

KNOWLEDGE MANAGEMENT AND PROFESSIONALS IN NIGERIAN CONSTRUCTION FIRMS: BARRIERS, BENEFITS AND CAPABILITIES

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ABSTRACT

Knowledge management (KM) is central to the performance of construction firms. KM has been found to be beneficial in companies in terms of quality, time, speed and reliability. The creation and diffusion of knowledge to the professionals in construction firm have become increasingly important factors in competitiveness, as most construction firm professionals pay insufficient attention to KM awareness and capabilities. This study aimed to assess the KM capabilities among professionals in Nigerian construction firms. The study adopted a quantitative research approach by eliciting primary data through structured questionnaire. One hundred and twenty (120) questionnaires were administered and 92 were retrieved and considered for further analysis. The data obtained were analysed using mean item score (MIS) and charts. The study revealed the three major barriers to KM implementation to be; cultural barriers (MIS = 4.90; SD = 0.32), lack of time (MIS = 4.60; SD = 0.52) and trying to solve large problems (MIS = 4.50; SD = 0.71). This study also discovered the main benefit of KM implementation to be enabling better and faster decision making (MIS = 4.71; SD = 0.47). Lastly, it was revealed that most construction professionals do not embrace creativity in KM. This study however recommends that: stakeholders of the construction industry should be encouraged to embrace cultural diversity; construction firms should pay keen attention to time management and development of appropriate methodology that will foster knowledge management implementation; professional bodies should collaborate with government parastatals and construction firms to train professionals on knowledge management; government should introduce policies and framework that will support knowledge management implementation; and construction professionals should embrace the concept of creativity in knowledge management.

Keywords: Construction firms, construction professionals, knowledge management capabilities, knowledge management.

INTRODUCTION

The construction industry is envisaged as the main driver of the economy with five percent increase in GDP growth, other sectors like education, health, transportation, etc. depend heavily on the construction industry. Nevertheless, the construction industry can be segregated into three fundamental parts which are the building industry, heavy and civil engineering works and specialist contractors who engage in the services of plumbing, carpentry, electrician, painting and tiling (Sanusi, 2008; Olanrewaju *et al.*, 2018). The know-how of a company is becoming more important than the traditional sources of economic power (capital, land, etc.). Knowledge is generated in all the phases of a construction project during its lifecycle (Shreekanth, 2014).

Knowledge management (KM) was initially defined as the process of applying a systematic approach to the capture, structuring, management, and dissemination of knowledge throughout an organization to work faster, reuse best practices, and reduce costly rework from project to project (Nonaka and Takeuchi, 1995). According to Botha (2004) KM is a process of systematic management of vital knowledge and its associated process of creating, gathering, organizing, diffusion, use and exploitation. It requires turning personal knowledge into corporate knowledge that can be widely shared throughout the organization. In construction, the term “knowledge management” (KM) is usually associated with the management of organizational knowledge (Anumba *et al.*, 2005; Kazi, 2005; Tan, 2015). KM has become an increasingly important issue due to rapid changes in market conditions, competition and

technological developments, which have led to changes in the way work is organized. The intellectual capital of individuals and teams are presented in a tangible form that facilitates the adding of value to the organization and ultimately its customers (Ravishankar and Leidner, 2011).

Majid (2006) identified one of the major problems facing the construction industry as delay because its results to time loss in construction project. Delay in construction project can occur through different means or sources which include the characteristics of the project, internal and external factors affecting the construction organization, social economic and cultural issues and others (Abisuga, 2014). There is much more that can be done to improve project delivery through better management of the knowledge generated on projects and in individual construction firms.

KM is considered as a tool to prevent re-inventing of wheel, improve efficiency and productivity and do things better to suit the need of the clients. Besides, KM is important to capture lessons and experiences learned from other projects in such a way that it can be used to train young or new comers, avoid duplication of efforts and hence results in better time management. An organization in the knowledge age is one that learns, remembers and act based on the best available information, knowledge and know-how (Bergeon, 2003).

There are serious dangers for companies that ignore knowledge management; they run the risk of simply repeating past mistakes or worse, taking decisions that can lead to major disasters. On the other hand, organizations that proactively manage their knowledge stand to reap considerable rewards in terms of cost savings, process efficiencies, reductions in errors and rework, etc. and will be able to deliver more innovative solutions to their clients (Carrillo, 2004). Adeeko (2012) also revealed that insufficient attention is been paid to knowledge management awareness and capabilities. Against this backdrop, this study seeks to assess the knowledge management capabilities among professionals in construction firms in Nigeria.

CLASSIFICATION OF KNOWLEDGE

KM is rooted on two vital activities: (1) capturing and documenting of individual tacit and explicit knowledge, and (2) its distribution within the organization (Barth, 2000). The knowledge that exists in companies can be fractioned into two types: tacit and explicit. Tacit knowledge is the knowledge stored in the minds of individuals. This kind of knowledge is acquired by lessons from seniors or experts, personal experience, and involvement in a specific situation etc. Construction industry is disintegrated in nature; consequently, management of tacit knowledge is imperative to the construction industry (Shreekanth, 2014). Construction projects have distinctive scenarios and requirements. Therefore, every project generates significant amount of knowledge during its execution. Also, because of the vibrant nature of construction project, new challenges are being encountered consistently for which solutions are created by the project team members wherever feasible. However, the tacit knowledge produced by this method is mostly remained in minds of project team members. The explicit knowledge on the other hand is the type of knowledge which can be articulated, codified, and communicated (Shreekanth, 2014). Remarkable attempts have been made by the construction sector to create and employ systems to manage acquiring, accumulating and retrieval of explicit project related information (Dave and Koskela, 2009). Some examples of explicit knowledge include organization different code books, maps, procedure manuals, intranets and extranets, document management systems, etc.

