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A PRINCIPAL COMPONENT ANALYSIS OF KNOWLEDGE MANAGEMENT SUCCESS FACTORS IN CONSTRUCTION FIRMS IN NIGERIA

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ABSTRACT

Construction firms are knowledge-intensive organisations as employees use knowledge in their day to day activities; however, managing this knowledge is essential for improved service delivery. Knowledge Management (KM) has been affirmed to be of great benefit and improve the performance of organisations and particularly quantity surveying firms in Nigeria so, therefore, the need to assess the factors critical to the implementation of KM. Quantitative data was collected through the use of questionnaire from eighty-six quantity surveyors from quantity surveying firms in the southwestern geopolitical zone of Nigeria which comprises of six states using census sampling. Descriptive and inferential statistics were used to analyse the data collected, and the result discussed. Mean Item Score was used to rank the factors while data reduction technique was used to ascertain the factors critical to the implementation of KM. The Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity were conducted before the data were subjected to principal component analysis and the results indicated that the data set is suitable for factor analysis. Five constructs of CSF, namely; Organisation and Leadership, Resources, Management involvement, Information technology and culture were developed from the Principal Component Analysis (PCA) with a significant value ranging from 0.524 - 0.776. The reliability of each construct was tested using Cronbach Alpha coefficient, and the values arrived at are; 0.87, 0.885, 0.882, 0.903 and 0.749 respectively. The study revealed that the significance of KM critical success factors is well acknowledged by quantity surveyors in quantity surveying firms and the findings contributed to knowledge by introducing five factors critical to the success of KM. The study recommends that these factors should be given adequate attention for successful KM implementation in quantity surveying firms in Nigeria.

Keywords: Critical success factors, Knowledge management, Principal component analysis, Nigeria

1. INTRODUCTION

The construction industry, according to Hsu (2008), is a knowledge-intensive industry, because the industry uses the skills, knowledge and experience of individuals in its day to day activities. The construction industry has become more and more complex with challenges as a result of globalisation, internalisation of markets, liberalisation of trades, deregulation and knowledge economy (Hari, Egbu & Kumar, 2005). This knowledge-based economy requires that good practices are available in organisations to improve the effectiveness of the organisation (Omotayo, 2015). In facing these challenges, construction companies need to have appropriate strategies to stay relevant in the industry, and KM has been identified as one of such strategies. Organisations are, therefore, dependent on applying

KM along with natural resources and tangible assets to achieve high performance (Lee & Sukoco, 2007).

According to Omotayo (2015), organisations have stopped to compete entirely on capital and financial strength but now compete based on the knowledge possessed by the organisation as knowledge has become the new competitive advantage in business (Okunoye, 2003). As such, knowledge ought to be protected, nurtured and shared among the people who work together within the organisation. Knowledge is considered the most valuable and precious asset of organisations (Sharif, Yaqub, Khan & Javed, 2014; Idris & Kolawole, 2016) and its benefits in quantity surveying firms in Nigeria has been affirmed (Awodele et al., 2015). The growing role of knowledge has made organisations move from other management practices to KM (Okunoye, 2003; Cho & Korte, 2014). This has lead Durst and Edvardsson (2012) to recommend that small organisations such as quantity surveying firms have to include KM to their daily activities so that they can stay stronger and perform better.

Studies have established that KM has been embraced in the Nigerian construction industry (Oke, Ogunsemi & Adeeko, 2013, Zuofa, et al., 2015; Idris & Kolawole, 2016; Idris, Bhadmus & Kadri, 2017) as well as in quantity surveying firms (Adegbembo, et al., 2015; Awodele, Adegbembo & Ajayi, 2015). Previous research on KM within Nigeria mainly addressed KM awareness, perception of benefits, challenges (Oke et al., 2013; Adegbembo et al., 2015; Awodele et al., 2015; Zuofa et al., 2015; Idris et al., 2017). Idris and Kolawole (2016), on the other hand, assessed the influence of KM success factors on organisational performance of construction firms with the focus on project managers in the construction industry. However, KM is still a new and evolving practice for the construction industries in developing countries like Nigeria (Idris, Ali & Aliagha, 2015).

While a considerable number of studies have identified success factors critical to the success of KM implementation, no known study has been conducted among quantity surveyors in the southwestern region of Nigeria using the principal component method. Due to the nature and scope of quantity surveying firms and using Principal Component Analysis (PCA), this study seeks to reveal the key success factors of KM with the focus on quantity surveying firms in Nigeria.

