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Evaluating the Implementation Efforts of Sustainable Value Management Strategies in Northern Nigeria

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ABSTRACT

Value management (VM) has emerged as a valuable strategy in numerous countries for advancing sustainability objectives. The study was to evaluate the implementation of VM and its role in promoting sustainable building initiatives in northern Nigeria. The questionnaire was administered to 250 construction professionals, facilitating an in-depth exploration of VM practices in the country. Data analysis encompassed techniques such as exploratory factor analysis (EFA), alongside descriptive statistics including frequency analysis and measures of central tendency. The findings indicate that 64% of respondents demonstrated awareness of VM, indicating familiarity with its principles. However, a significant majority (85.3%) reported non-adoption of VM practices and lacked formal training in VM methodologies. EFA revealed five principal components characterizing VM activities: an information phase, functional assessment, creative exploration, evaluation procedures, and project development/presentation stages. This research contributes to the awareness and understanding of VM among building professionals, thereby facilitating cost optimization and bolstering sustainability endeavors within building projects, particularly in developing nations like Nigeria. Ultimately, the insights garnered from this study hold the potential to enhance building management practices by integrating key elements of VM, thereby ensuring efficient resource allocation and alignment with sustainability objectives.

Keywords: Efforts, Implementation, Northern Nigeria, Strategies, Value management.

INTRODUCTION

Building projects have a profound impact on culture, the environment, and the economy throughout their lifecycle. They consume more than 40% of global energy and account for 30% of total greenhouse gas emissions in both developed and developing nations (Bilgen, 2014). Given the rapid development experienced by these countries, the construction industry plays a vital role in providing essential living infrastructure. Success in this field is typically assessed based on the quality, cost, and timeliness of construction projects (Burrows, 2023). However, the construction industry has undergone significant changes to meet the commercial demands and objectives of developing nations. Many financial procedures in developing countries are still in the process of being upgraded. Building projects in these contexts often face numerous challenges, including failure to meet targets, delays, budget overruns, and insufficient sustainability measures (Ropero-Gaona & Lucas-Marmol, 2023).

Nigeria, a developing country, exemplifies significant challenges in its construction market due to high unemployment rates and

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low wages. These issues stem from currency fluctuations, limited job opportunities, and strict financing criteria(Yang *et al.*, 2022). Additionally, Nigeria is one of the most populated countries in Africa, with rapid population increases occurring from 1950 to 2020. Projections estimate that the population by 2020 will be more than five times that of the 1950 population (Algarni *et al*., 2023). Moreover, rural urbanization increased by 0.9% between 2001 and 2012. This underscores the importance of improving sustainable buildings that are environmentally friendly and resource-efficient throughout their development processes (Algarni *et al*., 2023).

Value Management (VM) is a systematic, function-driven, team-based approach aimed at assessing the functions, goals, and expenses of a process or facility to optimize its efficiency (Uddin, 2022). It prioritizes delivering the necessary functions as defined by customers while minimizing overall costs, all while aligning with performance criteria. VM studies are typically conducted early in a project's lifecycle to maximize benefits and resource efficiency (Golroudbary *et al*., 2022).

To address this gap, this paper assess the application of VM and investigate its activities in building projects in developing countries, particularly Nigeria. To achieve this, a mixed-method research approach was proposed, aiming to delve into VM activities within the Nigerian construction industry. The outcomes of the study provide valuable insights to decision-makers, enabling them to optimize their building projects by reducing unnecessary costs and enhancing sustainability through VM implementation (Golroudbary *et al*., 2022; Han *et al*., 2023; Min *et al.*, 2022). These results have the potential to significantly impact building projects, not only in Nigeria but also in developed nations where similar project styles and procedures employed.

VM and the Sustainability

Existing research has emphasized the importance of sustainability (Golroudbary *et al.*, 2022). Implementing strategic sustainability goals and strategies for projects is a complex process (Han *et al.,* 2023), necessitating a delicate balance among the social, economic, and environmental aspects of sustainability (Chien *et al*., 2022). The integration of sustainability into the construction industry has spurred efforts to find practical methods for incorporating this concept into existing practices (Han *et al.*, 2023).