Tacit and explicit knowledge are not the two well-known states of knowledge, but they are reciprocally reliant and underpinning qualities of knowledge. Tacit knowledge creates the

essential foundation to decipher and cultivate explicit knowledge (Alavi and Leidner, 2001; Shreekanth, 2014). For personalities to precisely transfer knowledge, they must reveal a mutual knowledge base (field or discipline). Shreekanth (2014) emphasized that tacit knowledge is essential to the understanding of explicit knowledge, then in order for Individual X to understand Individual Y's knowledge, there must be some overlap in their underlying knowledge bases as shown in Figure 1. Table 1 also shows comparison of the properties of tacit and explicit knowledge.

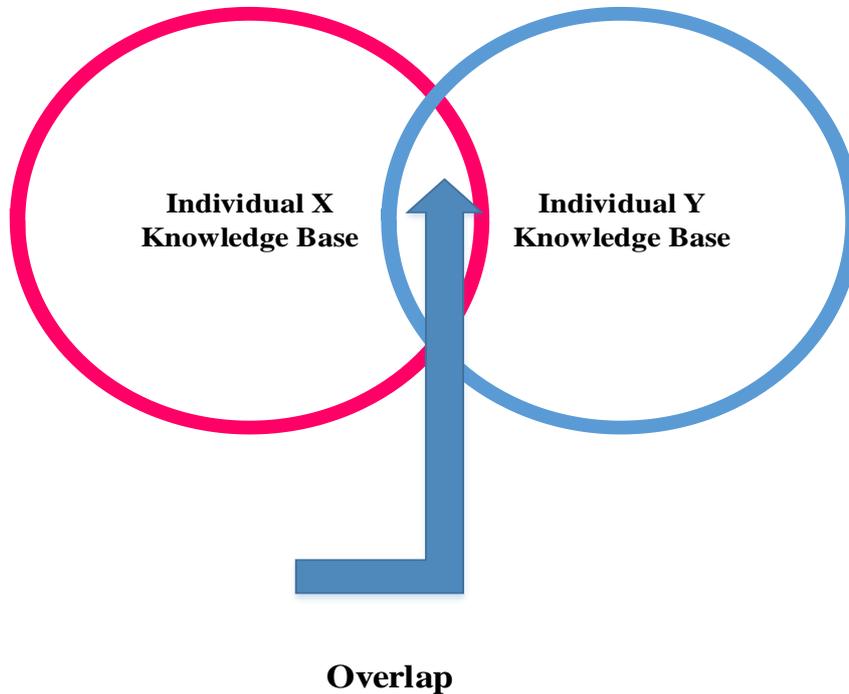


Fig.1: Knowledge Base Overlap

Table 1: Comparison of the Properties of Tacit and Explicit Knowledge

Tacit Knowledge	Explicit Knowledge
Ability to become accustomed, deal with new and exceptional situations.	Ability to distribute, replicate, access and re-use throughout the organization.
Capability, know-how, know-why, and care-why.	Ability to educate and train.
Ability to work together, share a vision, and spread a culture.	Ability to arrange, regulate, and transform a vision into a mission statement into operational guidelines.
Training and mentoring to transmit experiential knowledge on a, face-to-face, one-to-one basis.	Transfer knowledge through products, services, and documented processes.

Source: Barth (2000)

Hypothetical improvements in the subject of knowledge management are prompted by the peculiarity among various types of knowledge (Alavi and Leidner, 2001). Consequently, it is vital to comprehend the concept of knowledge and knowledge taxonomies. Also, the design of the type of knowledge management system of an organization hinge on the need to support the type of knowledge required by an organization and flow among the different types of

knowledge (Shreekanth, 2014). Diverse types of knowledge an organization can focus on when developing a knowledge management system are shown in Table 2.

Table 2: Knowledge Taxonomies and Examples

Knowledge Types	Definitions	Examples
Tacit	Knowledge is rooted in actions, experience, and involvement in specific context	Best means of dealing with specific customer
Cognitive tacit	Mental models	Individual belief on cause-effect relationship
Technical tacit	Know-how applicable to specific work	Surgery skills
Explicit	Articulated, generalized knowledge	Knowledge of major customers in a region
Individual	Created by and inherent in the individual	Insights gained from completed project
Social	Created by and inherent in collective actions of a group	Norms for inter-group communication
Declarative	Know-about	What drug is appropriate for an illness
Procedural	Know-how	How to administer a particular drug
Causal	Know-why	Understanding why the drug works
Relational	Know-with	Understanding how the drug interacts with other drugs
Pragmatic	Useful knowledge for an organization	Best practices, business frameworks, project experiences, engineering drawings, market reports

Source: Alavi and Leidner (2001); Shreekanth (2014)

KNOWLEDGE MANAGEMENT AND THE CONSTRUCTION INDUSTRY

The construction industry is recognized as being poor at learning on a consistent basis and improving performance and is notoriously slow in adapting to progressive change (Graham and Thomas, 2008). Lack of understanding and transferring of knowledge, when it comes to the type and source of information, which can range from the mathematical description of the project to a documented description of the whole project has impaired on project performance of firm (Carillo *et al.*, 2004).

