

Empirical Framework for Tackling Recurring Project Management Challenges Using Knowledge Management Mechanisms

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Abstract. The construction industry is termed as a highly risky industry, considering the alarming rate of recurring challenges and its negative impact on the economy, man, and his environment. This study aimed to develop a framework using knowledge management in tackling recurring problems in the Nigerian construction industry. The data instrument was a well-designed questionnaire directed at construction professionals. Out of the 80 questionnaires distributed, the study used 78 (97.5%) questionnaires for analysis. The study identified corruption, inadequate planning measures, and reduced government policies as the main factors influencing recurring project management challenges in the Nigerian construction industry. The study revealed significant knowledge management strategies used by Nigerian construction professionals, which include the use of emails, face-to-face interactions, and brainstorming sessions. The knowledge management strategies are further classified into data mining based, traditional based, and mobile technology-based knowledge management strategies in the construction sector. The primary benefits associated with knowledge management mechanisms in the construction industry include high growth performance, aid decision making, and innovation in the construction sector. Further classification showed that these benefits are mainly performance-based and collaboration and learning-based benefits. The study proposed a knowledge management framework for tackling recurring challenges in the Nigerian construction industry. Some recommendations drawn from the findings and conclusions can be found in this study.

Keywords: Construction industry · Emails · Knowledge management · Recurring challenges · Nigeria

1 Introduction

The construction industry is an essential sector in an economy that seeks development. This industry affects all other areas of the economy ranging from the agricultural sector, transportation sector, energy sector, manufacturing sector, economic sector, among

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others. The construction industry plays a crucial role in the economic development of several countries [1, 2]. The continuous need for infrastructural development resulted in a large percent of Nigeria's working population been found in the construction sector either directly or indirectly. According to [3], the Nigerian construction industry gives employment to over 3 million of the 160 million population in the country. Over the years, the growing construction sector has successfully attracted both private and public stakeholders in the industry. The construction industry is a complex and expandable sector that has developed over the years to shelter and accommodate the rise in the country population [4]. However, the perception of the construction industry is that it is a high-risk industry. If the management of these risks is ineffective, there are probabilities of the sector having recurring challenges that can affect lives and properties concerned. [5] corroborated this assertion that in terms of occupation area in modern society, construction work is one of the popular high-risk occupations. The recurring challenges have affected every phase of the construction process in Nigeria [2].

Some of the highlighted recurring challenges in Nigeria construction industry are building collapse [6], faulty design [7], time overrun and cost overrun [8], poor health and safety track record [9], high construction waste [10] and high energy consumption [2]. The trigger for the recurring challenges facing the construction industry could also be corruption and ineffective communication challenges. An individual or a profession cannot solve specific recurring problems; the Nigerian construction industry must seek more knowledge collaboration in the construction industry.

The lack of effective communication (knowledge sharing) among professionals and professional bodies may consistently lead to an unsuccessful project in the Nigerian construction industry. As stated by [11], effective communication is a critical aspect of construction project success outcomes. This study posits that many of the recurring challenges identified in this study can be resolved or lessened using appropriate software and other ICT-based tools as a prerequisite in the potential expression of a sound knowledge management system. Therefore, this study intends to develop an empirical framework for tackling recurring project management challenges using knowledge management mechanisms in the Nigerian construction industry. The outlines of the contributions of the study are to;

- Identify the factors influencing recurring project management challenges in the construction sector.
- Examine the knowledge management strategies used by construction professionals in Nigeria.
- Evaluate the benefits associated with knowledge management mechanisms.
- Develop a knowledge management framework for tackling recurring challenges in the construction sector.

2 Literature Review

Knowledge management is the open and efficient process of managing knowledge as a resource for the advantage of the society or individual's use. This knowledge can be generated, stored, and shared to make informed decisions. This information required in knowledge management can be produced individually or collectively from a group of people. Practically, when organizations put this knowledge together, it can form information management, of which organizations can learn from them [12]. Knowledge management cuts across different disciplines as it improves the outcomes within various industries by learning from the use of knowledge created within the firm or industry. Knowledge management processes involve designing, implementing, and reviewing different activities that improve knowledge acquisition in a company's operation. Knowledge management encourages innovation because it fosters the use of tested smart processes; it is people-centered and compares past behaviors to reduce complexity and ambiguity through the knowledge networks and connections. To understand knowledge management further, Fig. 1 sheds more light on the three orientations in which knowledge management.



Fig. 1. Understanding knowledge management Source: [13]

Knowledge management is not a new managing concept. This managerial concept has been well established in other fields such as Accounting, Banking, Information technology, and other knowledge-based professions. To examine knowledge management strategies in Nigeria, this study evaluated previous studies, as shown in Table 1, the use of knowledge management in tackling issues in various industries across other countries.