2. CRITICAL SUCCESS FACTORS OF KOWNLEDG MANAGEMENT

According to Idris and Kolawole (2016), Critical Success Factors (CSF) are the processes, activities and techniques that need to be considered for the successful implementation of KM in an organisation. These processes and techniques need to be developed in an organisation for KM to work successfully. Implementing KM is crucial so organisations need to be aware of the factors which will influence the success of KM initiative. The ignorance or oversight of these factors may hinder an organisation's effort in achieving the full benefit of KM (Wong, 2005). KM success factors can be seen as facilitating factors for a KM initiative and measurement of KM can be used as one of the means of providing an understanding of how it should be developed and implemented (Jennex & Olfman, 2004).

A series of researches on the CSF's inherent in KM has been carried out (Skyrme & Amidon, 1997; Egbu et al., 2010; Abdelrahman & Papmichail, 2016). Anantatmula and Kanungo (2007), established fourteen factors important in determining the success of a KM project. These factors are leadership, top management support, culture, strategic focus, budgetary support, communication, formalisation, collaboration, content quality, KM processes, top management involvement, technology infrastructure and measurement of results. Dalotă and Grigore (2010), on the other hand, had a deep look at the critical factors that play major roles in implementing a KM system in a small to medium-sized enterprise. These factors include leadership and support, processes and activities, motivational aids, resources, culture, information technology, strategy and purpose, measurement, organisational infrastructure, training and education, and human resource management. The

top three factors from the findings of the research are senior management support and leadership, a knowledge friendly culture, and a clear strategy for managing knowledge while developing technological infrastructure, giving incentives to encourage KM practices and measuring the effectiveness of KM was the least.

Concurrently, Yu, Kim and Kim (2004), identified three main factor dimensions and nine factors. These are Organisational characteristics which consist of learning orientation, communication, knowledge sharing, flexibility; IT comprising of KM system quality, KM system functionality and thirdly managerial support consisting of top management support, KM reward and KM team activity. Wong (2005) outlined eleven critical factors that affect KM initiatives, which are top management support, organisational culture, information technology, organisational strategy in relation to resource and capabilities utilisation, organisational infrastructure, KM processes and activities, financial support, employee training and education, employee motivation, practices of human resource management. It was further stated that these practices would either need to be nurtured if they already existed or be developed if they were not yet in place. Akhavan, Hosnavi and Sanjaghi (2009), identified five critical factors of KM, which are KM architecture and readiness, human resource management, benchmarking, and chief knowledge officer. Heisig (2009), examined 119 studies on CSF and harmonised the different CSF identified from these studies. The identified CSFs were classified into four main factors which are Human factor which is composed of culture, people and leadership; Organisation which is mainly structures and processes; Information technology and management processes which comprise of strategy and control.

Sedighi and Zand (2012), however in their research described KM critical components in a broader context. They identified these critical components from two categories. These are; the external factors which are also known as environmental factors which play an important role in implementing KM while and internal factors, also called organisational factors, were identified as crucial in developing KM systems. They developed a conceptual classification model of KM CSF. Yong and Mustaffa (2013) similarly noted that CSFs of KM should include both factors organisations have control over and those factors beyond the control of organisations. In more recent studies on construction infrastructure, Wang et al. (2014) described 11 factors important to the success of KM as culture, leadership and support, human resource management, training and education, organisational infrastructure, KM processes, motivational aids, resources, strategy, information technology and measurement. Similarly, in the Nigerian construction industry, Idris and Kolawole (2016) identified leadership, strategy, organisational infrastructure, culture, information technology, processes and activities, education and training and KM resources.

According to Heisig (2009), for successful and sustainable KM, the influence of the following key areas is important; organisation and roles, culture, Strategy and leadership, controlling and measuring, skill and motivation and information technology. Table 1 below shows a summary of CSF's identified by various authors.