Knowledge management is particularly important for the construction industry, for at least three main reasons. Firstly, the construction industry is widely perceived as an industry with low productivity and poor performance despite its importance in the national economy (Preece and Moodley, 2000; Musa, 2017). Hence, there is a need for KM to improve the existing processes and management of construction companies. Secondly, the project-based nature of the industry has made it particularly important to record and transfer lessons from one project to another (Rezgui, 2001). Thirdly, construction companies today face various challenges and new solutions are necessary to meet the growing demand for new types of buildings and structures (Mior and Abdul-Rashid, 2001). It is widely accepted that the current market dynamics and the trends towards specialized and customer-oriented services in the construction industry demand a more efficient and effective application of knowledge within corporate as well as project organizations (Snyman, 2004).

A considerable proportion of work delays, mistakes and cost overruns on construction projects can be attributed to poor knowledge management. Many organizations have some elements of knowledge management practice, which are not necessarily labelled as such (Anumba *et al.*, 2005). Knowledge management is considered vital for the survival of organization. It is asserted that knowledge is fast overtaking capital and labour as the key economic resource in advanced economies (Edvinsson, 2000). However, a minor percentage of construction organizations have implemented KM systems (Robinson *et al.*, 2001; Belaya *et al.*, 2016). A survey carried out by Carrillo *et al.* (2003) indicated that about 40% of construction organization already have a KM strategy. Similarly, Kanapeckiene *et al.* (2010) emphasized that there are limited attempts to apply advanced methods of KM in construction. Belaya *et al.* (2016) also affirmed that current publications acknowledged an increasing trend on the mindfulness of KM concepts and it will take ample time for the construction industry to invest on it. Nevertheless, construction industries have been pushed to develop KM strategy as a result of increasing demands in construction owing to immigration, population growth, the need for fast economic development and the likes (Belaya *et al.*, 2016).

KNOWLEDGE MANAGEMENT CAPABILITIES

Knowledge Management Capabilities (KMC) provide the supporting structure required in an organization to distribute knowledge within the perspective in which it is necessary. Lee and Lee (2007) examines the structural associations between the capabilities, processes, and performance of knowledge management, and proposed strategic guidelines for the successful implementation of knowledge management. They establish that there exists a statistically noteworthy relationship between knowledge management capabilities, processes, and performance.

KMC presents a measure of the degree to which an organization may be ready, prepared or willing to obtain benefits which arise from KM implementation. KM has become one of the most important trends in the businesses, yet many KM initiatives fail (Egbu *et al.*, 2004). To understand the success and failure of KM, firms have to identify and assess the organizational capabilities required for the effort to prosper. Knowledge-based capabilities (skills, motivation and communication) of professionals in construction firms were assessed.

BARRIERS IN IMPLEMENTING KNOWLEDGE MANAGEMENT

Some of the issues that impede an effective implementation of knowledge management according to Patricia and Carrillo (2000) are outlined below:

1. Cultural barriers

The typical construction organization does not encourage the culture of sharing knowledge. Primarily, the culture of the organizations need to be addressed if KM is to be of benefit. Each organization has its individual culture and only they can say what initiatives need to be set up to encourage a culture change.

2. Lack of time

Sharing knowledge demands additional effort. This effort may be minimized by work practices and the introduction of better knowledge sharing tools. Construction projects are always working to tight deadlines. Anything that detracts from the main business is seen as of diminished importance.

3. Trying to solve large problems

The various stages involve in KM are complex. It is easy to envisage the utopian world of delivering knowledge to different members of the project team as and when required for different stages of the construction process. However, in reality, for a company embarking on Knowledge Management, it is best to undertake very small projects that are self-contained with little input from external parties.

4. Converting knowledge

One substantial obstacle is how organizations capture knowledge on projects that cuts across organizational boundaries. The industry is full of individuals, skilled trade workers and professionals who have years of experience of doing specific tasks. Converting their tacit knowledge to explicit knowledge for the benefit of others is a problem, which is difficult to conduct within a reasonable period and at an acceptable cost.

5. Large number of SMEs

The Nigerian construction industry consists of a large proportion of small to medium-sized enterprise (SMEs). These organisations have more pressing concerns than KM and in many cases do not see the need nor do they have the commitment and resources to undertake KM.

6. Multi-Disciplinary Team

Some project team members may belong to different divisions or even different companies. Managing knowledge with such a team within a limited time period is difficult. Each team member will be working towards the agenda set by their employer. The benefits of KM may be seen as limited to the life of the individual project unless in long-term partnering type relationships.

