ORIGINAL RESEARCH ARTICLE

A model for enhancing the application of value management in construction projects in Kenya

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ABSTRACT

Value management (VM) has been widely used in the construction industry to facilitate projects for decades in many countries around the globe. The concept began in the US, and then other nations such as China, Japan, South Africa, and Nigeria followed and tested its effectiveness by assessing its impacts on costs, quality, and time. A VM application has a low cost and a high benefit process, and thus, if well-practiced and integrated into project management at the beginning of a project, it would lead to its successful completion. It also helps in improving the value of a project by ensuring low costs, high quality, and completion within the stipulated time frame. In Kenya, there remains a gap in that very little information has been documented about VM applications in construction projects. Therefore, this study seeks to evaluate and develop a model to enhance the application of value management to construction projects. The study sampled all registered key stakeholders in construction projects within Kenya. The stakeholders are comprised of engineers, architects, quantity surveyors, contractors, and project managers. A stratified sampling strategy was employed, and data analysis was conducted using Statistical Package for Social Sciences (SPSS) version 25. The analysis methods used in this research were both descriptive and inferential in nature. Data summaries in terms of frequencies, means, and standard deviations were obtained under descriptive analysis. The inferential analysis comprised Pearson's correlation and regression analysis, which determined the significant determinants of VM application and were used to establish a predictive model. The study showed that team dynamics, procurement policy, government regulations, and VM knowledge are significant predictors of the level of VM application. A model has been developed that can assist in enhancing the application of value management in construction projects in Kenya.

Key Words: Project performance, value management, team dynamic, government regulation, procurement practices.

1.0 Introduction

The construction sector is one of the biggest in the world economy. Many countries around the globe have proven the construction industry to be one of the main driving forces behind economies in the recent past (Yap *et al.,* 2019). In many ways, the pace of the economic growth of any nation can be measured by the development of physical infrastructure, such as buildings, roads, and bridges. The construction industry often acts as a catalyst to stimulate the growth of a nation's economy and is often referred to as an engine of growth (Yap *et al.,* 2019). About

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$10 trillion is spent on construction-related services and goods globally each year (Barbosa *et al.,* 2017). A study by Ibrahim (2010) states that the world construction industry contributes to around 10% of the global gross domestic product (GDP). The industry benefits not only from production output but also from providing employment to millions of people around the globe. The construction industry is believed to offer employment to nearly 7% of the total employed persons in the whole world (Ortiz *et al. 2009)*.

In Kenya, the construction industry is one of the largest, contributing greatly to the economy's GDP, and it is a key pillar of Kenya's Vision 2030. During the period 2010–2016, GDP grew from 133 billion to 231 billion, giving an indication of the importance of construction projects in the country (Construction Industry Policy, 2018). Recently, in 2018, Kenya's construction sector expanded by 8.6%, contributing 6% to Kenya's economy (KNBS, 2018). The industry has grown over time in different phases of development since the pre-colonial period. The growth has seen the use of sustainable, locally available materials, expertise, and technologies, which had been a problem in the past. Skills have been initiated and taught both informally and through formal training. The government has recognized initiatives geared towards enhancing the construction industry's performance.

Underperformance in the construction industry cuts across both developed and developing nations. In Kenya, despite the progress and initiatives made in the construction sector, there are challenges that derail the progress. The challenges include delay in the completion of projects, bureaucracy in the procurement process, high capital to support the projects, and outdated policies, laws, and regulations, among others (Machoka, 2017). Therefore, since construction is becoming more complex, a more sophisticated approach is necessary to deal with initiating, planning, financing, designing, approving, implementing, and completing a project. Thus, the aspect of value management that has an impact on costs and the overall economic success of a project is critical.

