Performance of Quantity Surveying Firms Using the Strategic Learning Assessment Map (Slam) Framework

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Organizational learning is of vital importance to business organisations, due to its positive relationship with business performance. Because the performance of quantity surveying firms influences the outcome of construction projects, learning within the organization is essential. The purpose of the study is to assess the performance of quantity surveying firms using Strategic Learning Assessment Map (SLAM) framework. Using the SLAM framework, five constructs of organizational learning were examined and compared with performance measures. Cross-sectional survey approach was used for the administration of questionnaires to quantity surveyors who are employees in quantity surveying firms. The SLAM model was used to examine the knowledge stock-learning-flow-performance (KS-LF-P) in quantity surveying firms. Exploratory factor analysis, correlation analysis and multiple regression analysis were then used to test the SLAM model. The findings indicate that there is a strong positive relationship between knowledge stocks, learning flows and the performance of quantity surveying firms; and the feed forward learning flow influence the level of individual performance in the organization. The findings demonstrate that facilitating learning at organizational level is valuable for improving performance.

Keywords: Knowledge stocks, learning flows, organizational performance, quantity surveying firms, SLAM framework.

INTRODUCTION

The construction sector plays a major role in the economic development process of any nation. This assertion has been reverberated in several studies investigating the linkage between the construction sector and the economy (Chiang, Tao & Wong, 2015; Rameezdeen & Ramachandra, 2008). Despite the importance of this sector, several scholars have continuously investigated and proposed new techniques or approaches meant to improve project performance. Last planner system is a good illustration of such techniques (see Hamzeh, Zankoul & Rouhana, 2015; Priven & Sacks, 2016). Thus far, previous studies have identified shortage of materials and resources, unavailability of experienced and qualified personnel, poor quality of materials and equipment, owner competence and climatic condition among others as factors affecting the performance of construction projects (Aje, Odusami & Ogunsemi, 2009; Bagaya & Song, 2016; Santoso & Soeng, 2016). A critical look at factors influencing performance of construction projects reveal that human-related factors (such as unavailability of experienced and qualified personnel, contractor management capability, etc.) can be addressed by the construction professionals (Chan, Scott & Chan, 2004; Sweis, Bisharat, Bisharat & Sweis, 2014). In contrast, factors such as finance might not be within the construction professional's control (Antón, Rodríguez & López, 2011). To improve project outcome, there is a need to holistically address the identified factors. However, the present study focuses on addressing human-related factors. Thus, it is suggested that improving the skill sets of construction professionals through the learning of 'best' practices could lead to improved project outcome. Knowledge acquired by individuals, through learning and experience, would result in improvements in project performance and sustain the growth of the construction sector. The term 'learning' refers to a social phenomenon which occurs within a social context in an individual and leads to knowledge creation (Akinci & Sadler-Smith, 2018; Jarvis, 1987; Klinge, 2015). The process of executing tasks results in changes in behaviour and cognition at individual, group or organizational level and this has an impact on the effectiveness of organizational learning (Matsuo, 2005). This form of learning is termed internal

organizational learning. According to Siebenhüner (2005), internal organizational learning process can be viewed as "changes in the internal cognitions, norms and rules of an organization building on reflections by individual members of an organization". Recent evidence suggests that organisation learning is positively related to project outcomes and organisational performance (Lee & Lee 2014; Wu & Fang, 2010). The outcome of the learning process results in intellectual capital development supports growth and generates innovation (Dulaimi & Ang, 2009). In an increasingly dynamic business environment, there is a need to develop and harness existing information and knowledge learnt at organizational level. This results in a competitive advantage and improved performance.

Studies investigating organizational learning have gained prominence over the years (Dereli, Durmuşoğlu, Delibaş & Avlanmaz, 2011; Durst & Runar Edvardsson, 2012). Similarly, there has been an increasing focus on organizational learning and knowledge management in construction management research. However, a large majority of organizational learning studies in construction management are targeted at contracting organizations (Shokri-Ghasabeh & Chileshe, 2014; Walker & Johannes, 2001). In contrast, organizational learning in consulting companies within the construction industry has received less attention. Thus, the present study reports the findings of a quantitative study which assesses the aspects of organizational learning and performance in quantity surveying firms using the Strategic Learning Assessment Map (SLAM) framework.