Table 1. Previous studies on the use of knowledge management

S/n	Issues	Sector	Country	Author	Remarks
1	Fragmentation of data, data stored in different formats and traditional project processes	Civil Engineering	USA	[14]	Used Building Information models as an efficient and effective knowledge management tool
2	Unstructured ways in which construction defects data are stored	Architecture and Building Science	South Korea	[15]	Used Building Information Modelling (BIM) to link and share construction defect data to reduce search time and improve accuracy
3	Inefficient management of knowledge hampers growth within a firm	Building	Malaysia	[16]	Developed a framework that links knowledge management and the growth performance of construction firms
4	Inability to recognize, collect accurate data on safety risk, and disseminate promptly	Civil Engineering	Taiwan	[17]	They developed a safety risk recognition platform through the use of Building Information Modelling (BIM)
5	Construction activities involve high risk, which needs to be identified and prevented	Built Environment	China	[18]	Used Building Information Modelling (BIM) to develop a methodology that manages construction risks
6	The usefulness of knowledge management using BIM-based on social platforms	Civil Engineering	Canada	[19]	BIM-based social platforms can improve, perform, provide low-cost housing
7	Knowledge management is viewed as a critical success factor in the everyday business of the society	Environmental Planning	Kenya	[20]	To deepen and surpass the role of effective Knowledge management in the construction industry

3 Methodology

For this study, the research design adopted to answer the research question was a cross-sectional survey research design. The research design was used to draw from the population of the study. The population includes registered and unregistered construction professionals such as Architects, Builders, Civil Engineers, Estate surveyors, Land surveyors, Service Engineer, and Quantity Surveyors working in construction

firms. The preferred study area was Lagos state in the south-west of Nigeria. This state currently has many ongoing construction projects and building professionals working within the construction industry. A convenience sampling technique, which is a non-probabilistic sampling technique, was adopted for the study, which helped select a total of eighty (80) construction practitioners who participated in the survey. The study utilized a survey questionnaire as the data instrument to obtain information from the research participants.

The questionnaire designed had four (4) sections, which includes the background information of research participants, factors influencing recurring challenges, knowledge management strategies, and the benefit of using knowledge management mechanisms in tackling recurring difficulties. The objectives in the questionnaire were represented using a 5-point Likert scale. A total of seventy-eight (78) survey instruments were retrieved and used in the data analysis, which represented a 97.5% retrieval rate. The analysis of the study was carried out using statistical package for social science (SPSS) version 23. This was presented using mean scores and principal component analysis (PCA).

4 Result and Discussion

This section in this research presented the analysis of the collected data and discussed the results, including background information of the respondents, factors affecting recurring challenges in the construction industry, knowledge management strategies used in the industry, and the benefit of knowledge management in the construction industry. Table 2 represents the summary of the background information of the participants in this study.

Table 2 showed the type of organization of the respondent, the highest academic qualification, year of work experience in the construction industry, and the profession of the respondent in the industry. In Table 2, most of the construction professionals worked in contracting organizations. Considering the highest educational qualification, most of the construction professionals had a bachelor' degree certificate. Most of the construction professionals had 1 to 10 years of work experience in the construction sector. Table 2 showed that there were 10 (12.8%) Architects, 38 (48.7%) Builders, 11 (14.1%) Civil Engineers, 11 (14.1%) Service Engineers, and 8 (10.3%) Quantity Surveyors. The distribution of the summary of the background information of the respondent showed that the construction professionals possess the required qualification in the industry to be able to contribute their quota effectively in the research.

Table 3 showed the factors influencing recurring challenges in the Nigeria Construction industry. Corruption with a mean score of 4.52 is the factor that impacts most of the recurring problems in the construction industry. It is followed by inadequate planning measures with a mean score rating of 4.22 and by government policies with a mean score rating of 4.18. Poor contract administration with a mean rating of 3.74 and poor weather conditions with a mean rating of 2.90 ranked as the least important factors influencing recurring challenges in the construction industry. Table 3 showed that Corruption, Poor planning measures, and Poor government policies ranked 1st, 2nd, and 3rd, respectively. The construction industry has been damaged by corruption at