Value management (VM) is a set of principles that include the combination of planning methods and tools that are used for improving organizational decision-making and performance by lowering operational costs. VM involves the optimization of risks, costs, and benefits when making decisions. Similarly, VM is the process of evaluating, reviewing, and maximising the value of a project from its conception to its occupancy. Value management provides documentable and structured consideration that ensures that the projects are framed to satisfy the benefit of the stakeholders and their successful completion. The ultimate goal of VM is to ensure value for money, not solely to cut costs. Kelly *et al*. (2014)

Value management is composed of value planning, value engineering, and value analysis. Value planning involves client briefing, brainstorming, evaluation, weighted value criteria, and a preferred scheme. Value engineering entails confirmation of objectives, information gathering, function analysis, speculation, and evaluation. Value engineering involves proposals for the final report and implementation. Value analysis encompasses the monitoring process, correction of defects, and feedback into subsequent areas (Perera & Selvadurai, 2006).

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The concept of VM has been used in the construction industry to facilitate projects for decades in the United Kingdom and the United States of America (Bowen, 2010). Other countries, such as China, Japan, South Africa, and Nigeria, have tested the effectiveness of VM, including its workability in their construction projects, by assessing its impacts on costs, quality, and time, which was found to be effective. Having begun in the United States, the concept of value management has spread greatly to developed economies as well as developing economies such as Kenya. However, Mwangi (2008) established a VM framework showing its implementation in construction projects in Kenya. The framework revealed that the benefits of VM have not yet been realized in Kenya.

Over the past decade, VM has been adopted by many countries around the globe, including developed and developing nations in Asia and Africa. In Nigeria, engineering and construction professionals have begun to embrace VM applications in their projects to improve the value of their project stakeholders. Since VM has been introduced in Nigeria, its implementation has indicated numerous benefits in the construction industry (Aghimien and Oke, 2015).

Similarly, Ncube & Rwelamila (2017) opine that VM has been implemented in the construction industry in South Africa as a management tool that helps companies arrive at more practical designs and creates a more precise focus on the project objectives. The researcher also noted the challenges that have influenced its implementation, including a lack of proper communication and interactions between the client and project managers and the clients' unwillingness to pay for the VM services. Mziray (2015) suggests that in Tanzania, VM has been implemented to ensure the viability of construction projects by the government. Nevertheless, the researcher stated that some of the main benefits experienced from the application of VM in construction projects included the completion of projects on time and effective budget control. However, the local government encountered some issues during its implementation into their projects, such as a lack of a defined value management team and political interference.

The first project to apply value management in Kenya was the construction of the US Embassy in Gigiri, Nairobi. The adoption of value management in construction projects has continued to grow with time. Additionally, from my experiences on the application of VM outside, Kenya has lowered costs and maintained project quality. Despite the benefits experienced while using VM in construction, it is still unpopular since it has not been well adopted in Kenya (Nderitu, 2009). Despite the above-mentioned benefits, less attention has been given to VM practices in construction projects in developing countries (Whyte & Cammarano, 2012). It is on this basis that the current research seeks to encourage the uptake of VM by highlighting the factors that influence the application of value management in construction projects. Furthermore, a framework has been formulated to facilitate the implementation of value management in construction projects in Kenya.

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2.0 Methodology

2.1 Research design

The research design adopted was a cross-sectional correlational survey. The design enables the examination of a relationship between variables and also enables the collection of data about given phenomena within a limited time horizon, which can help describe incidences of events or provide an explanation of factors related to an organization. The study had the application of VM in Kenya as the dependent variable, while the independent variables entailed VM knowledge and awareness, team dynamic factors, government regulation, and procurement practices. This study aimed at collecting comprehensive information through descriptions, which was helpful in identifying variables. The advantage of this design over others is that data can be collected less expensively and within a short time. Primary data was obtained using self-administered questionnaires, which were distributed through email, physical dropping, and interviews.

The design allowed the researcher to get information that describes VM determinants and sought its relationship with VM application by asking questions relating to individual perceptions and attitudes.

2.2 Sample size

This study targeted all the registered built environment professionals in Kenya by 2021. They were comprised of civil engineers, architects, and quantity surveyors. Given a study population of 3180 building professionals, a sample size of 355 was arrived at using a 95% confidence level and an error of 0.05. This was arrived at by using the formula taken from Yamane (1973).