The practice of Value Management (VM) typically involves structured workshops ranging from 4 hours (half a day) to 5 days (Golroudbary *et al*., 2022). The duration of VM workshops can be influenced by factors such as the scope of the VM (i.e., the size and complexity of the project, the objectives to be achieved), as well as the specific stages or phases of VM to be implemented. Methodological approaches vary for instance, the US Value Engineers Society (SAVE) outlines a three-step methodology consisting of "pre-study, value study, and post-study." The value study aims to execute six phases during the workshop: information phase, function analysis phase, creative phase, evaluation phase, development phase, and presentation phase (Han *et al*., 2023). However, some of these phases, such as information, development, and presentation phases, may be more efficiently conducted outside the workshop setting, potentially through virtual means (Lin *et al*., 2022).

Golroudbary *et al*. (2022) concluded that a commitment from multidisciplinary stakeholders, organized and formal VM studies, the adoption of sustainable concepts as project objectives, and a focus on project cost delivery all contribute to the integration of VM with sustainability. Thus, incorporating sustainability through VM is both feasible and advisable (Singh *et al.*, 2023).

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MATERIALS AND METHODS

Data Collection

Semi-Structured Interviews

The research utilized a semi-structured interview approach to ensure interviewees remained focused on VM activities (Alsolami, 2022). Confirmation and verification procedures were conducted iteratively between interviews and data analysis, a process akin to participation checks and validation observed and implemented in prior studies (Suriyankietkaew & Kungwanpongpun, 2022). The interview method comprised a range of open-ended questions aligned with the study's objectives. The interview instrument was structured into four sections: background information about the experts, their knowledge and application of VM within organizations, VM activities in construction and building projects, benefits of implementing VM in the construction industry, and factors influencing the adoption of VM for project sustainability (Lin *et al*., 2022).

Questionnaire Survey

A pre-qualification analysis was conducted through telephone calls with various organizations, resulting in 215 companies agreeing to participate out of over 280 generated during the screening study. The selected companies ranged from 9 to 250 staff, were self-employed or non-foreign corporations, and were established between 1994 and 2010, thereby minimizing potential influence from parent group international policies (Suriyankietkaew & Kungwanpongpun, 2022).

The data collection process commenced with gathering demographic information of respondents and their projects. The second section involved rating VM adoption activities using a 5-point Likert scale, ranging from "very low" to "very high," consistent with similar studies on VM implementation. Activities identified from literature review and expert interviews were listed. Finally, 21 potential VM adoption activities for Nigeria building projects were identified, and the questionnaire underwent face-to-face validation. Cronbach's α analysis was employed to assess the reliability of the research tool after EFA generation.

RESULTS AND DISCUSSION

Reliability Analysis and Validity Analysis

The Confirmatory Factor Analysis (CFA) and Exploratory Factor Analysis (EFA) techniques are normally used for factor analysis. In this study, CFA was used for evaluating the structure underlying the adopted variables with a view to properly test the proposed hypotheses. On the other hand, EFA was used to gather information about the relationship among variables and reduce the variables into a few underlying structures. It is one of the functions built into the Statistical Package for the Social Sciences (SPSS) (Rialti *et al.,* 2022).

More so, the number of participants used as a representative sample within acceptable ranges (Villabruna *et al.*, 2024). The 21 variables as well as 200 participants used in the current study, are considered suitable for factor analysis. It is vital to highlight that the sample size and methodology adopted for this research is similar to the study by Alsolami (2022) with 100 participants; Golroudbary *et al*. (2022) with 231 participants; and (Suriyankietkaew & Kungwanpongpun, 2022) with 200 participants.

Respondents' Characteristics

Approximately 18.7% of respondents had worked for one year to less than five years, while those with work experience ranging from 5 to 10 years, 11 to 15 years, and more than 25 years accounted for around 16.0%,

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27.3%, and 15.3%, respectively. These findings suggest that the participants in this study possess significant experience to provide the necessary information.

Table 1: Demographic characteristic frequency distribution

Variable	Characteristics	Respondents	(%)
Educational level	Less than five 5–10	28	18.7
Organization function	More than 25 Architect Civil Engineer	24	16.0
VM workshop adopting and attending	Electrical Engineer and Quantity surveying	41	27.3
format training on VM	Mechanical Engineer	34	22.7
format training on VM	Design Engineer	23	15.3
Work experience (Years)	Site Engineer	40	26.7
Professional field	Senior Manager	46	30.7
Current position	Consultant and Contractor	28	18.7

Level of Awareness and Implementation of VM in Nigerian Construction Industry

This study explored participants' comprehension and familiarity with the implementation of the VM method, as outlined in Table 1. Analysis of the findings reveals that 45.3% of respondents perceived value management or value engineering as a concept, while 44.0% considered it a profession. Similarly, regarding awareness of VM or value engineering, 62.7% of respondents were familiar, with 1.3% being entirely familiar with VM practices. Overall, participants exhibited a moderate level of VM awareness, with a knowledge rate of 64.7%, slightly surpassing the 50% average. This indicates a reasonably adequate level of awareness among stakeholders. Conversely, a large majority of respondents (approximately 85.3%) did not attend VM workshops or receive formal training, with 92.0% lacking any VM training related to participation in workshops. This suggests a lack of VM adoption within these organizations. Most surveyed companies cited reasons such as cost constraints and limited awareness for not utilizing VM.