Table 2. Background Information

General Information	Frequency	Percent
Type Of Organization		
Client Organization	20	25.64
Contracting Organization	36	46.15
Consulting Organization	22	28.21
Highest Academic Qualification		
Bachelor Degree	55	70.51
Masters Degree	17	21.79
Ph.D. Degree	2	2.56
OND/HND Degree	4	5.13
Work Experience in the Construction Sector		
1–10 years	71	91.03
11–20 years	4	5.13
21–30 years	3	3.85
Profession		
Architect	10	12.8
Builder	38	48.7
Civil Engineer	11	14.1
Service Engineer	11	14.1
Quantity Surveyor	8	10.3

multiple levels and results in underperformance and recurring challenges of a construction project such as quality defect and cost overrun [21]. [22] noted that up to 40% of the contract sum is most times expended on bribery of management officials in the process of contract award, execution, and payment issuance to contractors. [23] opined that the high level of corruption in the Nigerian construction industry would ultimately lead to building collapse, project abandonment, discrepancies between contract sum and final construction cost, project delay and poor building life-span. There has been a considerable economic loss in the industry caused by the corrupt activities practiced in the industry, which needs elimination to increase productivity in the construction sector.

Table 4 showed various strategies used for knowledge management in the Nigerian construction industry. Email with a mean score of 4.37 is the most used strategy for knowledge management in the Nigerian construction industry. It is followed by face-to-face interaction with a mean rating of 4.27 and by brainstorming with a mean rating of 3.97. Intranet with a mean score of 2.95 and cloud and drive services with a mean rating of 2.74 ranked as the least strategies for knowledge management used by Nigerian construction industries, as suggested by the respondents. In all, Table 4 showed that Emails, Face-to-face interactions, and Brainstorming ranked 1st, 2nd, and 3rd, respectively, as the most used knowledge management strategies in the construction industry. The study by [24] noted that emails had become an integral part of most organizations by providing essential communication and collaboration channels.

Table 3. Factors influencing recurring challenges in the construction industry

Factors	Mean score	Std. deviation	Ranking index
Corruption	4.52	.681	1st
Poor planning measures	4.22	.767	2nd
Poor government policies	4.18	.785	3rd
Inadequate techniques used during construction processes	4.13	.750	4th
Poor construction methodologies	4.00	.837	5th
Economic crunch	3.99	.974	6th
Poor communication among stakeholders	3.99	.814	6th
Inability to learn from past mistakes and experiences	3.97	.852	8th
Lack of construction standards	3.96	1.074	9th
Poor project financing	3.96	1.038	9th
Lack of adequate project information	3.91	.996	11th
Low managerial skills	3.87	.972	12th
Inadequacies in the training of project professionals	3.87	1.036	12th
Non-use of Information technologies	3.77	1.025	14th
Poor contract administration	3.74	.986	15th
Poor weather conditions	2.90	1.135	16th

In [25], they opined that emails had become a key component of knowledge management of most firms. Furthermore, [26] argued that using emails as a knowledge management strategy has a higher quality than face-to-face conversations. Whereas, [27] stated that the critical key in the use of emails is the informal knowledge flow among the firm's workers. While [28] noted that more than three-quarters of a company's email contains the best insight of a company's knowledge generation and storage. [29] identified the advantages of email as a knowledge management mechanism. One of the significant benefits is the ability to integrate email as a knowledge management tool in the everyday work practice of companies.

The study utilized Principal Component Analysis (PCA) to understand further the classification and characteristics of the strategies used in knowledge management by construction professionals. Table 5 showed the Principal Component Analysis of the knowledge management strategies. From Table 5, a cut-off point of 0.5 was used as the criteria for the selection of the components in the 3-dimension PCA. Examining the approach in three dimensions, the procedures that have a dimension figure report less than 0.5 is term insignificant during the analysis. Email and Brainstorming were termed irrelevant because they were less than 0.5. Table 5 further classified the strategies of knowledge management by characterizing each dimension by finding the frequent attribute in that dimension. Based on Table 5, there are three main classifications to the knowledge management strategies used in the construction industry.

The three primary groupings have been termed data mining based knowledge management strategy, traditional based knowledge management strategy, and mobile-

based knowledge management strategy. The following characteristic component is a data mining based knowledge management strategy, which is a concern with the sourcing of data and information in the planning and execution of projects. Some of the analyzed strategies are in-house web-based systems, gathering of the report, post-project reviews, and cloud and drive services. The other characteristic component is a traditionally based knowledge management strategy. This characteristic focuses on the earlier method of knowledge storage and knowledge transfer. The procedures analyzed were face-to-face interaction and paper-based archiving. The final characteristic component determined was the mobile-based knowledge management strategy, which is an innovative and more efficient way of knowledge management. The analyzed strategy in the study was the WhatsApp mobile application.