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

where; n = Size of the sample,

N = Size of the population

e = Acceptable error and given as 0.05

$$= \frac{3180}{1+3180*(0.05^2)} = 355$$

The sample size was then divided proportionately among the three professional categories as shown in Table 1.

Table 1: Sample size determination

Category	Number (N)	Proportion	Sample size (n)
Architects	868	0.27	96
Quantity Surveyors	526	0.17	60
Civil Engineers	1786	0.56	199
Total	3180	1	355

Source: Researcher, 2022

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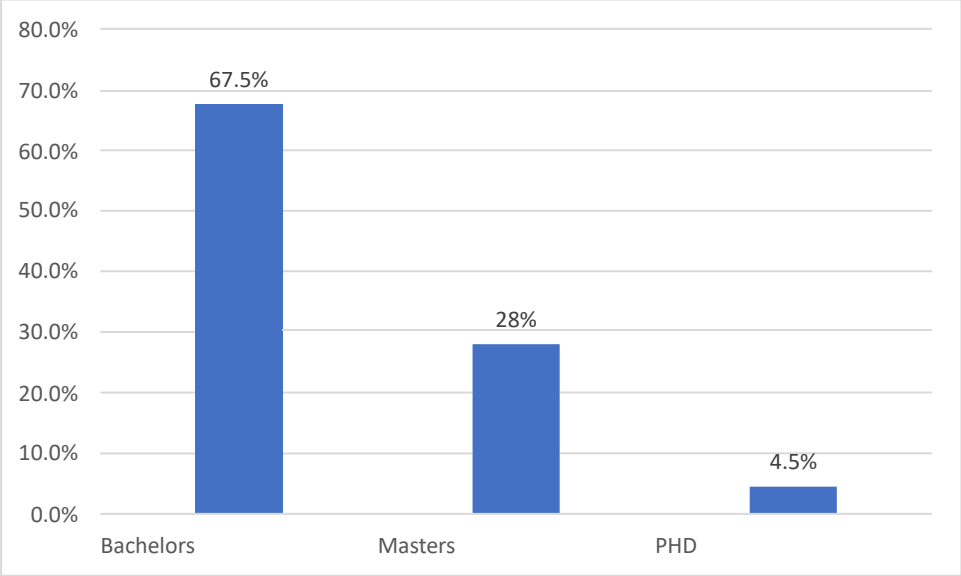
2.3 Data analysis

Descriptive statistics were useful in describing the distribution of scores or measurements using a few indices. The data obtained from the field was analyzed using the statistical package for social science (SPSS version 25). The qualitative data from the open-ended questions was analyzed using conceptual content analysis, where the data was organized, sorted out, coded, and interpreted. Inferential data analysis was then computed using the Pearson correlation coefficient and regression analysis (multiple regression analysis).

Multiple regression analysis was used to establish the relationships and develop a model between the independent and dependent variables. The multiple regression tool was used because it is a procedure that uses two or more independent variables to predict a dependent variable. The study used multiple regression analysis to analyze the collected data to measure the determinants of VM application. Multiple regression attempts are made to determine whether a group of variables together predict a given dependent variable (Babbie, 2004).

3.0 Results

The analysis of data based on gender shows that the majority of respondents (65%) were male, while 35% were female. The results show that the majority (46%) of the respondents were engineers; quantity surveyors were reported to constitute 25% of the respondents, while 29% were architects. The findings showed that 45% of the respondents had between five (5) and ten (10) Years of experience, while 35% had three (3) to five (5) years of experience. Respondents with experience below three (3) years and above ten (10) years had 10% each. Regarding level of education, the majority of the respondents had a bachelor's degree, while 28% had a master's, and only 4.5% had a PhD.