7. Unique Project

Despite efforts to encourage the Nigerian construction industry to view itself as a manufacturing enterprise, it still regards each project as a one-off. This reinforces the view that KM on individual projects will be wasted as the next project may be quite different.

8. Lack of Learning System

Because of the view of the industry producing unique projects, there has also been a failure to learn from past mistakes. In many circles, the Nigerian construction industry is regarded as a national (rather than international) industry and there is an unwillingness to learn from internal and external sources.

9. Lengthy Time Period

KM is a long-term goal without any short cuts. If it is to bring long-term benefit to the organization, it will take a considerable period to have systems up and running with sufficient time to be validated and for benefits to percolate to the organization's performance.

10. Loss of Faith

With KM systems available, employees may be tempted into thinking the data required is always easily accessible. In fact, it will take considerable time to get a spread of working KM systems. This may lead to employees losing faith in the system because it does not deliver immediately benefits in their own individual areas.

BENEFITS OF KNOWLEDGE MANAGEMENT TO CONSTRUCTION INDUSTRY

The ultimate aim of any construction of public infrastructures is to provide high standard and quality services to the public. This can achieve by fulfilling the goals of customer delight, which is exceeding the expectation of the public in this case. KM has help in the improvement

of performance in the manufacturing industries most especially in terms of the quality, time, speed and consistency (Armstead, 1999). However, Garfield (2014) outlined some possible benefits of KM as follows:

1. Enabling better and faster decision making

By conveying important information at the time of use through structure, search, subscription, syndication, and support, a knowledge management environment can provide the basis for making good decisions. Collaboration brings the power of large numbers, diverse opinions, and varied experience to bear when decisions need to be made. The reuse of knowledge in repositories allows decisions to be taken based on actual experience, large sample sizes, and practical lessons taught (Garfield, 2014).

2. Makes it easy to find relevant information and resources

When a need to respond to a customer, solve a problem, analyse trends, assess markets, benchmark against peers, understand competition, create new offerings, plan strategy, and to think critically, you typically look for information and resources to support these activities. If it is easy and fast to find what you need when you need it, you can perform all of these tasks efficiently (Garfield, 2014).

3. Supports reusing of ideas, documents, and expertise

Once you have developed an effective process, you want to ensure that others use the process each time a similar need arises. If someone has written a document or created a presentation which addresses a recurring need, it should be used in all future similar situations. When members of your organization have figured out how to solve a common problem, know how to deliver a recurring service, or have invented a new product, you want that same solution, service, and product to be replicated as much as possible. Just as the recycling of materials is good for the environment, reuse is good for organizations because it minimizes rework, prevents problems, saves time, and accelerates progress (Garfield, 2014).

4. Avoiding redundant effort

No one likes to spend time doing something over again. But they do so all the time for a variety of reasons. Avoiding duplication of effort saves time and money, keeps employee morale up, and streamlines work. By not spending time reinventing the wheel, you can have more time to invent something new (Garfield, 2014).

5. Avoiding making the same mistakes twice

If we don't learn from our mistakes, we will experience them over and over again. Knowledge management allows us to share lessons learned, not only about successes, but also about failures. In order to do so, we must have a culture of trust, openness, and reward for willingness to talk about what we have done wrong. The potential benefits are enormous. If engineers learn why highways and buildings collapsed during a previous earthquake, they can design new ones to better withstand future earthquakes. If you learn that your last bid or estimate was underestimated by 50%, you can make the next one more accurate and thus earn a healthy profit instead of incurring a large loss (Garfield, 2014).

6. Taking advantage of existing expertise and experience

Teams benefit from the individual skills and knowledge of each member. The more complementary the expertise of the team members the greater the power of the team. In large organizations, there are people with widely-varying capabilities and backgrounds, and there should be a benefit from this. But as the number of people increases, it becomes more difficult

for each individual to know about everyone else. So even though there are people with knowledge who could help other people, they don't know about each other (Garfield, 2014).

7. Communicating important information widely and quickly

Almost everyone today is an information worker, either completely or partially. We all need information to do our jobs effectively, but we also suffer from information overload from an increasing variety of sources. How can we get information that is targeted, useful, and timely without drowning in a sea of email, having to visit hundreds of web sites, or reading through tons of printed material? Knowledge management helps address this problem through personalized portals, targeted subscriptions, RSS feeds, tagging, and specialized search engines (Garfield, 2014).

8. Promoting standard, repeatable processes and procedures

If standard processes and procedures have been defined, they should always be followed. This allows employees to learn how things are done, leads to predictable and high-quality results, and enables large organizations to be consistent in how work is performed. By providing a process for creating, storing, communicating, and using standard processes and procedures, employees will be able to use them routinely (Garfield, 2014).

9. Providing methods, tools, templates, techniques, and examples

Methods, tools, templates, techniques, and examples are the building blocks supporting repeatable processes and procedures. Using these consistently streamlines work, improves quality, and ensures compatibility across the organization (Garfield, 2014).

10. Making scarce expertise widely available

If there is a resource who is in great demand due to having a skill which is in short supply, knowledge management can help make that resource available to the entire organization. Ways of doing so include community discussion forums, training events, ask the expert systems, recorded presentations, white papers, podcasts, and blogs (Garfield, 2014).