Table 1: Summary of Success Factors of KM

S/N	Success Factors	Skyrmr & Amidon (1997)	Davenport et al. (1998)	Halsapple&Joshi(2000)	Gold et al (2001)	McDemott & O'Dell (2001)	Okunoye & Karsten (2002)	Jennex & Olfam (2004)	Chong & Choi (2005)	Wong (2005)	Wong & Aspinwall (2005)	Koh et al. (2005)	Hariharan (2005)	Akhavan and Jafari (2006)	Akhavan et al. (2006)	Chong (2006)	Liebowitz (2006)	Anantatmula & Kanungo (2007)	Gao et al. (2008)	Akhavan et al. (2009)	Valmohammadi (2010b)	Dalota & Grigore (2010)	Oluikpe (2012)	Seidighi & Zand (2012)	Wang et al. (2014)	Idris & Kolawole (2016)	Kunthi et al. (2017)
1	Organisational Strategy	√	√	-	-	-	-	-	-	√	√	-	-	-	-	-	√	-	√	-	√	√	√	√	√	√	-
2	Leadership	√	-	√	-	-	√	√	-	-	√	√	-	-	-	-	-	√	-	-	√	√	-	√	√	√	-
3	Top management support	√	√	-	-	-	-	-	-	√	√	√	√	-	√	-	√	√	-	-	√	√	-	-	-	-	√
4	Organisational Culture		√	-	√	√	√	-	-	√	√	-	√	-	√	-	√	√	-	-	√	√	-	√	√	-	√
5	Budgetary support	-	-	-	-	-	-	-	-	-	-	√	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-
6	Communication	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-
7	Formalization	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-
8	Collaboration	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-
9	KM processes/Activities	√	√	√	-	-	-	-	-	√	√	-	√	-	√	-	-	√	-	-	√	√	-	√	√	√	-
10	Technology infrastructure/ Ontology	-	√	-	√	√	√	√	-	√	√	√	√	-	-	-	√	√	-	-	√	-	-	√	-	-	-
11	Measurement of Result	√	-	√	-	-	√	-	-	√	√	√	√	-	-	-	-	√	-	-	√	√	-	-	√	√	-
12	Motivational aid	-	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	-	√	-	-	√	-	-
13	Resources	-	-	√	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	√	√	-	-	√	-	-
14	Training & Education	-	-	-	-	-	-	-	-	√	√	-	-	-	√	-	-	-	-	-	√	√	-	-	√	√	-
15	Organisational Infrastructure	-	√	-	√	√	-	-	-	√	-	-	-	-	-	-	√	-	-	-	√	√	-	-	√	√	- -
16	Human Resource	-	-	-	-	-	-	-	-	√	√	-	-	-	-	-	-	-	-	√	√	√	-	√	√	√	√
17	knowledge officers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	-	-	√	-	-	-	-	-	-	-
18	Information Technology	√	-	-	-	-	-	-	-	√	√	-	-	-	-	-	-	-	-	√	-	-	-	-	√	√	√
19	Reward/Incentive	-	√	-	-	-	-	-	-	√	√	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-
20	Organisational Structure	-	-	-	√	√	-	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	√	-	-	√
21	Transparency	-	-	-	-	-	-	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	-	-
22	Trust	-	-	-	-	-	-	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	-	-
23	Pilot	-	-	-	-	-	-	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	-	-
24	Benchmarking	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	√	-	-	-	-	-	-
25	KM architecture & readiness	-	-	-	-	-	-	-	-	-	-	-	-	-	√	-	-	-	-	√	-	-	-	-	-	-	-
26	Financial Resources/support	-	-	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	-	-	√	-	-	-
27	KM Strategic focus	-	-	-	-	-	√	-	-	-	-	√	√	-	-	-	-	√	-	-	-	-	-	-	-	-	-
28	Content quality	-	-	-	-	-	-	-	-	-	-	-	√	-	-	-	-	√	-	-	-	-	-	-	-	-	-
29	Top management involvement	-	-	-	-	-	-	-	-	-	-	√	√	-	-	√	-	√	-	-	-	-	-	-	-	-	-
30	Employee involvement	-	-	-	-	-	-	-	√	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	-
31	Teamwork	-	-	-	-	-	-	-	√	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	-
32	Employee empowerment	-	-	-	-	-	-	-	√	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	-
33	Information System Infrastructure	-	-	-	-	-	-	-	√	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	-
34	Knowledge Structure	-	-	-	-	-	-	-	√	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	-

3. METHODOLOGY

The study is limited to quantity surveying firms in the southwestern geopolitical zone of Nigeria which comprises of six states in the country. The choice of this region is due to the high number of QS firms in the region as the region accounts for one-third of the total number of quantity surveying firms in Nigeria. One hundred and thirty-four QS firms were identified in the six states, the source of which is from the various state chapters of the Nigerian Institute of Quantity Surveying. Questionnaires were distributed to quantity surveyors both electronically via google form and personally. The questionnaire was designed having two sections. The first section was to obtain background information of both the firm and respondent, while the second section was to assess the identified CSF. Respondents were asked to rate the level of significance of the identified success factors on a 5- Likert scale where 5 represents Very High, 4 High, 3 Average, 2 Low and 1 represents Very low.

