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Knowledge Management Model and Instrument for Implementation and Adoption; Perspective of Developing Country

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Abstract

This paper presents a KM model that comprises a set of KM hypothesis model and measurement models for understanding and implementation. Research uses 323 questionnaire surveys. A hypothesized model of KM process was tested using structural equation modelling approach with a proposed model and the instrument was therefore developed. Analysis of the

five constructs of knowledge acquisition, creation, sharing, storage and dissemination with their reliability and Cronbach's Alpha coefficient of 0.80, 0.71, 0.82, 0.87 and 0.87 respectively were used. Likewise, all fit indices and factor loadings were significant leading to a frugal model achievement. The study serves as a guide to KM for the construction organization implementation.

Keywords: Knowledge management, Model, Construction, Organization, Procedures

1. Introduction

In developed countries over the last period, many construction organizations have funded heavily in knowledge management (KM) implementation as an answer to the upward demands for the improvement of their professional practices. Construction markets in today business, margin is simply hard to achieved, competitions have keep the marginal line very close and project becomes more complex (Egbu and Robinson, 2005). In most construction industry knowledge management is pleasing as a crucial role for business rising in order to convert business awareness in to viable gain (Davenport *et al.*, 1997) thus, the core of the construction organization is moving from capital intensive to knowledge intensive (Chen and Xu, 2010). In the introduction of awareness economy, learning has been converted not only a tactical assets but also one of the main sources for organizational prevalence (Imran, 2014). KM in construction is about managing organizations knowledge resources to accomplish its organization objectives(Khosravi *et al.*, 2014).

Thus KM system in construction is seen as means of ascertaining and manipulating cooperate individual knowledge resources, personal skills, ideas learned and best practices (Kim *et al.*, 2013). Marra *et al.* (2012) agree that knowledge associated with passed project's achievement and failure, amenities, clients and products are assets that can produce a long-term and sustainable competitive advantage for construction organization. Companies can improve organizational wisdom through knowledge acquisition, creation, storing mingle together by transferring knowledge (Alekseev, 2010) workers and organizational knowledge will be enhanced in addition to more improvement and tactical inventions(Al-Gahtani and Ghani, 2010). KM is an effective way to advance competitive advantage, which encompass the organizational performance of project skill and duties at more affordable time with cost together with clients satisfaction other than entrants (An and Ahmad, 2010). Hence, the industry needs KM to gain modest advantages through the improvement of the invention, value, business performance and efficacy of project delivery, and maintaining of smooth relationships with associates, purveyors and owners (Kale and Karaman, 2012; Kanapeckiene *et al.*, 2010). The construction organization is fast growing; the industry faces many challenges of how to apply a effective KM method that provides the desired results and benefits. A effective KM operation necessitates a key modification in organizational values besides assurance at the stages of organization (Lindner and Wald, 2011). It has been argued that most encounters in execution of KM in the organization are intricacy of business, diversified workers nature; combative relationships that is inspire by the approach of contracting the project environment, non-occurrence environment attributing to waste of knowledge (Malhotra, 2000; Nelson and McCann, 2010).

The effort of KM implementation for many construction organizations even in the developed countries are caused not only by the intricate environment of KM methods, application of KM imaginations has often been unintended and casual (Ahmad and An, 2008; Carlucci *et al.*, 2004). During this research work in the construction organizations in Nigeria it showed that these organizations lack direction and policy to KM implementation, and a large percentage of them are not aware of KM implementation and little that knows leaders of knowledge have not been appointed or a lineup to device their KM program. However, during the

investigation the main barriers to implementing KM policies in Nigeria are working procedures, lack of time by staffs, organizational values, costs, worker conflict and meager information technology structure, specified record momentous barricade KM application in the Nigerian building organizations. Poor standard of work procedures, and lack of efficient policy for collecting and reusing skills learnt and best practices during construction projects. Though, no previous studies have attempted to develop or adopt any appropriate KM policy for the construction industry, organizational courage is required to face this challenge to achieve changes to compete with other counterpart in the world. This paper introduces a technique to enhance the participation of workers in the KM processes through implanting KM tasks and roles in the work processes and activities of staffs. A KM model has been developed in this research to represent the method, provide guidance for KM implementation, adoption, and help for KM and learning is understood.