Table 6 showed the various benefits of knowledge management in the Nigerian construction industry. High growth performance with a mean score of 4.53 is the most important benefit of knowledge management in the construction industry. It is followed by it helps for decision making, and development of strategies with a mean rating of 4.50 and knowledge management fosters innovation with a mean score of 4.43. High growth performance, it helps for decision making and development of strategies, and it fosters innovation ranked 1st, 2nd, and 3rd, respectively, as the primary benefits associated with the use of knowledge management. The study showed that when construction businesses implement the application of knowledge management, they record high growth performance.

Table 4. Strategies for knowledge management

Strategies for knowledge management	Mean score	Std. deviation	Ranking index
Emails	4.37	.791	1st
Face-to-face interactions	4.27	.715	2nd
Brainstorming	3.97	.967	3rd
Paper-based archiving	3.91	1.015	4th
Gathering of report	3.87	.9718	5th
Communities of practice	3.62	.886	6th
Mentoring and apprenticeship	3.60	.944	7th
Google browsers	3.60	1.036	8th
Post-project reviews	3.53	1.181	9th
Enterprise systems	3.38	.894	10th
Group WhatsApp	3.38	1.203	11th
Other social platforms	3.32	1.006	12th
In-house Web-based systems	2.96	1.129	13th
Intranet	2.95	1.075	14th
Cloud and drive services	2.74	1.140	15th

The study utilized Principal component analysis to understand further the classification and characteristics of the strategies used in knowledge management by construction professionals. Table 7 showed the Principal component analysis of the benefits of knowledge management strategies in the construction industry.

From Table 7, a cut-off point of 0.5 was used as the criteria for the selection of the components in the 2-dimension PCA. Table 7 presented the report of the principal component analysis carried out on the listed benefit of knowledge management in the Nigerian construction industry. It fosters innovation was termed insignificant because of less than 0.5. Table 7 further classified the benefit of knowledge management in the Nigerian construction Industry by characterizing each dimension by finding the prevalent attribute in that dimension. Based on Table 7, there are two categories of knowledge management benefits in this study. The classification of the benefits of knowledge management has been termed performance benefit and collaboration and learning benefit.

Lastly, the study developed a proposed framework of using knowledge management in tackling recurring challenges in the Nigerian construction industry. The study identified three (3) main routes through which construction professionals use knowledge management, as shown in Fig. 2. Either using the electronic or traditional based knowledge management system, the study showed that knowledge is generated and stored in the construction industry. The study noted that there is two (2) classification of benefits garnered from adopting knowledge management in the construction business. By using knowledge management, construction professionals consider the performance, collaboration, and learning benefits attributes in choosing knowledge management. The study proposed that by using knowledge management, the recurring challenges in the construction industry can be resolved.

Table 5. Principal component analysis on knowledge management strategies

Components	Knowledge management strategies	Dimension		
		1	2	3
Data mining based knowledge management strategy	In-house Web-based systems	.790		
	Gathering of report	.721		
	Post-project reviews	.705		
	Enterprise systems	.681		
	Cloud and drive services	.673		
	Communities of practice	.661		
	Other social platforms	.607		
	Mentoring and apprenticeship	.591		
	Intranet	.575		
	Google browsers	.544		
Traditional based knowledge management strategy	Face-to-face interactions		.708	
	Paper-based archiving		.519	
Mobile-based knowledge management strategy	Group WhatsApp			.714

Table 6. Benefit of knowledge management

Benefit of knowledge management	Mean score	Std. deviation	Ranking index
High growth performance	4.53	.528	1st
It helps for decision making and the development of strategies	4.50	.528	2nd
It fosters innovation	4.43	.498	3rd
Improves construction performances	4.43	.594	3th
Learning process and performance is improved	4.39	.542	5th
Risk occurrences are reduced on construction sites	4.38	.762	6th
Increases competitive advantage and swift response to client needs	4.35	.641	7th
Provides a common platform for collaboration	4.33	.574	8th
Simplifies ideas	4.33	.638	8th
Ease of searching for solutions in previously exchanged documents	4.29	.559	10th
Share ideas in real-time	4.26	.692	11th
It is a critical success factor	4.24	.687	12th

Table 7. Principal component analysis on the benefit of knowledge management in the Nigerian Construction Industry

Component	Benefit of knowledge management	Dimension	
		1	2
Performance benefit	It helps for decision making and the development of strategies	.947	
	Improves construction performances	.944	
	High growth performance	.938	
	Increases competitive advantage and swift response to client needs	.938	
	It is a critical success factor	.769	
	Risk occurrences are reduced on construction sites	.716	
	Ease of searching for solutions in previously exchanged documents	.594	
	Provides a common platform for collaboration	.	.848
Collaboration and learning benefit	Simplifies ideas		.788
	Share ideas in real time		.732
	Learning process and performance is improved		.680

