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THE IMPACT OF KNOWLEDGE MANAGEMENT STRATEGIES TO REDUCE DELAY ON CONSTRUCTION PROJECTS

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ABSTRACT

The norm of knowledge management (KM) procedures on construction activities can accumulate advantages, it enhances execution and constant change, yet many projects are still not using KM completely and are hence anguished with wasteful aspects, reiteration of slip-ups and absence of lessons learnt. Poor abilities, design changes, mistakes and exclusions add to the interior disappointment cost component of the Cost of Poor Quality. Delay while the resultant impact of customer disappointment contributes to the outside disappointment cost. Delay is predominant in construction conspires and could be more in specific cases. The study meant to explore the degree of the impact KM has in decreasing delay and utilized a quantitative techniques approach. Inside and out meetings were led with several development industry specialists on KM over the Nigeria construction project, followed-up by a poll study of 106 respondents. The information got were broke down utilizing topical investigation and engaging insights individually. It was discovered that KM had a positive impact in reducing delay especially in the area of knowledge exchange through apprenticeships and tutoring. This infers the significance of dealing with the tacit knowledge of employees through 'socialization' activities. This study adds to the current collection of knowledge by giving a KM system to reduce delay on construction projects.

Keywords: Construction Project, Reduce delay, Impact of Knowledge Management, Quality Management

INTRODUCTION

1.0 Knowledge Management

Knowledge management (KM) is precious to construction management because of its commitment towards harnessing and incorporating learning crosswise over individual, organisation, project and industry limits. KM execution techniques can be rewarding, for instance, it enhances project execution and consistent change. Yet many projects are plagued with wasteful aspects, redundancy of errors and absence of lessons learnt in this way adding to extra extend costs (Al-Ghassani et al., 2004, Egbu, 2005; Suresh et al., 2008; Carrillo et al., 2013; Ren et al., 2013; Chatterjee, 2014). A noteworthy zone of concentrate is on the cost joined to the pointless exertion of re-doing procedures or exercises that were inaccurately actualized the first time through frequently alluded to as the cost of low quality on delay. This constitutes the cost of mistakes and oversights, cost of design changes and the important expenses related with client dissatisfaction (Feigenbaum, 1986; Juran and Godfrey, 1998; Josephson and Hammarlund, 1999; Love and Edwards 2005; Rosenfeld, 2009; Garstenauer et al., 2014).

Delay has been observed to be common on many projects paying little heed to sort or size. Researchers have endeavored to find the mean estimation of delay. Love (2002) found the mean immediate and backhanded improve costs on 161 construction projects to be 6.4% and 5.6% of the first contract esteem individually. Hwang (2009) got data from 359 construction projects and found the direct rework costs alone to be 5% of the construction costs. Love et al. (2010) observed the mean revamp expenses to be 10% of the agreement esteem in common framework projects.

1.2 Impact of Knowledge Management on Delay

Delay is endemic and a noteworthy contributory factor to client disappointment, lessened benefit of the store network and decreased reputation of the construction project in general. There is subsequently a basic need to detail techniques for reducing delay on project. While delay might be viewed as a quality management issue in which case activities, for example, Total Quality Management (TQM), Six Sigma and Lean standards are applicable for its usage, the investigation adopts a novel strategy into exploring the impact of KM on delay. Past KM contemplates have concentrated on harnessing knowledge at the individual and organisational levels but not at the project and industry levels. These past examinations have concentrated on

constituent viewpoints, for example, work, delays and wastage, however none was found to have embraced an all-encompassing methodology by incorporating every one of these aspects. Besides no exploration was found to date that has examined the degree of impact which KM has on delay.

However, the impacts of knowledge management to reduce delay in construction projects are still very meager (Embong et al., 2011). According to Idoro (2009) the impact of knowledge management (KM) have causes a lot of delays in delivery of projects in Nigeria and this have remain one of the challenges facing the construction companies in Nigeria. However, this was due to the challenges that lead to the research studying and comparing consultants and contractor views in Nigeria, in a view of finding solutions to minimize projects delay through legislative policies, because there is a large scale of activities and development now going on in Nigeria construction companies. Most of the new building projects are built to improve the economic and growth of the nation, because the construction organisation have become key player of the economy in times of industrialization of nation either develop or developing nation.

Although, the construction firms are really facing tough time in terms of knowledge management to reduce delays in construction projects, however challenges like this have become necessary for the industry to come out with workable solution to ease the entire problems or minimize it. This problems of delay is caused by various factors and in order to control this problem, it is very essential to adopt effective management approach most especially to minimize the factors that are causing delay in construction projects. Sambasivan and Son (2007) stated that factors causing delays in projects should be address and should be eradicated by the management and professionals in construction companies, because the construction companies have a lot of buildings raging from commercial, industrial and residential buildings.

According to Idoro (2009) delay in the delivery of projects remained the major problem confronting the construction companies in Nigeria. The role the construction companies plays in social economic development is significant, it provides the basic upon which other sector can grow by constructing the physical facilities required for the production and distribution of goods and services. The construction companies have a significant multiplier effects on the economy as a whole (Faridi and El-Sayegh, 2006). According to Faridi and El-Sayegh (2006), the interrelationship between the construction firms and the broader economy largely emanates from three of the industry characteristics namely, the public sector which is its major client, its large

size, ability to produce investment or capital goods which contribute significantly to national GDP and it is a major source of employment directly and indirectly by its multiplier effects.