2. Review of literature

Knowledge acquisition, creation, sharing, storing and re-using are the KM activities of this research group.

2.1 Knowledge acquisition

Acquisition of Knowledge is identify as a procedure of take out, configuring , establishing familiarity directed from a single area, habitually field expert ices are needed to transform it to a usable and movable documents (Chinowsky and Carrillo, 2007). Learning from outside sources by the organization is also referred to be knowledge acquisition. Outside learning are very crucial for organizational sustainability, thus a rounded approach for the assessment sequence include contractors, competitors, associates, businesses with outside (Hsu, 2008). The author further argue that during knowledge acquisition, environmental learning that are well-defined as well as bearing in mind professionals appointed, high performance of a project's risk of success will be greatly reduced.

2.2 Knowledge creation

The ability of workers to produce knowledge in an organization is a perilous to their success which has a major influence on project results and the organizational competitive benefit. Knowledge creation is conceived as the procedure for adapting the learning entrenched in organizational societies, through forecasting, infrastructures and problem solving, into a new form resulted from new combinations of experiences (Carrillo and Chinowsky, 2006) Knowledge creation necessitates active interface among workers to combine individuals existing unstated and categorical learning which advance current processes and discover new potentials (Berryman, 2005). Egbu and Robinson (2005) agrees that the main enticements for knowledge creation in the construction industry are the need to solve problems, modernize and manage changes. Nonaka and Takeuchi (1995) argued that learning is formed with the aid of incessant interfaces of embedded and plain knowledge to actualize four styles know as Socialization, Externalization, Internalization with Combination model, as Socialization, can be achieved when an contrive learn from skilled or senior project managers the know-how confidences of resolving organization problems in their businesses. Revolving the know-how

learning to clear information, and to permit it the engineer have to translate the tacit knowledge of the senior engineer into an explicit format that is easy to understand (tacit to explicit)is called externalization. Through combination, the explicit knowledge combined with other knowledge becomes available for other engineers (explicit to explicit). Finally, Internalization means that the explicit knowledge transformed into skills through reuse learning can be efficient, with novel experiences gained.

2.3 Knowledge sharing

Generally embedded learning are achieved during the organization jobs, a large volume of implied know-how is generated. Changes in construction projects such as the complexity of projects and construction expertise, the need of tacit knowledge sharing becomes vital, although, organizations are not prompt in effective collection and transferring the embedded learning (Carrillo and Chinowsky, 2006). It has then become very paramour for organizations to use the KM structure to incarcerate and accumulated learning in depositories, embedded learning are difficult to enact, therefore, it becomes vivid to transferred embedded learning in involving workers through social medias Skype, Facebook's, twitter, inbox etc(Forcada *et al.*, 2013). All these apparatuses aid to enable embedded learning transferred instead of packing them inside the storehouses. A successful KM system is expected to provide information about organizational workers experience, skills, qualification in order to influence the desire support in problem solving and decision making processes(Kamara *et al.*, 2003).

2.4 Knowledge storage

Knowledge from all undertaking jobs must be preserve accurately so as to be reused again when the need arises. Huysman and Wulf (2006) argues that IT plays a vital part if effective learning is to be managed. The whole learning preserved during jobs executions are keep within four core arrangements; personnel cognizance, daily dairies, electronic file with electrical learning base (Kazi, 2005). The author defined it as an way of, intangible, determined learning and document of files and dairies keep inside the organization. Major setback of accruing learning within the organizations is to be aware of which is highly needed to be kept and how it will be re-applicable in the future. Knowledge about strategy and products, customers , marketing are information's that can enhance organization performance and usable for storage (Alekseev, 2010).