11. Showing customers how knowledge is used for their benefit

In competitive situations, it is important to be able to differentiate yourself from other firms. Demonstrating to potential and current customers that you have widespread expertise and have ways of bringing it to bear for their benefit can help convince them to start or continue doing business with you. Conversely, failure to do so could leave you vulnerable to competitors who can demonstrate their knowledge management capabilities and benefits (Garfield, 2014).

12. Accelerating delivery to customers

Speed of execution is another important differentiator among competitors. All other things being equal, the company which can deliver sooner will win. Knowledge sharing, reuse and innovation can significantly reduce time to deliver a proposal, product, or service to a customer. And that translates into increased win rates, add-on business, and new customers (Garfield, 2014).

13. Enabling the organization to leverage its size

As an organization grows, the increasing size is only a benefit if it can use the knowledge of all of its employees. Through the use of tools such as communities, expertise locators, and repositories, the full power of a large enterprise can be exploited (Garfield, 2014).

14. Making the organization's best problem-solving experiences reusable

Consistently applying proven practices, also known as best practices or good practices, can significantly improve the results of any firm. For example, if a manufacturing plant in one part of the world has figured out how to prevent the need for product rework, and all other plants around the world adopt this practice, savings will flow directly to the bottom line. By establishing a process for defining, communicating, and replicating proven practices, an enterprise takes advantage of what it learns about solving problems (Garfield, 2014).

15. Stimulating innovation and growth

Most businesses want to increase their revenues, but it becomes increasingly difficult as industries mature and competition increases. Creating new knowledge through effective knowledge sharing, collaboration, and information delivery can stimulate innovation (Garfield, 2014).

METHODOLOGY

As indicated in Figure 2, the research process for this study is divided into four distinctive processes as done by Okorie and Olanrewaju (2019) namely; literature survey, questionnaire design and distribution, questionnaire collection and data analysis, and presentation of result. To achieve the objectives of this study, a literature survey was conducted on knowledge management capabilities, barriers in implementing knowledge management and the benefits of knowledge management. Quantitative research approach was adopted for this study. It involves the generation of data in quantitative form which can be subjected to rigorous quantitative analysis in a formal and rigid fashion (Kothari, 2004). Furthermore, the review of relevant literature resulted in formulation of a structured questionnaire based on 5-point Likert-scale measurement. Collins (2010) maintains that Likert scales are effective to elicit participants' opinions on various statements.



Fig.2: Research Process

Source: Okorie and Olanrewaju (2019)

Questionnaires were administered to professionals in construction firms in Abuja i.e Quantity surveyor, Architect, Builder and Civil Engineer that met the research criteria. Abuja was chosen as the study area because it is one of the administrative and commercial cities in Nigeria. The criteria upon which the questionnaire were distributed are as follows:

- a. The construction firm must have been in existence in the construction industry for not less than 10years.
- b. The professional in the construction firm must not be less than 6 years in the firm.
- c. The construction firm and their professionals must be within Abuja.
- d. The professionals must be registered professionals.

The main purpose of the questionnaire was to assess KM capabilities among construction professionals in Nigeria. One hundred and twenty (120) questionnaires were distributed within the twenty (20) construction firms that met the criteria. Ninety-two (92) questionnaires were completed and returned, and this resulted in a response rate of 77%. The response rate achieved in this survey provides reasonable data for analysis as indicated by Collins (2010).

IBM SPSS version 23 and Microsoft Excel were used for data analysis. The study adopted descriptive statistics (mean item score and charts) to analyse data obtained from respondents.

Mean item score (MIS) was used to rank the barriers, benefits and capabilities. The variables were rated against a scale to assist in assessing the significance of each variable. The scale was then transformed into an average otherwise known as mean item score (MIS) for each variable to determine the ranks of the different variables. Recent construction related research like Anifowose *et al.* (2018), Omoregie *et al.* (2019), and Okorie and Olanrewaju (2019) have adopted this method. It can be represented mathematically below:

$$\text{Mean Item Score} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + n_1}{(n_5 + n_4 + n_3 + n_2 + n_1)}$$

Where; N= Total Number of respondent, **n₁**= Number of respondent for ‘strongly disagree’, **n₂**= Number of respondent for ‘disagree’, **n₃**= Number of respondent for ‘not sure’, **n₄**= Number of respondent for ‘agree’ and **n₅**= Number of respondent for ‘strongly agree’.

ANALYSIS AND DISCUSSION OF RESULTS

1. Demographic Information

Figure 3 shows the academic qualification of the respondents. Majority of the respondents have Higher national diploma (32.61%), while 27.17% have Bachelor degree. Next were respondents with National diploma (16.31%), Master degree (13.04%), and Doctorate degree (10.87%) with least number of respondents. This inferred that the respondents were knowledgeable enough to give reliable response.

Figure 4 shows the years of experience of the respondents. 39.13% of the respondents have between 10 – 15 years’ experience, followed by 32.61% with years of experience between 16 – 20 years, next were respondents with experience between 21 – 30 years (28.26%). None of the respondents have less than 5 years and above 30 years’ experience. This indicate that the respondents are well experienced to provide meaningful information for this research.