Source: Researcher, 2022

Figure 1 Distribution of respondent by the level of education

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3.1 Descriptive statistics

Descriptive statistics were computed for the level of the VM application. The variable was measured using factors relevant to the specific concept addressed. A Likert scale of points one (1) to five (5) was used to measure the level of agreement based on the factors. In terms of the level of VM application, the average score was 3.147 (M = 3.15, SD = 1.34). The distribution of the score was assessed using the skewness value, where the entire variable had a skewness Value falling between -0.5 and 0.5. The values suggest that the distribution of the entire variable was fairly symmetrical.

Descriptive statistics were computed for VM knowledge application and awareness, team dynamic factors, government regulations, and procurement policy and issues. These variables were measured using factors relevant to the specific concept addressed. A Likert scale of points one (1) to five (5) was used to measure the level of agreement based on the factors. The descriptive statistics show that among the three independent variables, the average score in VM knowledge and awareness is 3.1437 (M = 3.4, SD = 0.95). Team dynamic factors had an average score of 2.8312 (M = 2.83, SD = 0.69). Government regulation factors had an average score of 3.1796, (M = 3.18, SD =0.63). The average score for the procurement policy factor is 3.678 (M = 3.68, SD = 0.615).

3.2 Correlation analysis

A correlation analysis was conducted to measure the strength and direction of the relationship between the dependent variable and the independent variable. The technique was adopted in order to show whether a relationship exists between level of VM application, knowledge and awareness, team dynamic factors, government regulation, and procurement procedures. The level of VM application was highly correlated with VM knowledge and awareness (r (232) =0.683, p = 0.01). The relationship between level of VM application and procurement policies has a positive correlation (r (232) =0.588, p = 0.03). The relationship between level of VM application and team dynamic factors had a positive correlation, r (232) =0.475, p = 0.033. A positive correlation occurred between the level of VM application and government regulation (r (232) =0.431, p = 0.036). The results are shown in table 2.

Table 2: Correlations analysis

		Team Dynamic factors	Procurement Policies and issues	VM Knowledge and awareness	Government regulations
Level of VM Application	Pearson Correlation	.475	.588	.683*	0.431
	Sig. (2-tailed)	.033	.030	.011	0.036
	N	234	234	234	234

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Researcher, 2022

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3.3 Regression analysis

Regression analysis was adopted in this study to establish the relationship and the impact of independent variables on dependent variables. Four independent variables—VM knowledge and awareness, team dynamics, government regulations, and procurement policy—were used to predict the level of VM application. The model summary statistics table generated a value of the coefficient of determination (R-squared) of 0.60. The value implies that 60% of the variability in the level of VM application is explained by VM knowledge and awareness, team Dynamics, government regulations, and procurement policy. The other 40% are due to unexplained variance or other variables that are not in the model.

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Table 3: Model Summary Regression Statistics

Multiple R	0.776331
R Square	0.60269
Adjusted R Square	0.594325
Standard Error	51.42
Observations	235

Source: Researcher, 2022

Table 4: ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	7.62E+09	1.91E+09	72.05388	4.82E-37
Residual	230	5.02E+09	26438858		

Source: Researcher, 2022

Table 5: Coefficient Values

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-12.99	17.922	-7.24831	1.03E-11
Team Dynamic factors	1.67	1.471	1.13132	0.025934
Procurement and policy and issues	2.44	0.7139	3.422715	0.000759
VM Knowledge and awareness	2.81	3.502	6.237278	2.82E-09
Government Regulations	1.01	2.026	2.46709	0.014507

Source: Researcher, 2022

Based on the coefficient table the optimal regression equation is as follows;

$Y = 12.99 + 1.67 (X_1) + 2.44 (X_2) + 2.81(X_3) + 1.01 (X_4)$

where; Y = Level of VM application

X_1 = Team Dynamic

X_2 = Procurement Policy

X_3 = VM Knowledge and Awareness

X_4 = Government Regulations

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The coefficient values show the change in the level of VM application as a result of changes in each of the independent variables. The optimal regression equation indicates that a unit increase in the team dynamic results in an increase in the level of VM application by 1.67. A change in procurement policies by a unit is likely to increase the level of VM applications by 2.44. Additionally, an increase in VM knowledge and awareness by a unit results in a change in the level of VM application by 2.81. A change in government regulation is likely to increase the Level of VM applications by 1.01. Overall, the value of the coefficient of determination (R-squared) is 0.60. The value implies that 60% of the variability in the level of VM application is explained by VM knowledge and awareness, team dynamics, government regulations, and procurement policy. The other 40% are due to unexplained variance or other variables that are not in the model.