Construction projects in Nigeria is parts of the country development initiative, it shared considerable amount of the country scare financial resources. In Nigeria the construction companies is the highest recipient of government budget in terms of government development program, construction projects consume an average annual rate of nearly sixty percent, according (Faridi *et al*, 2006) construction projects can be marvelous in their breath and complexity from the Egyptian pyramids to soaring skyscrapers and enormous bridges, it is obvious that the construction companies has special features that are not usually encountered in other industries, usually in construction, when condition in the field turn out to be more complex than what was anticipated in the planning and design phase, additional cost and time are needed. Any extremes can affects productivity level, damage materials and work in place more over the industry, most of the time is custom oriented, meaning that it is difficult to use mass production techniques, because of all these factors and others; it is always difficult to predict accurately how much money will be necessary to complete construction projects. Creating a large capital facility takes a longer time and usually involves a large capital investment, delays and other problems tend to be proportionally vast. Time is one of the primary measures of a projects success most especially for public projects in developing countries like Nigeria because construction projects in these countries are executed with scare financial resources, most literature reviews on construction projects suggested that the common criteria for project success are generally considered to be project delivery, cost and quality (Frimpong *et al,* 2003) called this measure as the iron triangle.

Clongh *et al* (2000) pointed out that project is successful if it has been completed on budget, on schedule, conformed to user expectation, met, speciation, attained quality of workmanship and minimized construction aggravation. Generally, a project is considered successful if the project is completed within time, cost or budget, getting the project into use by a target date, meets the technical specification and if there is a high level of satisfaction concerning the project outcome among the project participants. However, Completion alone does not constitute success for the project owner, for the owner much of the success of a project depends on many factors, the most important of which is project completion within specified budget parameters. The second most important factor affecting success is on time completion as delays in completion of facilities often equate to financial losses due to lack of revenue facility

operation (Mansfienld *et al*, 1994).

In this research work, two key questions that arises were: (1) what is the level of impact of KM on construction delay? (2) Which parts of KM have had the more prominent impact in reducing delay in project delivery? These inquiries were tended by extricating variables from the literature review on KM practice in organisation to carry out a questionnaire survey with a more extensive specimen of experts to rate the impact of these practices in reducing delay on project delivery. This research works aims at determining the causes and effects of delay in construction project; it will give forum for the collection of data that will be analyses in order to compare the theoretical concept developed from the literature review and findings from the analysis of data collected. Quantitative approach is choosing for the study because is best applied when two condition prevailed, that is when there is the needs to unveil the fact regarding a theory, a question and an attribute and when gathering real fact is required to determine the relationship between these facts or test theory (Naoum, 2013).

1.3 Aim of the Study

The aim of the study is to explore the degree of impact which knowledge management has in reducing delay on construction project.

1.4 Statement of the Problem

The main challenges confronting Nigerian construction projects are increase rate of delay in projects delivery. Delays are issue that the contractor and client jointly abided to the non-completion of the project within the agreement schedule. In other countries such as UK and USA, the case is relatively different. When projects are delayed, the duration is normally extended and that is why contingency is normally added in the pre-contract budget to take care of such act. However, construction project are always of standard because distinctive set of objectives needed the use of new technology or technical approaches to get the required result

Furthermore, delay causes misunderstanding between the contractor and the client, but such issues have been addressed by Sambasivan and Son (2007). In specific terms, Mansfield et al (1994) and Olayinka (2012) have addressed the causes of delay in Nigerian building projects. Some causes of delay identified by Mansfield et al (1994) are Financing, poor contract management, shortage of materials, while client related delay are; inadequate site inspection,

shortage of manpower, weather, act of God, labor disputes and strike.

1.5 Objective of the Study

The objective were fourfold: (1) to examine the current assemblage of work in the ranges of KM and delay keeping in mind the end goal to produce key research questions; (2) to conduct a field examine with industry specialists in view of the research questions created; (3) to talk about discoveries; and (4) to make inferences and show bearings for additionally research. The following areas show the literature survey and technique adopted individually. From that point, the discoveries and conclusions are discussed.

1.6 Scope of the Study

The scope of this work is constrained to eight (8) positioning factors of knowledge management. These are assessing knowledge management, mentoring programmes, engaging experts to facilitate knowledge management, capturing knowledge from other projects, capturing lessons learnt at various stages of project, identifying right knowledge, right people at the right time, and disseminating knowledge through publications. These variables were considered using technological tools of web conferring and blogging.

1.7 Limitation of the Study

The research work result cannot be finished or concluded statistically for the causes and effects of delay in construction projects in Nigeria, because the population sample will be drawn from construction professionals, contractors in construction industries in Taraba state Nigeria, clients and construction consultants. The response rate can affect outcome of the study. Secondly, we can not assume that the same factors can be found all over the country Nigeria.

2.0 Literature Review

2.1 Definition of Knowledge

They are different author with different view point of definition of knowledge management itself. Among the author, Epistemology, the branch of philosophy dealing with knowledge attempts to answer the basic question 'what is knowledge?' Epistemology aims at; (1) 'understanding ourselves and the environment that surrounds us'; (2) searching for judgemental criteria that distinguish truth from falsehood. Epistemology is the process of knowing or how to justify true knowledge as a result; scientific methods have conceptually become an integral part of many epistemologies. The philosophical concept of knowledge is very broad and often complex but it worth mentioning the two philosophical viewpoints that have emerged. However definitions can be classified into traditional and contemporary (Davenport and Prusak, 1998). Traditional epistemology can only be of limited use to knowledge management since it focuses on the origins and justification of personal knowledge rather than the pragmatics of knowledge use While the contemporary definitions are more relevant to knowledge management as they focus on the pragmatics of knowledge use and on the notion of knowledge as a practical tool for framing experiences, sharing insights and assisting with practical tasks. Infect knowledge management entails the justification knowledge, more importantly it deals with the understanding of the uses of knowledge in order to effectively deal with tasks that involve knowledge-based activity. This study therefore focuses on the contemporary definitions, concepts and applications.