2.5 Knowledge reuse

Knowledge reused is recognized with potential in deriving faster and more consistent decision, support, without respect to decision maker's skill in their domain. KM systems should provide the facility to easily search and find anticipated knowledge. KM systems should be made available to workers or people within the organization with a key-word admission process which recognizes the expert intent within staffs. At some certain level of expert, other users from within and outdoor organization agrees to contact and adopt KM system so as to back the organization relation to clients, traders and partners (Kanapeckiene, *et al.*, 2010). Knowledge absorbed by employees of the organization needs to be approved before making it effective and available for users of the KM structure. Knowledge added to

the KM system by employee needs to be evaluated, edited and modified in the formats that are accepted in the organization. All learning should be categorized so as to ease the process of accelerating learning incisive and recycling role.

3. Method of Data Collection

The method of data collection used in the study was achieved with the means of personal contact survey questionnaire. A stratified random sampling procedure was engaged to obtain the required sample size of the population of PM in the construction organization. A total of 500 questionnaires was administered, out of which 323 were return representing 63.4%, which is above the recommendation by (Krejcie and Morgan, 1970) for data collection concerning organization. Although, out of the total questionnaires return only 88% of it was used for analysis this is because the rest 12% was removed for wrong filling and incomplete respondents' information. From a descriptive statistics of the respondents PM, 21.5% are professional members of Nigerian Institute of Architectures (NIA), 30.5% are professional members council of registered engineers (COREC), 22% were professional members of Quantity surveyors (NIQS), 12.6%, 10.5% and 2.8% are in a National institution of estate surveyors and Valuers (NIEVS), National institute of building (NIOB) and other professional bodies respectively.

3.1 Methodology

Method of Structural equation model was adopted to test the manifestation of the knowledge management process from the hypothesized model. Multivariate analysis method for exploring causality in the models and the causal relations among the variables was used. Exploratory factor analysis, regression analysis, path analysis and confirmatory factor analysis were used. First, exploratory factor analysis showing factors using Kaiser-Meyer Okin measures with Bartlet test (KMO) was found to be significant for all the construct at <.001. Dimension reduction was adopted using the principle axis of factorization extraction to ascertain the loading coefficient of the items. All factors that loaded ≤3.99 were not considered for further analysis. Thus, confirmatory factor analysis was conducted for the rest 16 variables in order to achieve a reasonable model fit.

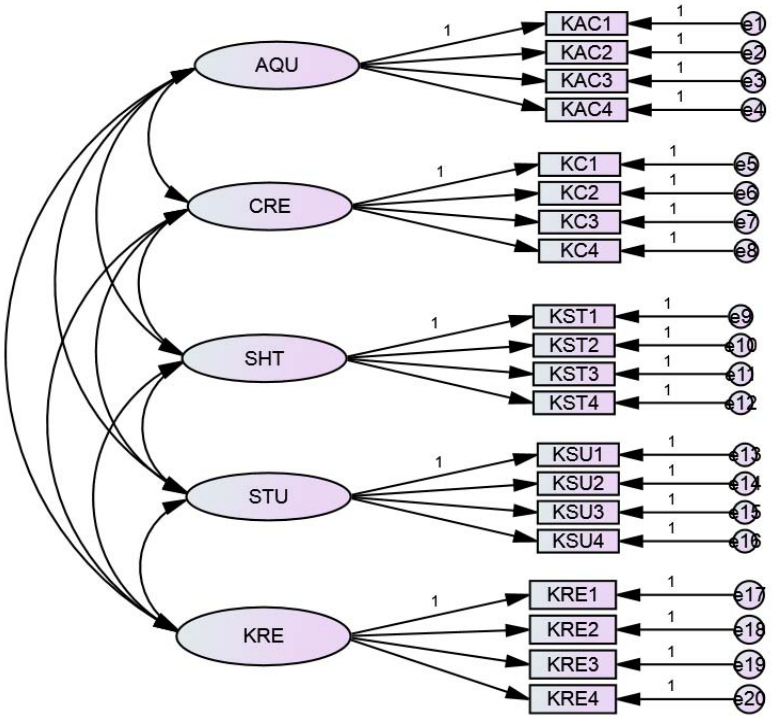

Figure 1. Hypothesized Model of the knowledge management process.