The Cronbach's Alpha test was conducted to measure the internal consistency and reliability of the measuring instrument, and a value of 0.945 was obtained. This result is greater than the 0.70 thresholds for adequacy as asserted by (Field, 2009), so, therefore, the data gathered, and result achieved should be reliable and of good quality. The data collected were analysed using the mean item score and the PCA using the International Business Machines Statistical Package for Social Sciences (IBM SPSS) version 23 to identify the inherent success factors. PCA was used in data reduction and summarisation to identify a smaller number of the CSF that explains most of the variance that is observed. It attempts to identify variables (factors) that explain the pattern of correlations within a set of observed variables. The strength of the intercorrelations was first checked among the items. Tabachnick and Fidell (2007) recommended that the correlation matrix should have coefficients greater than 0.3. the result showed a lot of items had above 0.3 coefficient. If a few correlations above this level are found, factor analysis may not be appropriate. The adequacy of the survey data was then examined by conducting the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of specificity (Aghimien et al., 2018; Zhang, 2005). This represents the ratio of the squared correlation between variables to the squared partial correlation between variables. A KMO value close to 1 indicates that the patterns of correlations are relatively compact, and so factor analysis should yield a distinct and reliable result. A recommended satisfactory value for KMO, which makes factor analysis suitable is a value greater than 0.50, while Bartlett's test indicates the significance and is suitable when value is less than 0.05 (Field, 2005). The principal component method was employed to extract the factors, and varimax rotation was used to rotate the factor loading so that the factors are close to one to facilitate interpretation. The PCA clustered related CSFs of KM into groups.

4.0 RESULT

4.1 Firm and Respondents Profile

A total of 64% response rate was achieved from the 134 questionnaire distributed. From the background information, 45% of the firms surveyed had over 11 years of experience, with 39% of the firms being partnership while about 58% have more than one branches. For the profile of respondents, on the other hand, 90.7% of the respondents had a minimum of Bachelor's degree while 67.44% had practised for over five years with 62.79% being corporate members of the NIQS. This implied that most respondents had a good level of knowledge and experience which must have guided their responses.

4.2 Assessing the Critical Success Factors of Knowledge Management

Using the mean item score to rank the factors, the result is presented in Table 2. From table 2, communication, top management support and top management involvement were ranked highest as success factors to the implementation of KM while the availability of knowledge

officer, benchmarking performance and pilot (testing KM) ranked least. All 29 identified success factors had a mean above the 3-point threshold as recommended by (Kothari, 2009) and so are deemed statistically significant.

Table 2: CSF's of KM

Success Factors	Mean	SD	Rank
Communication	4.50	0.628	1
Top management support	4.45	0.663	2
Top management involvement	4.43	0.585	3
Teamwork among employee	4.41	0.692	4
Organisational Strategy focus on Knowledge Management	4.34	0.696	5
KM Strategic focus	4.31	0.740	6
Leadership	4.29	0.734	7
Knowledge Structure	4.27	0.758	8
Level of Employee involvement	4.27	0.773	8
Information Technology	4.23	0.714	10
Organisational Structure	4.21	0.856	11
Trust	4.21	0.799	11
Quality of Knowledge content	4.20	0.838	13
Collaboration	4.19	0.759	14
Organisational Culture	4.17	0.754	15
Presence of KM processes/Activities	4.17	0.870	15
Information System Infrastructure	4.17	0.897	15
Reward/Incentives for knowledge sharing	4.16	0.866	18
Regular Training & Education	4.15	0.976	19
Formalization	4.14	0.769	20
Financial resources/Budgetary support	4.13	0.905	21
Level of Employee empowerment	4.13	0.905	21
Transparency in sharing knowledge	4.12	0.788	23
General readiness/Resources	4.09	0.916	24
Availability of Technology infrastructure/ Ontology	4.08	0.961	25
Effective Human Resource Management	4.08	0.985	25
Availability of knowledge officers	4.05	0.866	27
Benchmarking performance/measuring result	4.00	1.052	28
Pilot (Test/Sample KM)	3.93	0.905	29

4.3 Principal Component Analysis of CSF's

Principal components analysis was carried out on the CSFs of KM and the Kaiser-Meyer-Olkin (KMO) value is 0.848, while the Bartlett's test of sphericity is significant (p=0.000) making the data set suitable for factor analysis. This is as shown in table 3.