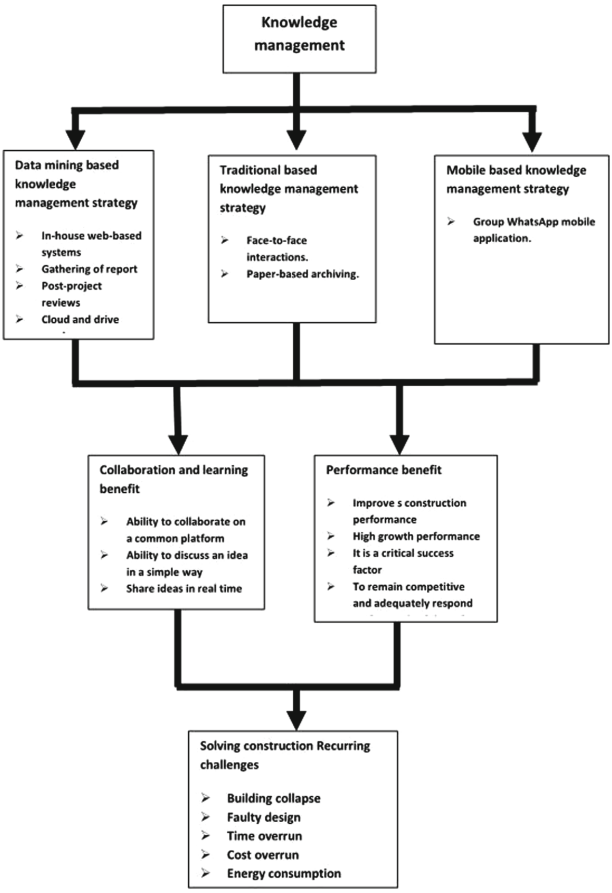

Fig. 2. Proposed knowledge management framework for tackling recurring challenges in the Nigerian construction

5 Conclusion

The prevailing of recurring problems in the Nigerian construction industry has a considerable impact on all major and minor project stakeholders in the industry. These actions can undermine the reputation of the Nigerian construction industry and to increase the expenses incurred by construction firms and the final construction cost. The identified corruption, inadequate planning measures, and poor government policies as the main factors influencing recurring project management challenges in the Nigerian construction industry. The main knowledge management strategies used by Nigerian construction professionals include the use of Emails, face-to-face interactions, and brainstorming sessions. Furthermore, knowledge management strategies were classified into data mining based, traditional based, and mobile technology-based knowledge management strategies in the construction sector. The significant benefits

associated with knowledge management mechanisms in the construction industry include high growth performance, aid decision making, and innovation in the construction sector. Further classification showed that these benefits are mainly performance-based and collaboration and learning-based benefits. The study proposed a knowledge management framework for tackling recurring challenges in the Nigerian construction industry.

Based on the findings, the study showed that less information and communication technology-based knowledge management strategies are being used in the construction sector. In contrast, traditional based methods are being widely used. This research points out that the traditional based knowledge management strategies are prone to certain drawbacks that may inhibit archiving and storing of the information generated. The use of ICT-based knowledge management mechanisms can give superior benefits to traditional-based methods. The construction industry should have more awareness seminars and training on the use of knowledge management mechanisms, especially the use of ICT based tools. Therefore, the need for construction businesses to increase investment in ICT-tools can aid knowledge management within their firms. Furthermore, knowledge management from our findings gives both performance benefits and collective and learning benefits. For this reason, professional bodies and construction firms should seek knowledge exchange, data storage, and proper use of this information. Besides, knowledge management should be introduced and well developed into the curriculum of tertiary institutions and professional courses in the construction industry. Training and continuous education on knowledge management should be conducted for employers and employees periodically to maximize productivity and minimize recurring challenges in the Nigerian construction industry.

This study becomes necessary in tackling recurring issues in the Nigerian construction industry. This study suggests the need for construction firms to migrate their construction activities' knowledge creation, storage, and usage from a traditional-based mechanism to an ICT-based mechanism. The ICT-based tool is a major prerequisite for the effective and efficient expression of the needs of knowledge management systems in the Nigerian construction industry. This study showed the benefits which construction businesses can accrue from the use of knowledge management. For the construction business to be able to adapt to new and current trends, it needs to adapt quickly to the use of adequate and efficient knowledge management systems. Areas of further studies can be the development of a web-based knowledge management system for use in the Nigerian construction industry. Its performance, adoption, and benefits can be measured.

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