Nonaka and Takeuchi (1995) defined knowledge as a dynamic human process of justifying personal belief toward the 'truth'. Knowledge management is an intellectual process by which raw materials data is gathered and transformed in to information elements. According to Plato (427-347 BC) He defined knowledge as perception, true judgement and justified true belief (Anand 2010).All these information elements are assembled and organized into framework and applicable structures that represent knowledge (Onge, 2001, in Geisler and Wickramasinghe, 2015). Knowledge is a formal procedure that engages an organization's people, processes, and technology in a solution that capture knowledge and deliver it to the right people at the right time (Geisler and Wickramasinghe, 2015). According to Uriarte (2008), KM is understood as the

process by which organizations add value to their assets using the knowledge process of identification, acquisition and maintenance of knowledge which is essential for the organization.

2.1.1 Types of Knowledge

There are two main types of knowledge identified from previous studies. The main types are explicit knowledge and tacit knowledge. The Explicit knowledge is the type of knowledge that expressed formal and systematic language or shared in form of data, scientific formula, specifications, and manuals among wide range of knower's, While Tacit knowledge is subjective and experience based, not visible to see and cannot be easily expressed, understood or measured, hard to encode and communicate (Polanyi, 1966; Nonaka, 1994; Nonaka et al. 2001). There are two methods to tacit knowledge; these are technical, and cognitive. The Technical knowledge deals with informal skills, crafts, expertise or 'know-how' which were acquired through years of experience but difficult to articulate in a formal way and Cognitive knowledge consists of schema, mental models, beliefs and perceptions that are taken for granted (Nonaka and Takeuchi, 1995).

The Procedural knowledge or 'know-how' is a knowledge on how to perform a task accumulates with experience over time (Argote and Miron-Spektor, 2011). Prior experience often dictates future knowledge possibilities thereby rendering the process a cumulative and path-dependent phenomenon. Once created such knowledge in an individual's, organisation routines and processes . Declarative knowledge or 'know what' results from knowledge generated through interactions, between producers and users of their products. Such knowledge are usually documented. Causal knowledge or 'know why' involves controlled experimentation, simulation to understand the principles and understanding the theories and the functions of the system. Accumulation of knowledge within the confines paradigm. Prior knowledge is essential to assimilate new knowledge . Conditional knowledge refers to knowing when and why to use the declarative and procedural knowledge. Relational knowledge' is the knowledge that resides intangibly with individuals through relations with others

Studies have explored the characteristics of knowledge and found that: knowledge is embedded in practice; knowledge is embodied; knowledge is embrained; knowledge is encoded; and knowledge is encultured. Embedded knowledge is explicit and resides within routines and is complex. Embodied knowledge is action oriented and consists of constant practices i.e. 'knowledge by doing'. Embrained knowledge is dependent on conceptual skills and cognitive

abilities and is considered to be practical, high-level knowledge where objectives are met through recognition and revamping.

Tacit knowledge is mainly of subconscious. Encoded knowledge is information that is conveyed in signs and symbols e.g. books, manuals, data bases and de-contextualised practice. It deals with the transmission, storage and interrogation of knowledge (Argote and Miron-Spektor, 2011). Encultured knowledge is the process of achieving understandings through socialisation and acculturation (Zins, 2007). (Cheung, (2006) explained that four types of knowledge, excluding encultured knowledge which was not mentioned, arose from the explicit-tacit and individual-collective knowledge. Therefore all knowledge types and sub-types which possess tacit and explicit knowledge can be classified under tacit or explicit knowledge

2.1.2 Definition of knowledge management

According to Davenport and Prusack (1998), there are various definitions of KM; many were generated in the last two decades, the period in which KM gained enormous. With the vast definitions some appear daunting and confusing , conflicting and overlapping. Yet it has been argued that the cause can be linked to various KM having its roots to other disciplines such as philosophy, human resource management, information systems, linguistics, and business (Dalkir and Liebowitz, 2011). As a result there is a tendency of each definition having its root discipline to it originated from.

According to stated that knowledge management has an existing resources that organisation has already have in place e g Good information systems management, organisational management and human resource management '. This definition has its roots in information systems and human resource management. (Dalkir and Liebowitz, 2011) defined KM, As improving the ways in which firms facing turbulent environments can mobilise their knowledge in order to ensure continuous innovation'.

Apart from the various definition, it is often debated whether KM is a tool, a process or strategy. As a tool, O'Dell and Grayson (1998) defined KM as a set of procedures, infrastructures, technical and managerial tools, designed towards creating, sharing and leveraging information and knowledge within an organization. KM can also be defined as a cyclic process Involving creation, integration and dissemination of knowledge, it also a continuous cyclic process

comprising of knowledge identification, collection, classification, storage, sharing, access, usage, and new knowledge creation. As a strategy, they also defined KM as a conscious strategy of getting the right knowledge to the right people at the right time, and helping people to share and put the information into action in ways that strive to improve organizational performance. With the various definitions of knowledge management, we can summarize the definition as follows: That Knowledge management entails harnessing and integrating knowledge across boundaries through the adoption of processes and supporting tools for the strategic benefit of an organization (O'Dell and Grayson, 1998)

Knowledge management (KM) and delay are wide subject areas having various conceptualizations and applications. The study examined the existing body of work in these areas and adopted relevant concepts.