3.4 Testing the hypothesis

The hypothesis for the study is as follows:

$$H_0: \beta_i = 0 \text{ for all } \beta_i \text{ , versus } H_A: \beta_i \neq 0, \text{ for at least one } \beta$$

The regression analysis reveals compelling evidence that team dynamics, procurement policy, VM knowledge and application, and government regulations serve as substantial predictors of the level of VM application (4,234) = 72.05, $p < 0.00$. This firmly rejects the null hypothesis. Furthermore, examination of the individual p-values for Team Dynamic, Procurement Policy, VM Knowledge and Application, and Government Regulations within the coefficient tables indicates that each of these independent variables stands as a statistically significant predictor of the level of VM application.

4.0 Discussion

Based on the findings of the regression analysis, team dynamic is a significant factor influencing the uptake of value management. It was observed that enhancing team dynamics by a unit results in an increase in the application level of value management by 1.67. The results align with Ochieng & Price (2010), who indicated that project teams enhance value management applications, which ultimately result in improvements in project performance.

Procurement policy generated a coefficient value of 2.44. The factor was also noted to have a significant influence on the level of VM application. The coefficient value suggests that enhancing procurement practices results in the application of value management practices by 2.44. The findings connect with Machoka (2017) who suggested that bureaucracy in procurement process were the key hindrance to project completion and adopting optimized procurement strategies would encourage a high application of value management.

VM Knowledge and awareness were found to influence the level of the VM application. Based on the coefficient value of the regression analysis, it was observed that a positive change in VM knowledge and awareness would enhance the application of the same by 2.81. The study's findings align with those of Maznan *et al.* (2012), who suggest that knowledge regarding value

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management among different employees of the construction industry contributes to a significant application of the same.

Government regulations generated a coefficient value of 1.01. The factor was also noted to have a significant influence on the level of VM application. The coefficient value suggests that improving government practices results in the application of value management practices by 1.01. The findings connect with Machoka (2017), who suggests that addressing the challenges of delay in the completion of projects, bureaucracy in the procurement process, high capital to support the projects, and outdated policies, laws, and regulations, among others, would contribute to the application of value management.

5.0 Conclusions

The percentage value of 62.94 percent regarding the level of application of value management in construction projects in Kenya suggests that VM in construction is slightly above average, which is not satisfactory. A lot is required to be done in order to boost the level of application of VM in construction projects in Kenya. The performance of the team dynamic factor in influencing the application of VM in construction projects appears to be 56.6%, while VM knowledge and awareness and government regulation are at 62.8% and 63.6%, respectively. Procurement practices appear to have a score of 73.6%, indicating that they highly influence the VM application in construction projects.

Team dynamics are unconscious, physiological forces that influence the direction of team behavior and performance. Procurement policy, VM knowledge and application, and government regulations are all significant predictors of the level of VM application. Team dynamic is a significant factor influencing the uptake of value management. Improving government practices results in the application of value management practices by 1.01. The model shows that all four factors above significantly influence VM application level in construction. The model therefore forms the basis for generating a framework for enhancing the implementation of value management in construction projects in Kenya. The framework takes into consideration the relevant stakeholders in the industry, which in our case include professional bodies and regulatory bodies. Interventions such as training and enacting relevant laws are essential in facilitating the adequate application of VM in construction projects.