Table 3: KMO and Bartlett's Test of CSF

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.848
Bartlett's Test of Sphericity	Approx. Chi-Square	2620.659
	df	406
	Sig.	0.000

SPSS automatically carried out a component matrix for all components with eigenvalues greater than one and all factors below one were not considered. It was decided to retain all

five components meeting the Kaiser criterion. The result of the analysis in Table 4 showed that the first five components had initial eigenvalues greater than one. The five factors explained 75.65% of the variance being 55.40, 6.05, 5.41, 4.67 and 4.11, respectively. The total percentage explained is more than the cumulative proportion of variance criterion recommended by Dogbegah et al. (2011), which affirms that extracted components should be at least 50% of the variance. So, therefore, the five components can be significantly used to represent the data.

Table 4: Total variance explained

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Comp.	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	16.066	55.400	55.400	5.406	18.642	18.642
2	1.754	6.048	61.448	4.873	16.805	35.448
3	1.572	5.419	66.867	4.584	15.808	51.255
4	1.354	4.669	71.537	4.325	14.913	66.168
5	1.191	4.108	75.645	2.748	9.477	75.645

Pallant (2011) suggested that a look at the scree plot is necessary in order to determine the components to retain. Figure 1 shows the scree plot for the CSF. From the scree plot, an elbow in the shape of the plot can be seen, and only components above this point are retained. It can be seen that there is a distinct flattening out from the sixth component downwards. The scree plot in figure 1 gives further evidence that all items with an Eigenvalue less than one can be excluded.