Notwithstanding the tremendous assemblage of research on KM, there gives off an impression of being no general meaning of the term, similarly as there is no accord in the matter of what constitutes research in any case. From the way knowledge is depicted by various authors, clearly it is conceptualized in divergent ways . The contending conceptualizations depend on in general sense diverse epistemologies, that is, the reasoning tending to the idea of learning, which is worried about inquiries, for example, is knowledge objective and quantifiable? Would knowledge be able to be gained or is it encountered? What is viewed as legitimate knowledge and why?

Nonaka and Takeuchi (1995) defined knowledge as a dynamic human process of justifying personal belief toward the ‘truth’. Knowledge management is an intellectual process by which raw materials data is gathered and transformed in to information. According to Plato (427-347 BC) He defined knowledge as perception, true judgment and justified true belief (Anand 2010).All these information are assembled and organized into structures that represent knowledge (Geisler and Wickramasingh, 2015). The different meanings of knowledge can be compressed and grouped into (1) established time meanings of knowledge similar to a legitimized genuine conviction (e.g. Plato, Aristotle) and (2) contemporary period meanings of learning just like a fluid mix of encircled encounters, values, relevant data, and master knowledge that gives a system to assessing and incorporating new experiences and information (e.g. Davenport and Prusak, 1998; Drucker, 1999). The contemporary definitions are more important to construction management as they concentrate on the pragmatics of utilizing

knowledge and on the thought of knowledge as a practical tool for framing experiences, imparting bits of knowledge and helping with practical tasks. KM in this way involves understanding the uses of knowledge so as to adequately manage the practical tasks that include learning based exercises.

A prevailing part of KM is that of knowledge change particularly where new knowledge is made through the interfaces amongst tacit and explicit knowledge. While explicit knowledge is regularly formal, efficient and can be shared effectively, tacit knowledge is personal, hard to formalize and can be hard to catch or impart to others (Polanyi 1966; Nonaka and Takeuchi 1995; Nonaka and Toyama 2005). Knowledge transformation is comprised of four interfaces known by the acronym 'SECI': Socialization (i.e. the transformation of tacit to tacit); Externalization (tacit to explicit); Combination (explicit to explicit); and Internalization (explicit to tacit). The SECI is relevant to the construction production network in encouraging knowledge collaborations crosswise over individual, organisation, project and industry limits. The operational meaning of KM with regards to this investigation is connected to these collaborations in this manner: 'KM involves the way toward outfitting and incorporating knowledge crosswise over individual, organisational, project and industry limits to make the best utilization of knowledge.

The way toward bridling and coordinating information constitutes certain sub-forms which have been recognized and characterized in various routes by various authors. Accordingly there is an absence of regular wording utilized as part of portraying these sub-forms. It is in this way essential to look at these sub-forms so as to clear up the covers in the utilization of wording. A specimen is drawn from the sub-forms exhibited by authors especially in the previous two decades when KM picked up fame in the projects and academia perspectives.

2.2 Application of Socialization, Externalization, Combination, and Internalization (SECI) to the construction industry

The concept of new knowledge created between tacit and explicit is formal and systematic which can be sheared. Tacit knowledge is personal and is hard to capture or communicate to others. (Polanyi, 1966, Nonaka and Takeuchi, 1995, Nonaka and Toyama, 2005) in (Afolarin, 2015), he reported that knowledge conversion is made up of four link known as; SECI model where: .S” Stand for Socialization which is conversion of tacit to tacit, “E” Stand

for externalization (tacit to explicit).”C” Stand for Combination of (explicit to explicit) and “I” Stand for internalization (explicit to tacit). The model is often facilitated by knowledge management tools. The whole aim of the model is to strategically manage employee-owned tacit knowledge with construction organization and the need for knowledge integration across organization (Carrillo and Chinowsky, 2006). Ruan *et al*, (2012) Garstenauer, (2014) in (Afolarin, 2015) leading to measurable outcomes such as retained knowledge, improved performance, reduced cost, client satisfaction, and increased profitability.

In harnessing and integrating knowledge Management processes e.g. knowledge sharing and knowledge codification ,the use of tools, there should be collaborative workspaces to reduce delays on projects .No matter the amount of explicit knowledge available to an organisation, it is useless if their personnel do not ‘pull’, ‘internalize’ and make use of Knowledge Management (Suresh and Chinyio,2015).

- In supporting business forms (Lytras et al., 2002; Liebowitz, 1999). Different terms utilized by creators to depict a similar procedure incorporate 'source', 'select', 'investigate' and 'find'. Others include:
- 'Capture' includes the act of recording recognized knowledge in hierarchical documents and knowledge bases. Collison and Parcell (2001) portrayed learning catch as methods for catching ability such that it can be reused. One of the initial phases in catching information is to recognize the wellsprings of basic learning that may be in danger in an organisation e.g. employee leaving because of downsizing or retirements. Different terms utilized for capture by authors incorporate 'gather', 'secure', 'ingest' and 'abstract'.
- 'Codify' is the securing of knowledge from its source in the most productive route conceivable keeping in mind the end goal to allow information re-usability within the organisation (Lytras et al., 2002). The reason for learning codification is to capture past encounters and make them accessible in the present either to the individuals who were part of the first experience itself or to a completely new arrangement of employee’s altogether (Holthouse, 1999). Different terms utilized by authors for codify include, classify, modify, organise, transform, compile, coordinate, structure, develop, focus and filter.