4. Data Analysis

In the data analysis process, data screening for missing values was done using outliers and normality. SPSS version 22 was used for analysis of the pattern of missing data which shows that only one variable have missing data and a mean substitution techniques was used to handle because it was a very small number of missing values (Awang, 2012; Byrne, 2013). However, in substitution of missing data through mean method skewness and kurtosis test with leaf plots were used to determine the normality of distribution. All the 16 variables lies between -606 and 0.05 of skewness and -963 and 0.15 for kurtosis which are within the range of an absolute value of ± 2 (for skewness) and ±7 (for kurtosis) recommended by many authors (Davčik, 2013; Hancock and Mueller, 2013; Hatcher and O'Rourke, 2014).Cronbach's alpha coefficient method was used for internal consistency of the data was assessed which shows that knowledge acquisition, creation , sharing and transfer, storing and disseminating with their reliability and Cronbach's Alpha coefficient of 0.80, 0.71, 0.82, 0.87 and 0.87 respectively. Thus, in considering the convergent validity, the analysis result signifies that all factor loadings for indicators measuring the same construct were statistically significant (Martens, 2005; Zhong and Yuan, 2011). The discriminant validity was evaluated based on recommendations by various researcher and all the factors are in accordance and significant (Crockett, 2012; Marcoulides and Schumacker, 2013).

4.1 Results

Re-specification of the model technique was conducted by examining the standardized residual values and modification indices. Two indicators were deleted, one indicator of knowledge sharing (KST1) and another indicator from knowledge storage (KSU 1). Amos (Analysis of Moment Structures) version 22.0 was used to test the model and the fit indices adjacent to the measurement model reveal the extent to which a parsimonious model was achieved. Each of the indicators loaded significantly on their respective hypothesized constructs loading of typically .5 or greater is recommended by (Awang, 2012; Byrne, 2013). Since the model acknowledges the data sufficiently then, no further modifications were required.

Table 1. Measurement of model

Construct	Indicators	Loadings of factors	Cronbach's Alpha	Average variance
Knowledge acquisition	KAC1 KAC2 KAC3 KAC4	0.81 0.78 0.84 Deleted	0.80	0.657
Knowledge creation	KC1 KC2 KC3 KC4	0.75 0.82 0.88 Deleted	0.71	0.669
Knowledge sharing	KST1 KST2 KST3 KST4	Deleted 0.87 0.88 Deleted	0.82	0.766
Knowledge storage	KSU1 KSU2 KSU3 KSU4	Deleted 0.81 0.89 0.83	0.87	0.712
Knowledge Reuse	KRE 1 KRE2 KRE3 KRE4	Deleted 0.93 0.86 0.85	0.86	0.776

Measurement of reliability and validity of the constructs used.