Figure 5 shows the profession of the respondents. 38.04% of the respondents were Quantity Surveyors, followed by Architect (23.91%) and Civil Engineer (21.74%). Builders were the least contributor with 16.31%.

Figure 6 shows the professional membership level of the respondents. 65.21% of the respondents were corporate members while 28.27% were probationer members of their professional bodies. Very few of the respondents rose up to the level of fellow (6.25%). This indicates that the respondents are highly competent to provide information for this research.

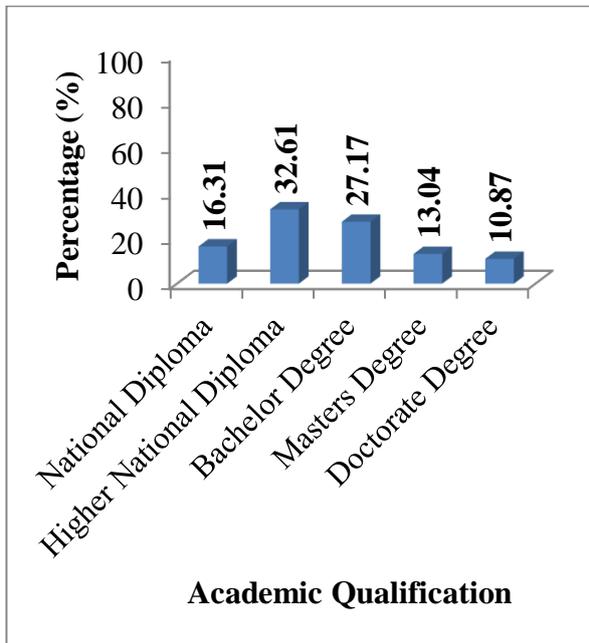


Fig.3: Academic Qualification

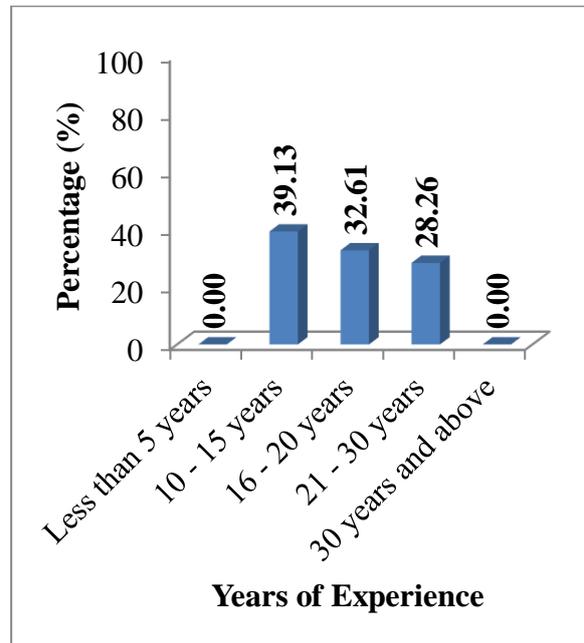


Fig.4: Years of Experience

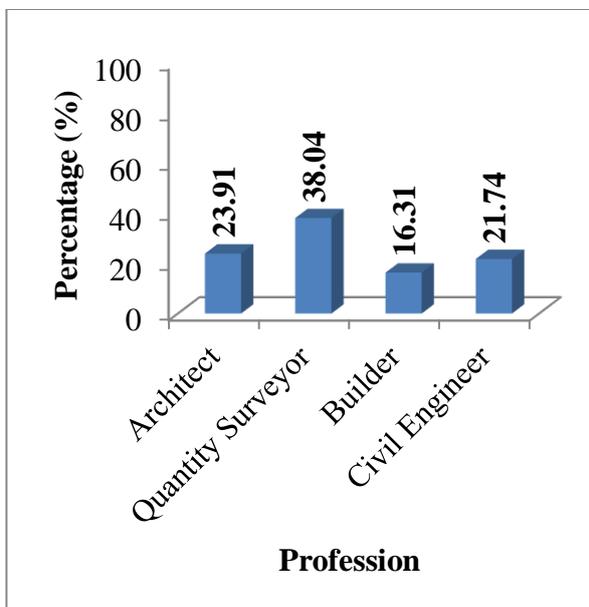


Fig.5: Profession

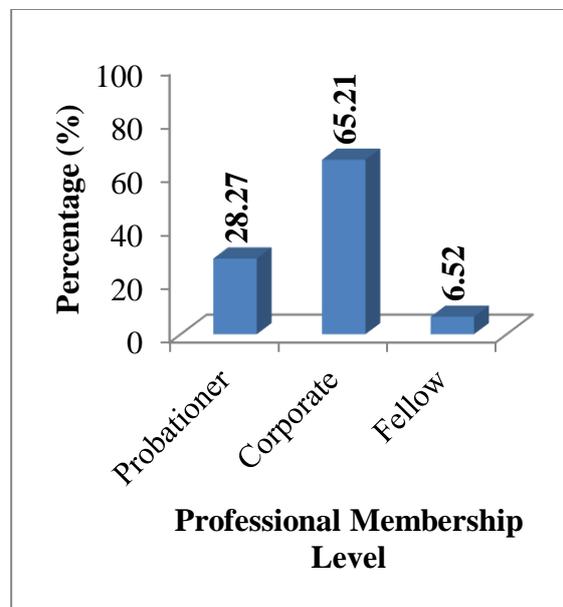


Fig.6: Professional Membership Level

2. Barriers to Knowledge Management Implementation

As illustrated in Table 3 which shows the ranking of the barriers to knowledge management implementation using mean item score, the greater the mean score the higher the rank. The mean score of the barriers ranges between 3.50 and 4.90. These barriers ranged from “Loss of faith” (MIS = 3.50; SD = 0.85) which is the least ranked to “Cultural barriers” (MIS = 4.90; SD = 0.32) which is the highest ranked. To get the significant barriers to knowledge management implementation in the Nigerian construction firms, a mean score threshold of 4.50 was set. As a result, only five of the identified barriers were found to be significant. Excluding the highest ranked barrier, the other four barriers were: “Lack of time” (MIS = 4.60; SD = 0.52), “Trying to solve large problems” (MIS = 4.50; SD = 0.71), “Multi-disciplinary team” (MIS = 4.50; SD = 0.53), and “Lack of learning system” (MIS = 4.50; SD = 0.53). This result

was found to be in agreement with the findings of Patricia and Carrillo (2000). The analysis indicates that cultural barriers is the most significant barrier because of the strong nature of culture. Also, it can also be deduced that most organisations do not have proper follow-up mechanism for KM due to lack of time.

Table 3: Barriers of Knowledge Management Implementation

Barriers	MIS	SD	Rank
Cultural barriers	4.90	0.32	1
Lack of time	4.60	0.52	2
Trying to solve large problems	4.50	0.71	3
Multi-disciplinary team	4.50	0.53	3
Lack of learning system	4.50	0.53	3
Converting knowledge	4.30	1.34	6
Unique project	4.10	0.74	7
Large number of SMEs	4.00	0.82	8
Lengthy time period	4.00	1.15	8
Loss of faith	3.50	0.85	10

Benefits of Knowledge Management Implementation