EFA for VM Implementation Activities

The primary objective of this study is to investigate VM activities in building projects, which was accomplished through EFA analysis. However, it is crucial to assess the normality of data before conducting the EFA study. In this research, evaluating the normality of data was considered a fundamental assumption, and the results of the normality test for VM activities are presented in Table 2. Suriyankietkaew and Kungwanpongpun (2022) concluded that if the kurtosis falls within the range of -7 to +7 and skewness falls within the range of -2 to +2, the data can be considered normal. As depicted in Table 2, the skewness ranged from -1.51 to -0.68, and the kurtosis ranged from 0.05 to 1.66, indicating that all variables exhibit normal distribution.

Table 2: Normality Test

Variable	Skewness	Std. Error	Kurtosis	Std. Error
Information phase	−1.61	0.17	1.66	0.33
Function phase	−1.25	0.17	0.76	0.33
Evaluation phase	−0.76	0.17	0.36	0.33
Creativity phase	−0.80	0.17	0.19	0.33
Development and presentation phase	−0.68	0.17	0.05	0.33

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EFA was utilized to examine the structure of the factor among twenty-one VM implementation activities, employing various well-established criteria for factorability assessment. KMO was employed to gauge factor homogeneity and is commonly utilized to determine if the variables' partial correlations are minimal [86]. Table 2 demonstrates that the sampling adequacy measure of KMO was 0.755, surpassing the recommended value of 0.6, and Bartlett's Test of Sphericity yielded a significant result (χ^2 (210) = 1204.837, $p < 0.05$) [64,87,88].

Table 3: Test result related to value management (VM) activities.

Olkin Measure of Sampling Adequacy		0.755
	Approx. Chi-Square	**1254.261**
Bartlett's Test of Sphericity	Df	210
	Sig.	1.000

Identify the Level of VM Awareness

Awareness of VM and its application in construction projects significantly influences the decision-making process of top management regarding VM implementation. The implementation of VM is a multifaceted endeavor involving various stakeholders, but familiarity with the process can facilitate overcoming implementation obstacles. According to this study, it is evident that 64% of the respondents possess sufficient knowledge of VM, indicating a moderate level of understanding regarding VM. This finding contradicts the observations of Regona *et al.* (2022), who reported that approximately 51.6% of their respondents had only a basic understanding of VM. This disparity may be attributed to differences in the methodologies employed in both studies. (Regona *et al*., 2022) surveyed a smaller sample size of thirty-five participants, whereas the current study conducted a broader examination by assessing the knowledge of building experts and administering 150 questionnaires across the two largest regions of the country (Kaduna, Kano).

Factor Analysis Results

Five phases of VM in Nigeria building projects were extracted through EFA. The activities executed are extracted under information, function, creativity, evaluation, and development/presentation phases. This finding did not match with the study of Suriyankietkaew *et al.* (2022) which was carried out in the Nigerian construction industry. Their findings show that the VM is extracted under three phases, that is, information/function phase, creativity/evaluation and development/presentation phase. These findings necessitate a need to enhance the application of VM in developing countries since the professionals in those countries did not consider VM phases according to VM standard generated by SAVE (Villabruna *et al*., 2024). The extracted phases in this research are hereby discussed.

Information Phase, Creativity Phase and Development Phase

The primary components identified in this study provide insight into the various phases of VM implementation in construction projects, each contributing to overall project success. The first principal component, referred to as the information phase, encompasses seven items and explains 17.66% of the variance. This phase involves activities such as clarifying project background information and constraints, involving clients and stakeholders early in the project, conducting site visits, and defining project scope and objectives. It is imperative for this phase to support the adoption of VM, with stakeholders sharing project details and expectations explicitly. The second principal component, known as the function phase, comprises four items and

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explains 13.178% of the variance. Activities in this phase include presenting project restrictions to stakeholders, categorizing project functions, and ensuring clear communication of project scope and expectations. The focus is on defining and fulfilling project criteria and needs, with an emphasis on understanding primary and secondary functions to comprehend project sustainability.