First, a background to the research section presents a review of previous studies on organizational learning, performance and SLAM framework. The underlying science behind the choice of research approach is discussed in the methodology section. In the research method section, the procedure and sampling techniques used in this study are described. Fifty-five quantity surveyors responded to the questions relating to organizational learning and related practices. In the discussion section, the results of the present study are discussed in relation to similar studies found in literature. Finally, the inferences drawn from the findings of the study are highlighted in the conclusion section. Also, the significances of findings, limitations of the study and area for further studies are presented.

Organizational Learning

Organizational learning is an established field of study in social sciences. However, it is imperative to note that the term 'organizational learning' has been operationalized in different ways. This is largely due to the lens or academic discipline of the concerned scholar. From the definitions in Table 1, the common theme that emerges from these definitions reveal that organizational learning is a dynamic process of transforming information into knowledge. This enables business organizations to develop their intellectual capital, which provides the engine for growth, the power to manage change and help to generate innovations (Dulaimi & Ang, 2009). Hence, it is reasonable to suggest that the ability of quantity surveying firms to learn and constantly improve operational process is vital to improving financial performance and increasing its market share in the construction industry

Table 1: Definitions of organizational learning

Author(s)	Definition
Chauhan and Bontis (1994)	Organizational learning is a dynamic process that occurs through different levels and dimensions within the organization.
Argyris (1996)	Organizational learning emerges when organizations acquire information (knowledge, understandings, know-how, techniques and procedures) of any kind by any means.
Senge (1999)	Organizational learning is a continuous testing of experience and its transformation into knowledge available to the whole organization and relevant to their mission.
Huysman (2000)	Organizational learning is the process through which an organization constructs knowledge or reconstructs existing knowledge.
Garcia and Vano (2002)	Organizational learning can be understood as a collective phenomenon in which new knowledge is acquired by the members of an organization with the aim of settling, as well as developing, the core competences in the firm, taking individual learning as the basic starting point.
Van der Heijden (2004)	Organizational learning is a process of exploring new knowledge resources and internalizing employees' experiences into the organization.
Lopez et al. (2005)	Organizational learning can be defined as a dynamic process of creation, acquisition, and integration of knowledge aimed at the development of resources and capabilities that contribute to better organizational performance.
Panayides (2007)	Organizational learning refers to the organization-wide activity of creating and using knowledge to enhance competitive advantage.
Bustinza et al. (2010)	Organizational learning is a dynamic process which enables the firm to adapt to changing environments, so making it easier for it to change established behaviour patterns and routines.

Performance

The concept 'performance' is a multidimensional concept which has been measured using different variables in several studies (De Menezes & Kelliher, 2011; Shaw, 2011). Even though the concept of 'performance' has achieved prominence amongst interested parties, considerable variance still exists in relation to how the term is conceptualized or measured (Venkatraman & Prescott, 1990). Waggoner, Neely and Kennerley (1999) acknowledges that the index for measuring organizational performance has evolved over long period of time. A review of the indicators of organizational performance reveals that a wide range of variables (such as personnel cost, sales growth, return on equity, customer service quality, labour hours per ton, accident rate, etc.) have been used as metrics for assessment (Shaw, 2011). Based on Shaw (2011), it is reasonable to suggest a few trends that emerged from literature on assessment of organizational performance namely: (1) a shift away from financial to non-financial metrics; (2) expanding the focus from owners of the business to other stakeholder groups (e.g. customer satisfaction); (3) the use of indicators that capture present performance rather than past performance (e.g. customer waiting time); and (4) the use of indicators that are not considered confidential, especially for private-owned firms.

In Bontis, Crossan and Hulland (2002), five constructs ("our group meets its performance targets", "our organization is successful", "individuals are generally happy working here", "our organization meets its clients' needs", and "our organization's future performance is secure") were used to measure business performance under the SLAM framework of organizational learning. While a variety of metrics have been suggested for measuring business performance, the constructs of individual performance, group performance and organisational performance will be used in this study because of its reliability, extensive use and non-confidential nature (see Bontis et al. 2002; Real, Leal & Roldán, 2006).