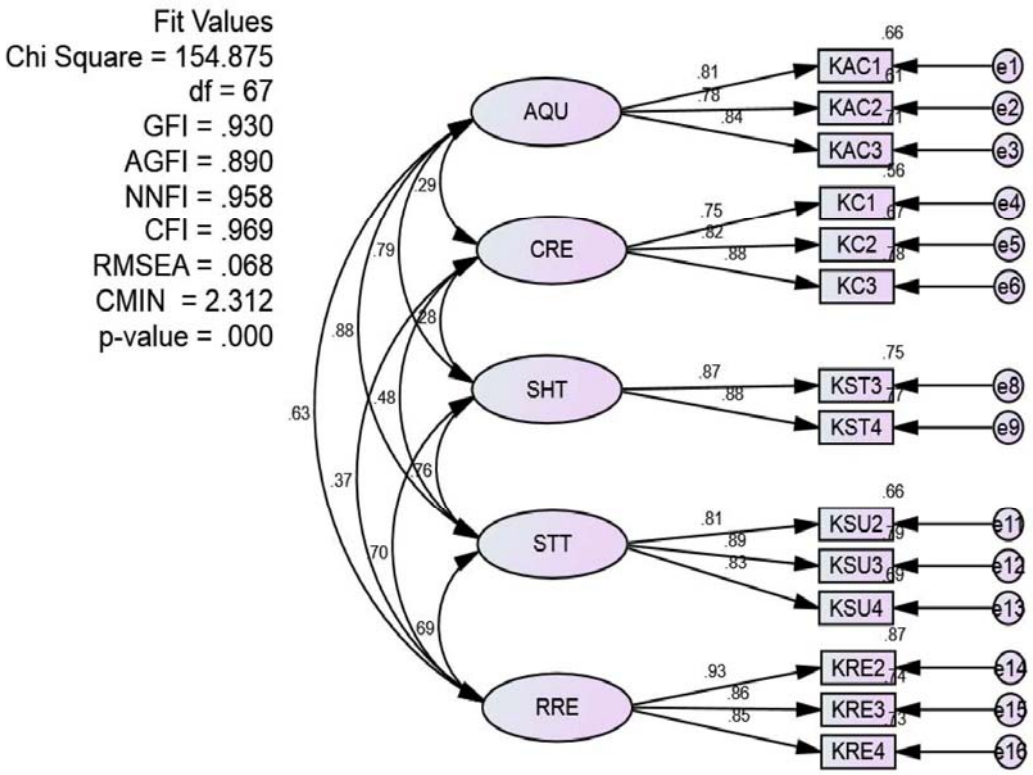

Figure 2. Confirmatory factor analysis of knowledge management model

The Model fit indices: Chi Square = 154.875, df = 67, GFI = .930, AGFI = .890, NNFI = .958, CFI = .969, RMSEA = .068, CMIN = 2.312, p-value = .001

In upright analysis and evaluation the outcome of the hypothesized effects, eight model fitting indices was used and presented in the figure. 2. The GFI, CFI, NNFI have values of .930, .969, .958 respectively meaning that the model fits the data since most researchers recommended a minimum threshold of > .80 < 1. Thus, Root mean square error of approximation (RMSEA) value of .068 is also below the maximum threshold of .08 (Bagozzi and Yi, 2012; Kenny, 2011). RMSEA mean that the model explains the observed data as expected.

4.2 Regression analysis

In order to predict the strength of the determinants in the phenomenon, regression analysis was done to support the convergent relationships between all constructs and variables. However, multivariate values are considered significant at <0.001.

Table 2. Standardized Regression Weights

		Standardized Beta Estimate	p-value
KAC1	<--- F1	.811	***
KAC2	<--- F1	.782	***
KAC3	<--- F1	.844	***
KC1	<--- F2	.750	***
KC2	<--- F2	.816	***
KC3	<--- F2	.884	***
KST3	<--- F3	.869	***
KST4	<--- F3	.879	***
KSU2	<--- F4	.813	***
KSU3	<--- F4	.891	***
KSU4	<--- F4	.828	***
KRE2	<--- F5	.931	***
KRE3	<--- F5	.859	***
KRE4	<--- F5	.853	***

Note; *** indicate a highly significant at <0.001

Thus, since all items are significant, one could conclude that the convergent validity is achieved.

4.3 Discussion

Knowledge management is presently attracting a considerable attention in the construction organization. In fact, most of the workers and engineering job in Nigeria Context lack courage in implementing while some lack experience to participate in the process of managing organizational knowledge. In developing country the study proposed and tested a model for knowledge management adoption. The model consisted of five dimensions, i.e, knowledge acquisition, creation, sharing & transfers, storing and reuse. Analyses show that virtually all the indicators reasonably measure acquisition except (KAC 4) whereas in creation (KC 4) did not measure it. Sharing of knowledge was measured by two indicators while (KSU 1) did not measure knowledge storage.

5. Conclusion.

The study main aim was to develop a KM model for application and adoption in the developing country context precisely Nigeria. Thus, the first of its kind in the Nigerian Context, the model displays a sensible degree of trustworthiness and legitimacy as evinced in the SEM statistical indices and can be prudently modified for application elsewhere. This developed and validated model can be adopted by many users and application for both researchers and managers in the construction organizations from developing countries. Managers can use the model as a guide for organizational changes and researchers can use the

model as a guide to further explore similar areas respectively. A frugal model was achieved, the model should not be protected from other confines, so various studies through data collection from different sources is needed to boost both the consistency and rationality of the model.

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