- 'Store' includes holding information in anorganisational memory unit or knowledge base (Robinson et al. 2001). Different terms utilized for store incorporate 'look after', 'archive', and 'secure'.
- ‘Access’ refers to the ease of locating and retrieving of the right knowledge by the right people at the right time (O’Dell and Grayson, 1998). ‘Access’ is also termed 'retrieve' by some authors.
- 'Exploit' includes the ideal utilization of information for authoritative and singular advantages. It incorporates exercises that encourage the information change process (Nonaka and Takeuchi, 1995) at the individual, authoritative or between association levels. Information abuse includes a few sub-forms which have been distinguished by authors, for example, spread, share, exchange, circulate, offer, convey, diffuse, assemble, learn, utilize, re-utilize, apply, use, strategies and use.

- 'Create' is the key authoritative capacity to bring into reality or start new learning constantly and over and over in a round procedure with no extreme end (Egbu et al., 2001; Story and Quintas, 2001). Learning creation includes the age and revelation of new information. As indicated by Takeuchi (1998) learning creation ought to be seen as a procedure whereby the association opens up the information made by workers and solidifies it as a feature of the learning system of the association. Also Tiwana (2002) expressed that an effective KM venture must start with learning that as of now exists, convey beginning outcomes, and afterward keep on expanding on it. New information is generally made as one of the results of overseeing existing knowledge. Different authors utilize the equivalent word 'produce' to connote information creation.

- 'Assess' alludes to the estimation and benchmarking of KM results inside an association. A few creators have utilize the terms 'approve', 'assess' and 'measure' to allude to appraisal of information.

These 8 sub-forms above can be additionally ordered into 3 primary headings:

1. Knowledge obtaining – the way toward engrossing and storing knowledge, the

achievement of which is frequently gaged by how well the information can be recovered later.

2. Knowledge exploitation – includes the unitisation of learning ideally for the advantage and benefit of an association. Sub-forms 6-7 (e.g. disseminate, share, exchange, and create new information) belong to this category.

3. Knowledge assessment – an efficient assurance of legitimacy utilizing criteria represented by an arrangement of models which helps an organisation to find out the level of accomplishment or incentive with respect to the aims and destinations of an embraced project are i.e. approve, assess and measure which belong to this category.

2.3 Knowledge Management Processes

The delay idea originates from quality management especially in the manufacturing industry but however has discovered an articulation in different enterprises including construction. Characterizing the term 'quality' itself can be a challenging assignment since it is frequently perceptual, conditional and a subjective attribute that might be conceptualized in various ways. Quality in the development administration setting depends on a concurred set of criteria characterized by project stakeholders including the client, originators and the primary contractor (Olayinka et al. 2011). These criteria may incorporate conformance to prerequisites, accomplishment of zero defects and utilization of proficient procedures, accomplishment of client fulfillment, cost reduction and expanded benefit (Crosby, 1979; Kano et al., 1984; Taguchi, 1993; ISO 9000, 2005). Deviation from these set criteria accordingly would tend towards low quality; thus, the superfluous cost related with redressing low quality is named as delay.

A broadly utilized idea in characterizing delay is the anticipation appraisal-failure (AAF) cost explained by Feigenbaum (1986) and Juran and Godfrey (1999). Anticipation and appraisal costs are brought about by organisation to guarantee that their items or products are conveyed right the first time. Disappointment costs are either interior (i.e. inability to meet explicit necessities or implicit needs of the customer/end-client before item handover); or outer (i.e. inability to meet prerequisites after handover).

While counteractive action and evaluation costs are essential costs referred to as the cost of good quality Delay, disappointment are pointless and avoidable, along these lines referred to as delay which this investigation concentrated on. Three sub-divisions of delay rose up out of different investigations in particular: cost of mistakes and oversights; cost of design changes; and

cost of poor skills (Feigenbaum, 1986; Burati et al., 1992; Love et al., 1999, Hwang, 2009).

2.4 Incorporating knowledge management with Delay

The rationale for undertaking the research was driven by the need to reduce delay on construction project. KM is important to the construction industry as it is esteemed basic for construction organization to tackle and coordinate knowledge in mind to enhance proficiency and increment benefit. The nature in which the construction industry is sorted out implies that, productivity in project conveyance is now not as much as expected, bringing about disappointed client and low gainfulness for construction organization. There is an attention to the need to deliberately oversee employee-owned tacit knowledge within construction organization (Carrillo and Chinowsky, 2006; Anand et al., 2010) and the requirement for knowledge joining crosswise over individual, organization and project limits (Ruan et al. 2012).

While endeavor is made by some few authors to measure delay on construction but none of them has embraced a comprehensive approach. Rather, past investigations have concentrated on the constituent parts of delay, for example, quality disappointments (e.g. Nylen, 1996), non-conformance costs (e.g. Abdul-Rahman, 1995), deviation costs (e.g. Cnuddle, 1991; Burati et al., 1992), direct and indirect rework costs (e.g. Love et al., 2002; Hwang, 2009), and design and construction related change orders (e.g. Cox et al., 1999; Love et al., 2010). A more all-encompassing methodology is incorporated in the parts of errors and oversights, design changes, and poor aptitudes, which all add to rework, delays and wastage, which are in term quantifiable regarding plant, material, work, time, and punishment costs. None of the current collection of work has inspected the impact of KM on delay or displayed exact confirmation on the level of this impact. This research therefore set out to investigate these areas by joining the KM display exhibited in Figure 1 with the delay model introduced in keeping in mind the end goal to explore the impact of KM on delay practice. The key inquiries tended were: (1) what is the impact of KM on the cost of mistakes? (2) What is the impact of KM on the cost of design changes? Also, (3) what is the impact of KM on the cost of poor skills?