Learning and Performance Using the Slam Framework

The basic elements of any learning process include knowledge, people and the organization. However, knowledge is dynamic and transmitted from one level to another. Several theories have suggested the process of knowledge creation and the flow among different level, such as Nonaka's theory (Nonaka, 1994), Huber's theory (Huber, 1991), the 4-I framework (Crossan, Lane & White, 1999) and the SLAM framework (Bontis & Crossan 1999), amongst others. The *4-I*framework suggests that learning takes place via social and psychological process at three levels: individual (*intuition*), group (*interpretation and integration*) and organizational (*institutionalization*) (Crossan et

al., 1999). The levels (*4-I*) are linked through feed-forward and feedback flows. Bapuji and Crossan (2004) describe the feed-forward flow as a process where learning at individual level is transmitted through group and organizational level. The knowledge generated becomes institutionalized at the organizational level. In contrast, the term feedback flow is viewed as the process where knowledge embedded at organization level is transmitted to individuals within the establishment (Oh, 2009). On the other hand, the transfer of knowledge and experience within the organization translates into procedures, roadmaps, routines and database required for organizational performance (Gareis & Huemann, 2000). The sequential application of these standard processes and procedures through standard practices ensure the success of construction projects (de Carvalho, Patah & Bido, 2015). Hence, the general performance of construction projects begins with the transfer of knowledge and experience within the organization.

SLAM builds on and operationalizes the 4-I framework (Bontis et al., 2002). Knowledge stock refers to knowledge generated and retained within the same level. In contrast, knowledge flow refers to knowledge generated and transmitted within different levels. Lack of stability between the two concept leads to continuous application of existing knowledge domiciled within the organization. This is largely due to the hierarchical structure within the organization which ensures that knowledge retained within the organization is transmitted to its employees at individual levels (Oh, 2009). This leads to continuous application of existing knowledge and prevent creative activities meant to generate new knowledge required to meet changing needs of clients. This phenomenon is termed 'learning trap' (Bapuji & Crossan, 2004). To address likely learning traps, there is a need to constantly unlearn obsolete or inappropriate knowledge stored in organizational memory. The process of learning and unlearning within an organization facilitates continuous improvement in knowledge gained at organizational level and ensures a balance is maintained between feedback and feed-forward learning (Huber, 1991).

In recent years, academic disciplines, processes and systems within the construction industry has evolved to meet with changing clients' needs. For instance, the traditional method of procuring projects (Design-Bid-Build) has evolved into a more integrated process (e.g. Integrated Project Delivery). These new procurement systems have led to changes in the roles and responsibilities of quantity surveying firms in construction projects. Therefore, the SLAM framework is adopted in the present study as a measurement tool for assessing organizational learning, due to its ability to capture the dynamic process of knowledge flows among different levels of learning.

Research focused on organizational learning has a long history, with a recent growth in the number of published studies (Bapuji & Crossan, 2004; Oh & Kuchinke, 2017; Zhou, Battaglia & Frey, 2018). Though several organizational learning frameworks exist in literature (Crossan et al., 1999; Edwards, 2016; Huber, 1991), Crossan et al (1999) point out that only a few capture the friction that occurs between exploring new knowledge while concurrently exploiting what has been learnt (this phenomenon is called strategic renewal). It is imperative to note that the SLAM framework has been used to test the relationship between various dimensions of organisational learning and performance in the mutual fund (Crossan et al., 1999) and manufacturing industry (Real et al., 2006, 2014). The SLAM framework is adopted in this study because it captures the important components (i.e. individual, group and organizational level) and integrates the process of organizational learning. Similarly, the SLAM framework views organizational learning as a dynamic process and this responds to the changes in business environment to sustain competitive advantage.

Conceptual Model

The review of literature presented in the preceding section highlights the importance of knowledge stocks and learning flows in an organization. Due to the increasing complexity of

construction projects and improvements in the practices within the sector, there is a constant need for quantity surveying firms to learn, unlearn and relearn to meet the changing needs of clients. Hence, a conceptual model was developed to explain the possible relationships and impact of knowledge stocks (individual, group and organization knowledge), learning flows (feed forward and feed-back) on the performance (individual, group and organization performance) of quantity surveying firms. Several hypotheses were established to test and explain the possible relationships between knowledge stocks, learning flows and performance of quantity surveying firms namely: (1) knowledge stocks and learning flows has significant effect on individual performance of quantity surveying firms; (2) knowledge stocks and learning flows has significant effect on group performance of quantity surveying firms; (3) knowledge stocks and learning flows has significant effect on organization performance of quantity surveying firms; (4) knowledge stocks significantly influences feed forward learning flows; and (5) knowledge stocks significantly affects feed-back learning flows.