Table 4 shows ranking of the benefits of knowledge management implementation using mean item score, the greater the mean score the higher the rank. The mean score of the benefits ranges between 4.29 and 4.71. These benefits ranged from “Stimulating innovation and growth” (MIS = 4.29; SD = 0.59) which is the least ranked to “Enabling better and faster decision making” (MIS = 4.71; SD = 0.47) which is the highest ranked. To get the significant benefits of knowledge management implementation in the Nigerian construction firms, a mean score threshold of 4.50 was set. As a result, only seven of the identified benefits were found to be significant. Excluding the highest ranked benefit, the other six benefits were: “Makes it easy to find relevant information and resources” (MIS = 4.65; SD = 0.49), “Supports reusing of ideas, documents, and expertise” (MIS = 4.65; SD = 0.49), “Avoiding redundant effort” (MIS = 4.63; SD = 0.50), “Avoiding making the same mistakes twice” (MIS = 4.59; SD = 0.62), “Enabling the organization to leverage its size” (MIS = 4.53; SD = 0.51), and “Communicating important information widely and quickly” (MIS = 4.53; SD = 0.62). These findings corroborate with the findings of Garfield (2014). The results indicate that knowledge management can enhance decision making within construction firms and make it easy to find relevant information and resources that will improve construction project delivery.

Table 4: Benefits of Knowledge Management Implementation

Benefits	MIS	SD	Rank
Enabling better and faster decision making	4.71	0.47	1
Makes it easy to find relevant information and resources	4.65	0.49	2
Supports reusing of ideas, documents, and expertise	4.65	0.49	2
Avoiding redundant effort	4.63	0.50	4
Avoiding making the same mistakes twice	4.59	0.62	5
Enabling the organization to leverage its size	4.53	0.51	6
Communicating important information widely and quickly	4.53	0.62	6
Promoting standard, repeatable processes and procedures	4.41	0.71	8
Accelerating delivery to customers	4.41	0.71	8

Providing methods, tools, templates, techniques, and examples	4.41	0.62	8
Showing customers how knowledge is used for their benefit	4.41	0.51	8
Making scarce expertise widely available	4.41	0.80	8
Taking advantage of existing expertise and experience	4.35	0.49	13
Making the organization's best problem-solving experiences reusable	4.35	0.61	13
Stimulating innovation and growth	4.29	0.59	15

3. Knowledge Management Capabilities

Table 5 shows ranking of knowledge management capabilities using mean item score, the greater the mean score the higher the rank. *Under Skill capabilities*, The mean score of the components ranges between 3.71 and 4.43. These skill capabilities components ranged from “The stakeholders are committed and competent to embrace new ideas” (MIS = 3.71; SD = 1.60) which is the least ranked to “There is guideline within the firm to embrace new ideas” (MIS = 4.43; SD = 0.53) which is the highest ranked. Based on the 4.50 mean score threshold, no component under skill capabilities was found to be significant.