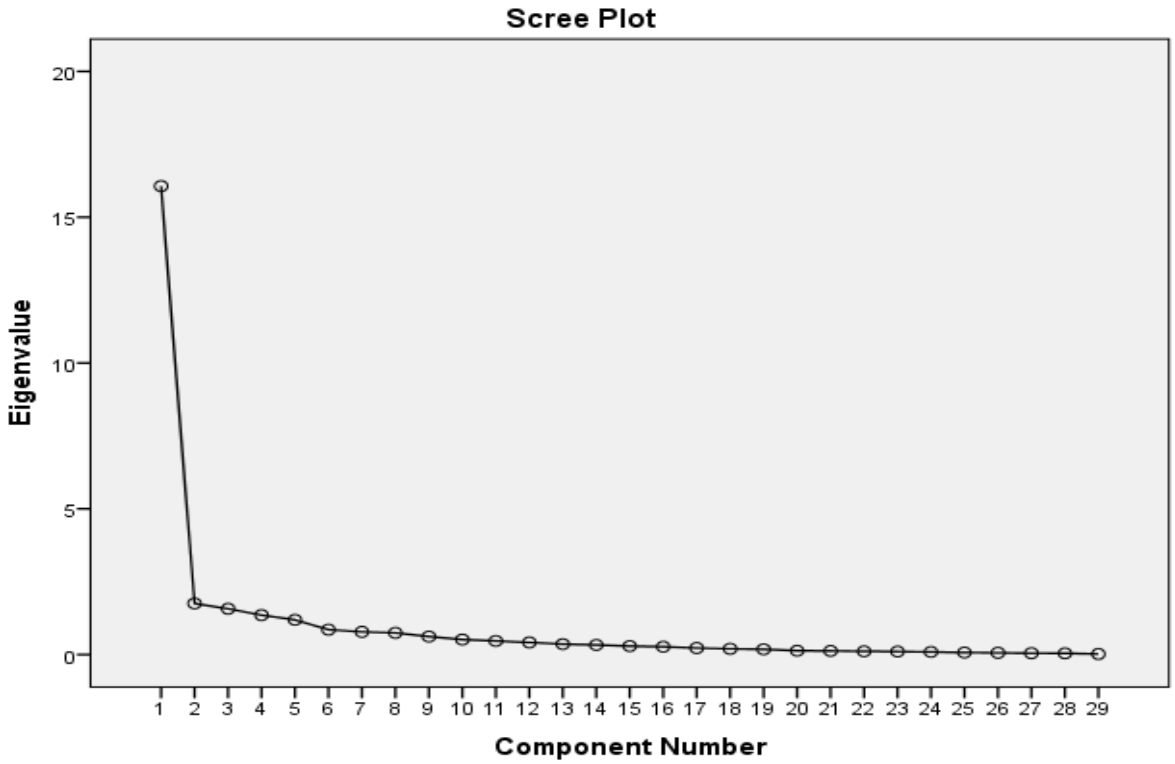

Figure 1. Scree Plot for CSF's

Table 5: Factor Loading of the CSF's of KM

	Critical Success Factors	Factor Loading	Alpha Value
	LEADERSHIP & STRUCTURE		**0.870**
CSF28	Information System Infrastructure	0.764	
CSF25	Level of Employee involvement	0.715	
CSF15	Availability of knowledge officers	0.687	
CSF29	Knowledge Structure	0.663	
CSF24	KM Strategic focus	0.645	
CSF19	Trust	0.613	
CSF2	Leadership	0.587	
CSF26	Teamwork among employee	0.573	
CSF27	Level of Employee empowerment	0.568	
	RESOURCES		**0.885**
CSF12	Organisational Structure	0.765	
CSF14	Financial resources/Budgetary support	0.694	
CSF3	Top management support	0.668	
CSF13	Effective Human Resource Management	0.667	
CSF1	Organisational Strategy focus on KM	0.594	
	MANAGEMENT INVOLVEMENT		**0.882**
CSF6	Formalisation	0.776	
CSF20	Pilot (Test/Sample KM)	0.690	
CSF22	Quality of Knowledge content	0.675	
CSF7	Collaboration	0.606	
CSF18	Transparency in sharing knowledge	0.618	
CSF23	Top management involvement	0.528	
CSF21	Benchmarking performance/measuring result	0.524	
	INFORMATION TECHNOLOGY		**0.903**
CSF8	Presence of KM processes/Activities	0.756	
CSF5	Communication	0.675	
CSF9	Availability of Technology infrastructure/ Ontology	0.615	
CSF10	General readiness/Resources	0.611	
CSF16	Information Technology	0.585	
CSF11	Regular Training & Education	0.526	
	CULTURE		**0.749**
CSF4	Organisational Culture	0.746	
CSF17	Reward/Incentives for knowledge sharing	0.528	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalisation.
a Rotation converged in 13 iterations.

The results of the factor analysis for the success factors shows that the 29 items resulted in 5 components which have been named as; Leadership & Structure, Resources, Management involvement, Information Technology and Culture.

Component 1 – Leadership and Structure

The first component named leadership and structure is the first of the components extracted, and it explained 55.4% of the observed total variance of 75.65%. This is higher than the total variance explained by all other eleven components implying that the factors loading on this component are critical. It contains nine factors that loaded as; leadership with a significance of 0.587, availability of knowledge officers 0.687, trust with a significance of 0.613; KM strategic focus 0.645; level of employee involvement with the sig. 0.715; teamwork among employee with the significance of 0.573; the level of employee empowerment with

significance of 0.568; information system infrastructure 0.764 and knowledge structure with the sig. 0.663, as shown in Table 5. All the nine items in the component had a loading above 0.5 significance value.

Component 2 – Structure and Resources

The second component is named structure and resources with 6.05% total variance explained and comprised of five variables. These items with their factor loadings are organisational strategy focus on KM (0.594), management support (0.668), organisational structure (0.765), effective human resource management (0.667) and financial/budgetary support (0.694). The component had a Cronbach alpha value of 0.885.

Component 3 - Management Involvement

The third component accounted for 5.42% of the variance explained and given the name Management involvement. A total of seven variables were grouped under this component and are highly correlated as; Formalization (0.776), Collaboration (0.606), Transparency of sharing knowledge (0.618), Pilot (0.690), Benchmarking/measuring KM result (0.524), quality of knowledge content (0.675) and Top management involvement (0.528). These components had a reliability value of 0.882.

Component 4 - Information Technology

Information technology is named as the fourth component with six variables explaining 4.66% of the variance and a corresponding reliability score of 0.903. These variables are highly correlated, and they include communication (0.675), presence of KM processes/activities (0.756), availability of technology (0.615), general readiness (0.611), regular training and education (0.526) and information technology (0.585).

Component 5 – Culture

The last component loaded only two factors, namely organisational culture (0.746) and reward/incentive for knowledge sharing (0.528), and accounts for 4.108% of the total variance with the reliability of 0.746. These factors were subsequently named culture.

