (2004) carried out three case studies and concluded that by adopting VM tools, sustainable construction solutions and strategies can achieve significantly. Noor *et al.* (2015) confirmed this by stating that VM can actually lead to the attainment of sustainable construction solutions and strategies because VM's overall objectives and that of sustainability are similar. While VM attempt to achieve optimum value based on projects objectives, sustainability strives to achieve value not just economically, but as well as the environment and the social aspects of the projects. Aghimien and Oke (2015) also established that VM identifies and eliminates areas of unnecessary designs which affects cost and has no functional benefits. It also reduces the cost of construction, construction time, and provides value for money, thereby giving an overall satisfaction to the client. By doing this, certain measures of sustainability, not just from the economic, but also environmentally as wastage, are managed through the elimination of unnecessary designs, materials and process.

3. Research Methodology

The study sets out to assess the VM ability to deliver sustainable construction. Two ongoing proposed residential high-rise buildings in Lagos State Nigeria, wherein VM practices were conducted, were identified and used as a case study. The instrument for data collection was an interview of some participants of the VM practices. For case study 1, three of the participants (Architect, Quantity Surveyor, and Engineer) were interviewed while for case study 2, aside from the quantity surveying function, all other activities were sourced from one particular organisation. A representative each from both organisations (the quantity surveying firm and the consortium) was interviewed, making a total of 5 participants in the interview section. For anonymity, the names of the organisations from which these participants were selected are not included in the write-up. The interview was semi-structured in nature and questions on the VM exercise undertaken were asked in order to get a vivid view of the activities carried out during the exercise, and to also ascertain the sustainability implication of these activities. Also, questions regarding the challenges faced during the process were asked, this was used to evaluate the challenges that might be facing the VM practice in the delivery of sustainable construction.

4. Results and Discussions

4.1 Results

Case1: *Proposed Villa and Apartments in Banana Island, Lagos State*

The project is a 6-storey building plus a penthouse, estimated at 3.9 billion naira. The project commenced in 2016 and it is estimated to span through 96 weeks. Due to the complexity of some of the works to be done and the high initial estimate, the client called for an avenue in which the project team can devise a means to reduce the complexity of the work and possibly the cost of construction, hence the VM exercise. The VM exercise carried out was semi-formal in nature. This was as a result of the client's unwillingness to fund any special gathering; hence the VM exercise was carried out during the first two site meetings. The VM team comprises of the Architect, Engineer (structures and services), the Quantity Surveyor and the Main Contractor.

Below are the major findings of the VM Team as it concerns sustainability.

At the end of the exercise, some modifications to the original design were drawn up, with a view to achieving value for money without compromising function. Alternatives were drawn up and the best alternative in terms of function and cost was chosen and a recommendation made thereof. The team agreed to the removal of features that serves solely as aesthetics, and whose removal will have no effect on the function and beauty of the building. By doing this, considerable savings were made thereby giving rise to the economic sustainability of the project. Contrary to the use of imported doors as proposed in the initial design, the team recommended the use of locally made doors. By doing this, the project will likely make savings in terms of transportation and importation cost. Also, maintenance cost relating to doors is reduced as these local doors tend to consume less in terms of maintenance, unlike the imported ones. It was also agreed that although the client has decided to import the floor tiles, labour for fixing them will be acquired locally unlike the popular trend within the area were by tillers are sort from neighboring countries like Togo and Benin Republic. This will help provide adequate savings in terms of cost of labour. At the end of the VM

exercise, it was observed that the total cost of construction was reduced by 18%. Thus it can be said that by conducting the VM exercise, the project is bound to achieve some sense of economic sustainability as the unnecessary cost will be eliminated without reducing function.

It was observed that VM brings about certain environmental sustainability like in the case of changing from chillers to smaller air conditioning units. This was done not only to save cost but also to reduce power consumption within the facility as chillers will be on for 24hours hence increasing power consumption. Also, the use of energy saving bulbs and low voltage appliances were recommended, and this will help reduce power consumption.

In terms of the social dimension of sustainability, the VM exercise proposed the elimination of complicated method of construction and materials. This invariably will lead to the elimination of the need for imported expertise, hence reducing the cost of importing one and increasing the chances of employment of local labour. Labour for the construction was to be sought locally, especially the unskilled. By doing this, the project will provide some means of employment for the people in the immediate community. Also, by using locally made doors as against the imported ones initial described, the project will be encouraging locally made products and this is an essential part of achieving social sustainability.

As regards the challenges faced during the VM exercise, the Quantity Surveyor stated professional sentience as a major challenge. While being professionally conscious is good, not being ready to accommodate the perception of other allied professionals might be a problem in achieving a positive result in a VM exercise. Also, the issue of client's unwillingness to fund a separate gathering for the VM exercise was stated as a challenge by the Quantity Surveyor, Architect, and the Engineer. This they said led to the elongation of the duration of site meetings as the VM exercise had to be done on the site meeting days prior to the commencement of the meetings. These challenges can be seen to deter the delivery of sustainable construction through VM if not checked.

Case 2: *Proposed High Rise Residential Apartment, Lagos Island, Lagos State*

The proposed building is an 11-storey building to house diverse residential interest. The initial cost of construction was estimated to be 8 billion naira. The VM exercise was solely on the structural aspect of the building. From the initial estimate, it was clear that the cost of structural works, particularly concrete and reinforcement was too high for the client, hence other means of achieving the same structural stability, function and at an affordable cost was necessary. Hence the VM exercise was carried out in a semi-formal manner at the early stage of the design.