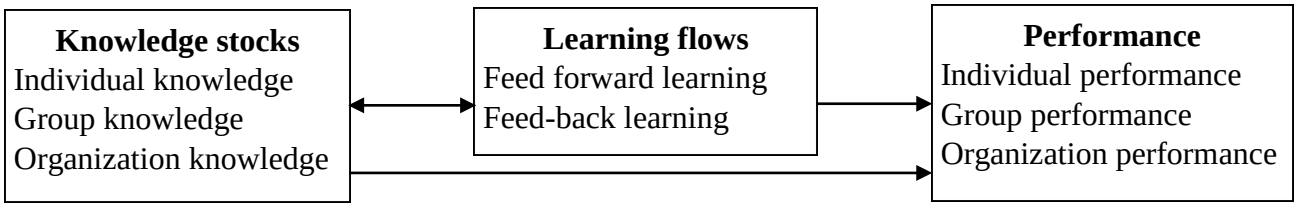


Figure 1 Conceptual Model between Knowledge Stocks, Learning Flows and Performance of Quantity Surveying Firms

To assess learning mediums, questionnaires were administered to quantity surveyors working in quantity surveying firms. The survey instrument contained three main sections: (1) background information of respondents; (2) knowledge stocks and learning flows; and (3) performance-related outcomes. Based on previously validated SLAM framework, three knowledge stocks (i.e., individual level, group level and organization level), two learning flows (e.g., feed forward and feed-back) were included, and three performance measures (i.e., individual, group and organization performance) were identified and included in the study (Bontis et al., 2002). The SLAM framework was chosen because of its ability to predict knowledge creation flow through the feed-forward and feed-back learning flows. The responses were rated on a five-point Likert type of scale. This was done to measure the response of participants relating to the 45 items on knowledge stocks and learning flows as well as 9 items on performance. The score for the level of agreement with each knowledge stocks, learning flows and performance measures was calculated by summing up ratings of relevant items.

Success of construction projects in the construction industry has often been measured using cost, time and quality parameters (Toor & Ogunlana 2010). However, proper planning and management of cost contributes significantly to timely completion and quality of construction projects. In the Nigerian construction industry, quantity surveyors are saddled with the responsibility of the cost management of construction projects. The accuracy of cost plans and the outcomes of construction projects are influenced by the knowledge and competence of quantity surveyors. Similarly, a thorough understanding of the learning flow in the organization can enhance the procedures for planning and budgeting of cost for construction projects. Hence, the study has been limited to the quantity surveyors to understand the learning flow in quantity surveying firms.

Lagos, the economic hub of Nigeria was chosen because about 75% of the quantity surveying firms either operate or have their operational head offices within Lagos (Fagbemi, 2008). Out of the 78 consulting firms registered with the QSRBN and up-to-date as at 2015 (more than 75% with operational head offices within Lagos), eighteen firms were purposively selected based on the following criteria: (1) duly registered with QSRBN; and (2) had employees with varied levels of experience (i.e., considered as an important component in the process of

learning). The cadres are determined based on the number of years and experience of the employees in the organization. To ensure the validity of the second criteria, four cadres common to quantity surveying firms in Nigeria were established before their selection for the study, namely trainee quantity surveyor (TQs), assistant quantity surveyor (AQs), quantity surveyor (Qs) and senior quantity surveyor (SQs). Trainee Qs were included in this study because it is believed that they have acquired some level of knowledge about the profession and could contribute to the activities of the organization.

In this study, TQs are quantity surveyors with no experience at all (i.e., students on industrial training), AQs are fresh graduates who must have gathered a minimum of 2 years' experience in the construction industry during their industrial internship and the compulsory National Youth Service Corps, Qs have a minimum of 5 years' experience while SQs have over 10 years of experience. Four questionnaires each were sent to selected quantity surveying firms for the established cadres of quantity surveyors as pointed out earlier. Out of the questionnaires distributed, 55 were returned with one of them inadequately filled and was removed from the data set. The remaining 54 questionnaires were used for the data analysis. From the data set, 33% of the respondents were TQs, 19% were AQs, 28% were Qs and 20% were SQs. The response rates of the four groups were relatively close, indicating that the results were not overly biased towards any of the groupings.

The data collected were analysed using SPSS version 20.0. Firstly, the 9-item scale for measuring performance was analysed by principal component factor analysis with Varimax rotation in thestudy. Secondly, Cronbach alpha values were calculated to ensure the internal consistency of each performance measures, knowledge stocks and learning flows. Lastly, multiple regression analysis was used to investigate the predictive ability of the knowledge stocks and learning flows on the performance of quantity surveying firms.