The fourth principal component, the creativity phase, consists of three items and accounts for 11.041% of the variance. This phase involves brainstorming alternative ideas to achieve project functions and evaluating these ideas for feasibility. Innovative approaches are encouraged, with the aim of enhancing innovation and considering economic, environmental, and community sustainability in proposing alternatives.

The final primary component, the development and presentation phase, encompasses three items and represents 9.748% of the variance. Activities include generating action plans for short-listed alternatives, following up on action plan implementation, and holding review meetings. This phase focuses on transforming ideas into practical solutions, evaluating their feasibility, and presenting them for further consideration. While some authors suggest presentation as the final step, this phase serves to provide feedback to the authorizing body and refine proposed solutions. Therefore, these components highlight the essential stages of VM implementation in construction projects, emphasizing the importance of thorough planning, stakeholder involvement, creativity, and sustainability considerations throughout the process.

VM Activities Implementation for Sustainable Building

Recent advancements in building practices have emphasized more efficient and sustainable methods, specialized techniques, and materials. This trend underscores the need for substantial and sustainable development in the construction industry. However, there is a growing importance in measuring sustainability and performance during usage, necessitating the establishment of strategies to incorporate sustainable development concepts effectively.

Value Management (VM) has emerged as an effective method for achieving building sustainability. This study evaluated VM activities through EFA analysis to propose VM implementation activities and stages that can facilitate the sustainable delivery of building projects. By integrating sustainability principles into the conceptual and initial design phases, VM studies allow for the exploration of alternatives that promote a healthy and safe ecosystem for residents. Moreover, VM provides multidisciplinary professionals with opportunities to address community, societal, and environmental concerns, effectively enhancing sustainability concepts throughout the building project lifecycle.

Traditionally, project success has been measured by the "iron-triangle" of time, cost, and quality, which has faced criticism in recent years. VM implementation enables building companies to balance time, cost, and quality, reducing costs without compromising benefits. Additionally, VM contributes to achieving optimum project time, as demonstrated in various fields such as roadway and marine construction.

Cost and financial sustainability in building projects can also be targeted through VM adoption. VM serves as a supportive method to address challenges such as limited financial resources and strict planning in the building industry. Financial analysis plays a crucial role in evaluating a company's sustainable improvement and value creation, making VM a valuable tool for incorporating

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sustainability into construction projects. In the context of construction firms, which face obstacles as they mature and strive for positive social, environmental, and economic impacts, VM activities offer practitioners the opportunity to make informed decisions for achieving company success. These decisions can have long-term effects on corporate practices and contribute to enhancing company value over time. Ultimately, the adoption of VM activities enables enterprises to focus on sustainability aspects and ensure that the value created outweighs any negative impacts, thereby achieving long-term success and enhancing their business model effectiveness.

CONCLUSION

construction projects, particularly in developing nations like Nigeria, often suffer from low quality and lack adherence to sustainable principles. This research underscores the significance of Value Management (VM) as a viable solution to address this challenge. The hypothesis posited that the implementation of VM activities is essential for building professionals to attain their sustainable objectives. To investigate this hypothesis, a mixed methods approach was employed, involving semi-structured interviews with fifteen experts and a questionnaire survey.

The findings collectively revealed that the level of VM implementation in building projects in Nigeria is relatively inadequate. Despite reasonable awareness among building participants (67.7 percent), the majority perceive VM primarily as a concept rather than adopting it in practice. Thus, the main challenge in the Nigerian construction industry lies not in awareness but in the adoption of VM.

Through questionnaire analysis using Exploratory Factor Analysis (EFA), the study identified five phases of VM adoption in Nigeria building projects: information, function, creativity, evaluation, and development/presentation phases. Additionally, new activities identified through expert interviews, such as estimating total life-cycle costs for each alternative and researching evaluation criteria for alternatives, were incorporated into the analysis. Conversely, one activity, involving and assigning responsibilities to construction professionals at the initial project stage, was removed based on the EFA results. Therefore, VM activities play a crucial role in ensuring the sustainable delivery of building projects. The study outcomes can provide valuable insights for policymakers and top managers in understanding the relative importance of VM activities and facilitating their efficient implementation. Moreover, these findings can assist developing countries in leveraging VM implementation to achieve overall sustainable success in their construction projects.

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