The team recommended the use of polystyrene mixed with concrete and reinforcement as opposed to the extensive use of concrete, reinforcement and steel works. This they discover will give the same structural stability that the building requires and will be able to withstand the proposed load it is to bear. At the end of the exercise, the total cost for the structural aspect of the building was reduced by 20%, thus providing some measure of economic sustainability for the client. Aside the cost saving of this, the lesser use of concrete implies less of cement, hence providing a reduction in the pollution of the environment through the excess use of cement. The safety of the building is not compromised even though adequate saving is being made.

Similar to case 1, client's unwillingness to fund a separate gathering for the VM exercise was stated as a challenge faced during the VM process. Also the Quantity Surveyor stated that from the onset of the exercise, there was a divergent view of participants as to what is expected from the VM exercise. It was stated that most of the participants believed it is an exercise set to reduce cost.

4.2 Discussion

Findings show that the use of VM on a project will deliver a considerable amount of economic sustainability as a percentage reduction of 18 and 20 percent were recorded for the projects after the VM exercise. Not only that, maintenance cost in some areas of the project will be reduced following the VM recommendations. In the aspect of providing environmental sustainability, the projects will conserve energy through the use of suggested energy-saving appliances and by so doing, reduce power consumption which is an important aspect of achieving environmental sustainability. Also, pollution to the environment through the use of excess cement is reduced as observed in case 2. This invariably helps in attaining certain measure of environmental comfort within the area. Socially, employment opportunity is provided for people within the immediate locality of these projects. Also, local materials are being promoted as suggested by the VM team.

It is imperative to note that the initial aim of the VM exercise in the assessed cases was not that of achieving sustainability in construction but rather to meet the clients' desire through providing value for money. However, while doing this, they achieved some measures of sustainability in the process. Thus, if the consciousness to achieve

a sustainable construction project is adopted from the onset of the VM exercise as suggested by Al-Saleh and Taleb (2010), then it can be assumed that higher sustainability criteria could be achieved. Findings of this research show that the application of VM exercise on a project has the tendency of achieving the core values of sustainability for such project. This is in tandem with Abidin and Pasquire (2005), Noor *et al.,* (2015) and Oke *et al.,* (2015).

From the study, it is evident that normal VM workshop practice was not fully adopted as a semi-formal system was used in both cases. Reason for this was attributed to client's unwillingness to fund a separate gathering for the exercise. This further corroborates Ellis *et al.* (2003) assertion that there appears to be a trend towards reducing the duration of the VM workshop and reason for this includes reducing the cost for the client and limited amount of time busy professionals are able to dedicate to the process.

5. Conclusion

This study set out to assess the ability of VM to deliver sustainable construction projects in Nigeria. Through the assessment of VM exercise conducted on two proposed construction projects, the study concludes that the use of VM in the delivery of construction projects will help in achieving the core values of sustainability for such project. Achieving economic, environmental and social sustainability can be possible through the use of VM practice as unnecessary areas that will affect the sustainability of the project can be identified early and eliminated accordingly. Also, new ideas that will help promote sustainability in the project can be harnessed from participants during the course of the exercise. However, the ability of professionals to work together and see problems from a common stand and client's unwillingness to fund separate gathering for VM exercise was discovered to be the major factors affecting VM exercise. The study, therefore, recommends VM as a truly beneficial exercise in providing sustainability in any project, which is worth investing some time and effort in by both the government and private investors. Adopting VM as an integral part of construction projects (either small or large) will go a long way in achieving sustainability in such projects, thus achieving a sustainable environment.

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Biographies

AGHIMIEN Douglas Omoregie, is a vibrant researcher and an intricate painter of the world with words. He bagged his Bachelor and Master degree from the Department of Quantity Surveying, Federal University of Technology, Akure, Nigeria, and he is currently pursuing a Ph.D. in Engineering Management at the University of Johannesburg, South Africa. During his master's programme, he was employed as a Teaching Assistant in his department, where he assisted in teaching and conducting of researches. This employment gave the platform for an increased interest in research. He has worked on areas such as construction performance measurement, value management and sustainability in construction. To his name and in collaboration with academia within and outside Nigeria, he has authored a good number of journal and conference papers both locally and internationally. He is a probationer member of the Nigerian Institute of Quantity Surveyors.

OKE Ayodeji Emmanuel, is a Quantity Surveyor by training and a Ph.D. holder in the same discipline. He bagged his B.Tech degree in Quantity Surveying from Federal University of Technology, Akure, Nigeria in 2006 with a first class (Hons.). He is a reviewer for various local and international reputable Journals. To his name and in collaboration with academia within and outside Nigeria, he has authored a good number of journal and conference papers both locally and internationally. He received 2016 Emerald Literati Award for the article on Structural Equation Modelling of Construction Bond Administration, as a highly recommended paper in the Journal of Financial Management of Property and Construction. He is one of the authors of the book titled sustainable value management for construction projects. He is currently a Post-Doctoral Research Fellow at the Department of Construction Management and Quantity Surveying, University of Johannesburg, South Africa.

AIGBAVBOA, Clinton Ohis, is currently the Vice-dean: Postgraduate Studies, Research and Innovation (PSRI) of the Faculty of Engineering and the Built Environment (FEBE) of the University of Johannesburg. He also serves as the Head: Sustainable Human Development and Construction Research Centre, in the Department of Construction Management and Quantity Surveying, School of Civil Engineering and the Built Environment, FEBE. He is an Associate Professor in the Department of Construction Management and Quantity Surveying, University of Johannesburg, South Africa. As a Ph.D. candidate in 2013, he was among the top 10 researchers in UJ; while in 2014 and 2015, he was the leading research output contributor in the University. Prof Aigbavboa has published more than 400 peer-reviewed articles in journals, conference proceedings and in book chapters.