While KM and delay might be seen as two unmistakable territories in practice but evidence confirm that one impacts the other. Besides none of the current group of work has analysed this impact. This study hence means to connect this distinguished huge hole. Although none of the past studies has explored the impact of KM on delay nor demonstrated any exact

confirmation of the degree of the impact, literature proposes that poor KM adds to delay and that enhancing KM, i.e. harnessing and incorporating knowledge across limits, can reduce delay, thereby leading to enhanced projects execution from the overall project management point of view, expand customer loyalty and enhanced industry reputation. This study along set out to investigate these areas.

In Nigeria construction projects, delay is one of the critical problems facing the construction project (Memon *et al*, 2014). Hamzah *et al* (2011) stated that, delay often causes disorder and reduce productivity; however projects are completed above the contract time which can result in budget overrun, contractual claims or also abandonment of the projects. Memon *et a*l (2014) stated that one of the biggest challenges facing the construction firms were delay, he continues by mentioning that delay could lead to so many factors in the construction companies, that is delays in projects completion, projects are sometime abandon, disputes and litigation, there a lot of examples from local and international. For examples most of the construction projects in Nigeria have delays in projects completion which have raised serious concern from the private and public sector. Despite the huge amount of money been spend on building projects to meet up with public demands, based on the country policies on housing (William, 2011). Abedi *et al* (2011) mention that in June, 2010, eighty percent of the public works department known as federal government projects in year 2010 to 2011 were delayed, and the government had to bear the higher cost as well as waste of energy (Embong, 2011).

Therefore, various practice have been adopted by the government to overcome this problem which involved the private sector in government development, hiring of professional projects managers that have experience so that the projects can be managed effectively for achieving completion on time.

The impacts of knowledge management to reduce delay in construction projects are still very meager (Embong, 2011). According to Idoro (2009) the impact of knowledge management (KM) have causes a lot of delays in delivery of projects in Nigeria and this have remain one of the challenges facing the construction companies in Nigeria. However, this was due to the challenges that lead to the research studying and comparing consultants and contractor views in the causes of delay in building projects in Nigeria, in a view of finding solutions to minimize projects delay through legislative policies, because there is a large scale of activities and development now going on in Nigeria construction companies. Most of the new building projects

are built to improve the economic growth of the nation, because the construction organisation have become key player of the economy in times of industrialization of nation either develop or developing nation.

Although, the construction firms are really facing tough time in terms of knowledge management to reduce delays in construction projects, however challenges like this have become necessary for the industry to come out with workable solution to ease the entire problems or minimize it. This problems of delay is caused by various factors and in order to control this problem, it is very essential to adopt effective management approach most especially to minimise the factors that are causing delay in construction projects (Sambasivan and Soon, 2007). Abedi *et al* (2011) stated that factors causing delays in projects should be address and should be eradicated by the management and professional in construction companies, because the construction companies have a lot of buildings raging from commercial, industrial and residential buildings.

However, one of the criticisms against the construction firm has been its penchant for delays; according to Idoro (2009) delay in the delivery of projects remained the major problem confronting the construction companies in Nigeria. The role the construction companies plays in social economic development is significant, it provides the basic upon which other sector can grow by constructing the physical facilities required for the production and distribution of goods and services. The construction companies have a significant multiplier effects on the economy as a whole (Faridi *et al*, 2006). According to Faridi *et al* (2006), the interrelationship between the construction firms and the broader economy largely emanates from three of the industry characteristics namely, the public sector which is its major client, its large size, ability to produce investment or capital goods which contribute significantly to national GDP and it is a major source of employment directly and indirectly by its multiplier effects.

Construction projects in Nigeria is parts of the country development initiative, it shared considerable amount of the country scare financial resources. In Nigeria the construction companies is the highest recipient of government budget in terms of government development program, construction projects consume an average annual rate of nearly sixty percent, according (Faridi *et al,* 2006) construction projects can be marvelous in their breath and complexity from the Egyptian pyramids to soaring skyscrapers and enormous bridges, it is obvious that the construction companies has special features that are not usually encountered in other industries,

usually in construction, when condition in the field turn out to be more complex than what was anticipated in the planning and design phase, additional cost and time are needed. Any extremes can affects productivity level, damage materials and work in place more over the industry, most of the time is custom oriented, meaning that it is difficult to use mass production techniques, because of all these factors and others; it is always difficult to predict accurately how much money will be necessary to complete construction projects.

2.5 Types of Delay in Construction

Mohammed and Isah (2012) stated that there are only two methods of delay in construction industry. They group them as excusable delay and non-compensable delay. The non-compensable delay are the type of setback that are caused by unforeseen circumstances or we called it as the third parties that might happen as an act of God, weather conditions, strikes, fire disaster, government giving public holidays. Political/Social Unrest, terrorist Attacks, which the client or the contractor have no power to stop such act, therefore the contractor is liable for time extension but it will not attract any monetary value, he has to bear any additional expenditure that might cost him, while in the compensable delay, which is caused by the client, or the owners agent eg late release of project sketches from the architect, such delay always causes or leads to extension of time and owners to financial damages claimed by the contractor.

Causes of delay are generally a common issue in construction plan and are increasing daily. According to Prakash and Joseph (2014) They said that delay is classified into four basic ways: Namely

- Critical or non- critical delay
- Excusable or non-excusable delays
- Concurrent delay
- Compensable or non- compensable delays.

It is good to understand the level of delay before determining the actual impact on project execution.