6.0 Recommendations

In light of the research findings and conclusions, the following recommendations were developed to enhance the application of VM in construction projects in Kenya: For continued application of value management, there is a need to put much focus on the aspect of team dynamics. This can be achieved through proper identification of the project team members and promoting communication within the team. Knowledge regarding value management among different employees of the construction industry contributes to the increased application of VM. Enhancing knowledge in value management can be achieved by organizing value management training among the employees. Procurement policies and government regulations encourage the application of value management. One of the hindrances to optimal utilization of VM is

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bureaucracy in procurement processes. To overcome the barrier, there is a need to map out the procurement process and restructure the inventory.

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7.3 Conflict of interest

None.

7.0 References

Aghimien, D. O., & Oke, A. E. (2015). Application of value management to selected construction projects in Nigeria. *Developing Country Studies*, *5*(17), 8-14.

Babbie, E. R. (2004). *The practice of social research*. Belmont, CA: Wadsworth/Thomas Learning.

Barbosa, F., Woetzel, J., Mischke, J., Ribeirinho, M. J., Sridhar, M., Parsons, M., & Brown, S. (2017). Reinventing construction: a route to higher productivity. *McKinsey Global Institute*.

Bowen P, (2010) The Awareness and Practice of Value Management by South African Consulting Engineers: Preliminary Research Survey Findings, 'International journal of project management', 28, 2010, 285-95.

Ibrahim, A. R. B., Roy, M. H., Ahmed, Z., & Imtiaz, G. (2010). An investigation of the status of the Malaysian construction industry. *Benchmarking: An International Journal*.

Kelly, J., Male, S., & Graham, D. (2014). *Value management of construction projects*. John Wiley & Sons.

KNBS, 2018. *Home - Kenya National Bureau of Statistics, Nairobi, Kenya*. [Online] Kenya National Bureau of Statistics. Available at: <https://www.knbs.or.ke/> [Accessed 17 August 2022].

Machoka, P. O. (2017). *Public Procurement Practices and Performance of Selected Constituency Development Fund Projects in Kenya* (Doctoral dissertation, COHRED, JKUAT).21(2), 55.

Maznan, N. A., Jaapar, A., Bari, N. A. A., & Zawawi, M. (2012). Value Management: Private Sector's Perception. *Procedia-Social and Behavioral Sciences*, *50*, 383-391.

Mwangi, A. K. (2008). *A study to determine whether and how value management is applied in the construction industry of Kenya* (Doctoral dissertation, University of Nairobi).

Mziray, S. A. (2015). An Evaluation on Application of Value Management In Local Government Authorities Construction Projects In Tanzania.

Ncube, M., & Rwelamila, P. D. (2017). Value management expertise in the South African construction industry–a case study of Gauteng. *Mega Journal of Business Research*, *2017*(1).

Nderitu, C. K. (2009). *Value management: A tool for cost management in the building industry in Kenya* (Doctoral dissertation).

Ochieng, E. G., & Price, A. D. F. (2010). Managing cross-cultural communication in multicultural construction project teams: The case of Kenya and UK. *International Journal of Project Management*, *28*(5), 449-460.

ISSN 1561-7645 (online)
doi: 10.4314/jagst.v23i1.6

Ortiz, O., Castells, F., & Sonnemann, G. (2009). Sustainability in the construction industry: A review of recent developments based on LCA. *Construction and building materials*, *23*(1), 28

S. Perera, G. Karunasena, and K. Selvadurai, "Application of value management in construction", *Built. Environ. Sri Lanka, vol. 4, no. 1, 2006*.

Whyte, A., & Cammarano, C. (2012). Value management in infrastructure projects in Western Australia: Techniques and staging. In *Proceedings of the 28th annual ARCOM conference* (pp. 797-806). ARCOM, Association of Researchers in Construction Management.

Yamane, Taro. (1973), Statistics: An Introductory Analysis. London: John Weather Hill, Inc.

Yap, J. B. H., Chow, I. N., & Shavarebi, K. (2019). Criticality of construction industry problems in developing countries: Analyzing Malaysian projects. *Journal of Management in Engineering*, *35*(5), 04019020.

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