Under Motivation capabilities, The mean score of the components ranges between 4.14 and 4.86. These motivation capabilities components ranged from “Firm recognized an employees’ needs” (MIS = 4.14; SD = 0.69) which is the least ranked to “Firm acknowledge any superior performance” (MIS = 4.86; SD = 0.38) which is the highest ranked. Based on the 4.50 mean score threshold, three components under motivation capabilities was found to be significant. Excluding the highest ranked component, the other two components were: “Firm use friendly technology” (MIS = 4.71; SD = 0.49) and “Firm has incentives for the employees” (MIS = 4.57; SD = 0.53).

Under Communication Capabilities, The mean score of the benefits ranges between 3.71 and 4.86. These communication capabilities components ranged from “There is willingness among employees to accept and share new knowledge” (MIS = 3.71; SD = 0.00) which is the least ranked to “Co-workers are keen to explore unknown ideas/knowledge” (MIS = 4.86; SD = 0.38) which is the highest ranked. Based on the 4.50 mean score threshold, three components under communication capabilities was found to be significant. Excluding the highest ranked component, the other two components were: “There exists trust within the parties” (MIS = 4.57; SD = 0.53) and “Employees are willing to adopt originated ideas from outside the firm” (MIS = 4.57; SD = 0.53).

Under Creativity Capabilities, The mean score of the benefits ranges between 3.43 and 4.71. These creativity capabilities components ranged from “Employees are encouraged to take advantage of opportunities in the work place” (MIS = 3.43; SD = 0.98) which is the least ranked to “Firm offers a creativity measuring plan that includes the proper availability of resources” (MIS = 4.71; SD = 0.49) which is the highest ranked. Based on the 4.50 mean score threshold, only the highest ranked component was found to be significant.

Table 6 shows the summary of the knowledge management capabilities. It can be deduced that most construction firms in Nigeria have good motivation capabilities (Average = 4.54), followed by communication capabilities (Average = 4.34), and skill capabilities (Average = 4.16). Most construction firms’ creativity capabilities (Average = 3.94) were found to be low. This connotes that most construction firms do not embrace the concept of creativity in terms of knowledge management. These findings were found to be in contrast with the findings of Umaru (2012) where it was emphasized that inadequate attention is given to motivation among professionals in Quantity surveying firms.

Table 5: Knowledge Management Capabilities

KM Capabilities	MIS	SD	Rank
<i>Skill Capabilities</i>			
There is guideline within the firm to embrace new ideas	4.43	0.53	1
There is a flexibility in the structure of your firm	4.35	0.00	2
Employees' tolerance for ambiguity and discomfort	4.29	0.53	3
There exist means by which employees employ logic to explore new ideas	4.00	0.58	4
The stakeholders are committed and competent to embrace new ideas	3.71	1.60	5
<i>Motivation Capabilities</i>			
Firm acknowledge any superior performance	4.86	0.38	1
Firm use friendly technology	4.71	0.49	2
Firm has incentives for the employees'	4.57	0.53	3
Firm have a staff training and development	4.43	0.79	4
Firm recognized an employees' needs	4.14	0.69	5
<i>Communication Capabilities</i>			
Co-workers are keen to explore unknown ideas/knowledge	4.86	0.38	1
There exists trust within the parties	4.57	0.53	2
Employees are willing to adopt originated ideas from outside the firm	4.57	0.53	2
There is openness within the people in the firm	4.00	0.82	4
There is willingness among employees to accept and share new knowledge	3.71	0.00	5
<i>Creativity Capabilities</i>			
Firm offers a creativity measuring plan that includes the proper availability of resources	4.71	0.49	1
Employees are willing to adopt idea originated elsewhere	4.29	0.49	2
Employees are willing to accept and share new knowledge	3.86	1.21	3
Employees are receptive to new ideas/knowledge	3.43	0.53	4
Employees are encouraged to take advantage of opportunities in the work place	3.43	0.98	5

Table 6: Knowledge Management Capabilities Summary

KM Capabilities	Average	Rank
Motivation capabilities	4.54	1
Communication capabilities	4.34	2
Skill capabilities	4.16	3
Creativity capabilities	3.94	4

CONCLUSION AND RECOMMENDATIONS

Knowledge management is central to the performance of construction firms. This study has presented results of a questionnaire survey with the main aim to assess knowledge management capabilities among professionals in Nigerian construction firms.

Mean item score was used to explore the ten barriers to knowledge management implementation in Nigerian construction firms revealed from literature review. The topmost three barriers in order of mean item score and significance are: cultural barriers, lack of time, and trying to solve large problems. This shows that keen attention needs to be paid to culture

and time in Nigerian construction firms so as to embrace the concept of knowledge management. Similarly, mean item score was used to explore the fifteen benefits of knowledge management implementation. The topmost three benefits in order of mean item score and significance are: enabling better and faster decision making, makes it easy to find relevant information and resources, and supports reusing of ideas, documents, and expertise. Finally, this study revealed the inadequate attention given to creativity among the professionals in construction firms. However, this study recommends the following:

- 1) Stakeholders of the construction industry should be encouraged to embrace cultural diversity.
- 2) Construction firms should pay keen attention to time management and development of appropriate methodology that will foster knowledge management implementation.
- 3) Professional bodies should collaborate with government parastatals and construction firms to train professionals on knowledge management.
- 4) Government should introduce policies and framework that will support knowledge management implementation.
- 5) Construction firms and professionals should embrace the concept of creativity in knowledge management.

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