2.6 Causes of Delay in Construction Project

Causes of delay are generally increasing daily. Research was carried out and found delay causes in countries such as ; Chile, Hong Kong, India, United States, Thailand, Saudi Arabia, Jordan ,Kuwait, Nigeria ,and Ghana (Assaf *et al* 1995; Frimponga *et al*.2003; Koushki et al,2005; Kumaraswany and Chan 1998; Toor and ogulana 2008). Sometimes the quality of the incident may be right for instance 40 % out of 646 initiated plans in Indian production companies were nearly 40% completed behind estimated time. In Chile a number of 34 projects were not completed at the estimated period, they were delayed of nearly 20% (Frimponga *et al*.2003).

Researchers who engaged in trying to find out the causes have come out with various view point, providing necessary reasons of delay. A good number of researchers that are involved in collection of information from the public, private individual, general contractors, site engineers and specialist. Some of this information collected is; Quantitative development data, case studies, surveys and oral face to face talk. For instance, a survey was carried out in Kuwait on one of the construction companies and various reason for delay were observed (Foreig, 2006), while in Honk Kong, research was also carried out by Love et al., (2006), One of the basic finding in all these researches carried out were the primary causes of delay which was militating around the management and the project environment. Abdullah and Koskela (2008) concluded that more findings can be conducted to established the wrong notion of delay impact and provide some lasting solutions.

2.7 Reduction of Delay in Construction Project

Prakash and Joseph (2014) recommended that in order to avoid delay in construction project, proper planning factors must be considered, this factors are (1) risk management, (2) proper planning (3) Constance relist of fund to client (4) prepare insurance claims (5) Adequate programmer planning (6) Client representative at the project (7) choice good people who knows the work (8) Settle contract bill and BOO (9) pay off outstanding claims. Furthermore, to minimize delays in construction projects, three methods are identified which includes: site management and supervision, effective strategic planning, and clear information and communication channel. In minimizing the effects of delay in Nigeria construction projects, two method are identified which are acceleration of subsequent site activities to reduce delay if possible eliminate it and contingency allowances in precontract estimate to offsets the cost

overrun . According to Ibnu (2006) in his study of causes and effects of delay, he mentions that the most effective methods of minimizing delays are to:

- Ensure adequate and available source of finance until the project is completed;
- Competent project manager;
- Availability of resources;
- Frequent progress meeting;
- Awarding bids to the right/experience consultant and contractor;
- Use of experienced subcontractors and suppliers;
- Multidisciplinary/competent project team;
- Accurate initial cost estimates;
- Competent and capable of clients representative;
- Use of appropriate construction methods;
- Perform a preconstruction planning of project task and resources needs; and
- Project management assistance.
- The provisions which allow contractors to claim interest on delayed payments must be strictly enforce to serve as deterrent to clients
- Commercial bank for building and construction should be established so that contractors can have access to credit in times of liquidity difficulties.

3.0 Materials/Methodology

Academic and professional research journal articles, conference papers, reports/occasional papers, dissertation/thesis, government publication, textbooks, newspapers, trade magazines, technical press and magazines are the resources consulted for the research work. Statistical package for social science software (SPSS) was used to analyse the data collected from the research. Majority of the respondents are of the view that these variables are strong barrier to KM strategies in reducing delay on construction.

The Respondents were asked five questions relating to the measurement of the impact of KM to minimise delay in project delivery, Based on the findings from questionnaire survey. The questions relate to respondents' experiences in their organisation and on projects they have been involved in. Base on the responses, the respondents welcomed the idea of new tools which has a percentage of 91% while those that have no tools to assess or measure the impact of KM on delay are 40%.majority which are in support of welcoming new tools with average response of 91,87and 79% respectively.

The questionnaire data was broke down utilizing sampling technique approach (Braun and Clarke, 2006) which concentrated on distinguishing and portraying both implicit and explicit

thoughts inside the data.

3.1 Profile of Questionnaire

The respondents have gained long time of involvement in large construction organization with more than 250 employees especially with main contractors that has been engaged with a various scope of activities. 49.1% of the respondent has procured more than 30 years of experience, 1.9% between 20 - 30 years, 52.8% in the vicinity of 10 and 20 years, while 28.3% have gained between 5 - 10 years of experience. The primary inquiry acted to the respondent was as following: what is the impact of KM in reducing delay in construction (1) design changes (2) Number of employees, and (3) poor skills?

3.2 Design and Analysis of the Questionnaire Survey

A questionnaire was intended to facilitate the collection of quantitative data related with the impact of KM on delay. The survey design depended on the factors got from the literature review on KM rehearses in construction project. The survey respondents were chosen additionally by non-likelihood sampling, which was a think determination of the most suitable respondents especially KM specialists in construction who could give tenable knowledge into the study. The respondents were chosen in light of their times of involvement in construction industry. Utilizing on the web registries of KM people group of training within construction, a rundown was drawn up of 120 research focuses on that were reached and sent the questionnaire. The questionnaire contained shut finished inquiries in which respondents were solicited to rate the level from impact of fifteen KM practices on reducing delay: (1) design changes (2) blunders and exclusions, and (3) poor abilities. A four-point Likert scale (Knight and Ruddock, 2008) was used to gauge the level of impact as takes after; 1 – strong negative impact, 2 – negative impact, 3 – positive impact, 4 – strongly positive impact. A sum of 106 substantial reactions was gotten along these lines putting the reaction rate at 88.33%. The reactions were collected and broke down utilizing the SPSS statistical software.

The mean esteems for the appraisals of impact were ascertained and positioned in descending order to recognize the relative importance of the procedures as well those that have had the most and least impact on delay practice.