5. DISCUSSION

The CSF's for the implementation of KM in quantity surveying firms was assessed, and communication, top management support and top management involvement were ranked highest as success factors to the implementation of KM while the availability of knowledge officer, benchmarking performance and pilot (testing KM) ranked least. All identified success factors had a mean above the 3-point threshold as recommended by (Kothari, 2009) and so are all deemed statistically significant. The result of the findings is in tandem with Ekung and Okonkwo (2015), who asserted that communication and leadership are the suggested knowledge areas where the future of the quantity surveying profession can be built on. Similarly, Chhim, Somers and Chinnam (2017) concluded in their study that without top-level leadership support, the necessary practices to develop, implement and continually support KM and especially repositories would not be well established. Drew (1997) asserted from his findings that benchmarking was one of the best tools for promoting organisational performance is in disagreement with this study as quantity surveyor rated it as the least. However, it was concluded that benchmarking may not be equally desirable or effective for all types of firms.

From the factor reduction carried out, five factors emerged and are discussed. The first component being leadership and structure had the highest variance explained by all factors, having explained 55.4% of the total variance of 75.65%. This implies that all factors in the component are critical to the successful implementation of KM. Factors in this component are; Leadership, availability of knowledge officers, trust, KM strategic focus, level of employee involvement, teamwork among employee, level of employee empowerment, information system infrastructure and knowledge structure. This is in line with Pasha and Pasha (2012) assertion that leadership is critical in creating organisational mission, vision

and objectives as well as its KM strategies. Availability of knowledge officers which has been found to be important to the success of KM in this study is in agreement with Jassen (2011), noted in its study that it is necessary to define different roles and positions in organisations to help better KM in organisations and this can be better done by having knowledge officers who handle all KM related matters within the organisation. This is also the position of Akhavan et al. (2009); however, Adegbembo et al. (2015) found that quantity surveying firms in Nigeria do not have specific unit nor specific staff responsible for KM and its needs.

The second component of the factor analysis, named Resources produced five factors grouped together. These factors are; organisational strategy focus on KM, top management support, organisational structure, effective human resource management and financial resources. Organisational strategy focus on KM as described by Jennex (2017), deals majorly with aligning KM initiative with organisations competitive strategy as well as identifying knowledge users, knowledge needed, KM metrics and incentives that are needed to ensure the use of knowledge. Aligning with Kunthi et al. (2017), Abbaszadeh (2010), top management support is one of the most influential factors in determining the success of KM. Adegbembo (2014), however, found that the support of top management is essential in overcoming the challenges of KM in QSF in Nigeria.

Management involvement factors which grouped together are formalisation, collaboration, pilot testing KM, benchmarking performance, quality of knowledge content and top management involvement. Management can act as mentors to its employees by demonstrating and practising KM activities within the organisation (Pasha & Pasha, 2012). Involvement implies that management practice what they preach, and since it is leadership by example, the employee tends to do as they are mentored to do and by what they see the top management does.

The six extracted factors for Information Technology component are communication, presence of KM processes, availability of technology infrastructure, general readiness, training and education and information technology. Information technology aids communication, KM activities as well as training and education within organisations. The information technology system is noted to have a positive impact on knowledge sharing, knowledge application (Choi et al., 2010) and knowledge creation (Lee et al., 2012). The use of IT, according to Khan & Vorley (2017), has greatly changed KM practice and raised its quality.

Culture as a component comprises of organisational culture and reward/incentive for knowledge sharing. Culture according to Davenport et al. (1998); Lee and Choi (2003) is probably the most influential factor for the successful practice of KM also Egbu (2004) noted that cultural change is required to aid the total effect of KM. These are in agreement with the study, but from Awodele et al. (2015), QSFs in Nigeria do not acknowledge that the culture of an organisation may be a challenge to successful KM practices

6. CONCLUSION AND RECOMMENDATIONS

Quantity surveyors have acknowledged the significance of all identified CSF's for the implementation of KM in quantity surveying firms, but communication and top management support and involvement were the most significant to quantity surveyors. A good leadership and structure, management involvement, availability of resources, information technology and culture are the most critical factors in the implementation of KM. From the findings and conclusions emanated from this study, it is recommended that quantity surveying firms should continue to recognise the importance of good leadership and structure, making resources available, the involvement of management, information technology and culture in developing successful KM practices.

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