4.0 Results

According to the results of the research, the five most outstanding positioning factors that impact of knowledge changes were: Assessing knowledge management of construction activities (3.21) Using mentoring programmes among staff (3.06) Engaging experts to facilitate knowledge management (3.06) Capturing knowledge from other projects (3.04) and Capturing lesson learnt at various stages of project (3.00) while the three most minimal positioning factors that impact knowledge management changes were: Involving all stakeholders (2.70) Identifying right knowledge, right people at the right time (2.57) and Disseminating knowledge through publication (2.45).

The elevated positioning factors that impact the effectiveness of techniques and technology were web conferencing (3.11) and the list is Blogs with (2.21).This is an interesting set of results as they are all interlinked and relate to project team. In fact these techniques and technology tools have shown great level of effectiveness in reducing delay causes on projects as per the results. The t-test for equality was carried out to investigate whether there were any significant differences between “SMS and large construction organisation” insights on the usage of KM techniques and technology (at the 0.05 significant level) as refer to table 4.4.1.Acording to Black *et al*. (2010), in the t-test, a significant value (p) below 0.05 indicates a high degree of difference of opinion between groups on that variable. However in this case, between SMS and large construction organisation, the results here show that KM techniques and technologies, apart from web conferences, instant message, lesson learned management system, learning review, peer assist, internet, post project review and collaborative virtual workspace are not significant (<0.05) and therefore there are no significant statistical variation between the responses of the SMS and Large construction organisation. In this study, web conferences (with a mean value of 3.31) perceive that web conferences is being more widely used for managing knowledge in SMS (with a mean values of 2.93)All other variables seem important and are effective in reducing delay causes. The summary ranking for Effective KM techniques and technologies for reducing delay causes on construction project and the common tools mostly use is web conferencing which has the highest percentages. It is interesting to note that most of the lowest ranking tools are codification tools which involve the use of technologies and technological infrastructure (Suresh *et al*. 2016)

4.1 Discussions

4.1.1 The Exploitation of Knowledge to Reduce Delay on Construction Projects

There was proof of information sharing at the individual, organizational and project levels. Over the individual level for instance, there was a prove that the group of specialists inside their organization set out on periodical knowledge sharing sessions keeping in mind the end goal that knowledge does not dwell just in one individual but rather is spread crosswise over work force so that knowledge is held in the organization should any one leave. Likewise, the organization should holds monthly talks in which colleagues share new bits of knowledge with each other e.g. new strategies and systems of work. This has brought about further exploring into details elements in the matter of why delay happen and how it could be eradicated.

At organizational level, there was proof of the utilization of strategies and technologies for knowledge hoarding, recovery and sharing. The organization should have an information bank and specialized perfection meetings where their organizational knowledge is been stored and how it coordinates the difficulties they face on project is checked on by a specialized perfection group. They additionally have various productions for knowledge dissemination to the organization's principle and operational units with a specific goal to guarantee that sufficient lessons learnt is known and mistakes made are not reworked. Another case of organizational level KM was observed that let organization should keep an online technical inquiry and lessons learnt log from which personnel can externalize and disguise knowledge in order to reduced delay. At the project level, there was proof of joining, collaborative working and knowledge sharing and retention inside some organization to ensure that we hold the greater part of our production network of around 60 industries and utilize them from project to project. The advantage of this is that significant project knowledge is held inside the organization and there is a level of trust inside the organization since they are rest guaranteed that they will cooperate for quite a while. The earth of trust in this way encourages knowledge sharing among parties". Little proof was found of industry level KM impact. It was set up in this investigation that project are still tormented with wasteful aspects, redundancy of missteps and non-exchange of lessons learnt thereby adding to pointless re-doing forms that were executed erroneously at the first run. The discoveries support past work by Al-Ghassani et al., 2004; Egbu, 2005; Suresh et al., 2008; Carrillo et al., 2013; and Ren et al., 2013. This affirms a portion of the project challenges faced

by organization that tight project schedules and constrained (Zin and Egbu 2011; Ruan et al. 2012). KM was found to have a positive impact in reducing delay. However there was another new understanding that: organization couldn't evaluate delay neither could they be able to measure the degree of the impact of KM on delay. The questionnaire review hence was helpful in rating the level of this impact.

The most noteworthy positioning KM practices that impacted the reduction of delay were knowledge exchange apprenticeships and knowledge exchange tutoring. This uncovers the significance of the management of the tacit knowledge of workers to especially ensure that sufficient knowledge is exchanged from more experienced employees to less experienced ones. An extremely helpful interface of the SECI (Polanyi 1966, Nonaka and Takeuchi 1995, Nonaka and Toyama 2005) is along these lines 'socialization'. Knowledge capture personnel to the organization positioned high in terms of impact. This could imply that personnel are effectively 'externalizing' their tacit knowledge and changing it into more explicit formats adding to their organizational knowledge base (Suresh, 2006).

5.0 Recommendation

It can be construed that regardless of the measure of explicit knowledge accessible to an organisation, it is futile if their work force don't pull, adopt and particularly utilize it.
The personalization approach was a better approach of KM and appeared to be more successful than the codification approach.

6.0 Conclusions

The study has pragmatic pertinence and application in giving construction organisations with the knowledge of investing resources into KM and quality management strategies, technologies and frameworks is essential but what is more critical is the ability to track the impact of the investment in cost terms. Organisation need to comprehend and acknowledge that there is an endemic delay issue which desperately needs to be inclined. Organisations need to embrace a holistic method and a hearty philosophy in evaluating delay, for example, the one exhibited in this study. Evaluating delay forms the premise on which to quantify the impact of KM on delay that Create performance measurements to survey the impact of KM on delay in construction projects in Nigeria.

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