DISCUSSION

Factor Analysis and Reliability of Performance Measures

In order to identify performance measures with similar characteristics, the items were subjected to factor analysis. The nine factors in Bontis et al (2002) for measuring performance were subjected to principal components analysis (PCA) using the Varimax rotation. Prior to performing the Principal Component Analysis (PCA), the suitability of the data for factor analysis was assessed. The Kaiser-Meyer-Olkin (KMO) value was 0.835, exceeding the recommended value of 0.5 and Bartlett's Test of Sphericity reached statistical significance ($p < 0.05$) which makes the data suitable for factor analysis (Field, 2005). Furthermore, the sample to item ratios for the measures of performance is 6:1 which is adequate with the minimum requirement of 5:1 suggested for factor analysis (Hair, Black, Babin and Anderson, 2010; Tabachnick and Fidell, 2007). Factor loadings of all the items obtained and the alpha values were higher than 0.6 (Pallant 2011). The details are as shown in Table 2.

Three factors were extracted from the analysis which included organizational performance (P1), group performance (P2) and individual performance (P3). The three factors explain 82.6% of the total variance. Cronbach's alpha values were then checked to ensure the reliabilities of the three factors. All the reliabilities of the three factors were acceptable because they had Cronbach alpha values greater than 0.7 (Hair et al., 2010). The items, factor loadings and the Cronbach alpha values of the factors are summarized in Table 2.

Table 2Scale items, factor loading and Cronbach alpha for performance measures

Factors	Nature	Item	Description	Factor loading	Alpha (α)
P1-Organization	+	3	Our organization's future performance is secure	0.834	0.913
Performance	+	4	Our organization is well reputable within the industry	0.775	
	+	1	Our organization is successful	0.759	
	+	2	Our organization can meet client's requirement	0.685	
P2-Group	+	5	Our groups perform well as a team	0.839	0.875
Performance	+	6	Our groups can make strong contribution to the organization	0.838	
	+	7	Our group can meet the performance targets	0.776	
P3-Individual	+	8	Individuals are generally happy working here	0.831	0.776
Performance	+	9	Individuals feel satisfaction to their own performance	0.830	

Note: All items were measured on a 5-point scale ranging from "strongly disagree" to "strongly agree"
Kaiser-Meyer-Olkin = 0.835% variance explained is 82.6%

Reliability Analysis of Knowledge Stocks and Learning Flows

To test the internal consistency of knowledge stocks and learning flows in a quantity surveying firm, reliability analysis was conducted. The three knowledge stocks (individual, group and organization) and learning flows (forward and backward) all have Cronbach alpha values greater than 0.7, indicating that they are reliable (Hair et al., 2010; see Table 3).

Table 3Scale Items and Reliability Values for Knowledge Stocks and Learning Flows

S/N	Description	α-value
	K1-Individual level knowledge	
1.	Individuals are current and knowledgeable about their work.	0.819
2.	Individuals are aware of the critical issues that affect their work.	
3.	Individuals can feel a sense of success in what they do.	
4.	Individuals can develop many new insights in their work.	
5.	Individuals can feel confident in their work.	
6.	Individuals can feel a sense of pride in their work	
7.	Individuals can feel a sense of job satisfaction in what they do	
8.	Individuals can have a feel of job security	
9.	Individuals can have a high level of energy at work	
10.	Individuals are able to grow through their work.	
11.	Individuals have a clear sense of direction in their work.	
12.	Individuals are able to break out of traditional mind-sets to see things in different ways.	
	K2-Group level knowledge	
13.	Regular meeting is held within the team.	0.835
14.	In meetings, we seek to understand everyone's point of view.	
15.	We share our successes within the group.	
16.	We share our failure within the group.	
17.	We have effective conflict resolution when working in groups.	
18.	Adaptability of groups in the organization is high.	
19.	Groups have a common understanding of departmental issues.	
20.	Different points of view are encouraged in group work	
21.	Groups rethink decisions when presented with new information.	
	K3-Organization level knowledge	
22.	Organization organises seminar/symposium to improve members of staff	0.867
23.	Organization allows members of staff to attend seminar/symposium.	
24.	We have a strategy that positions us well for the future.	
25.	The organizational structure can support the strategic direction.	
26.	The organizational structure allows us to work effectively.	
27.	Operational procedures exist in the organization.	
28.	Operational procedures allow us to work effectively	
29.	The organization's culture could be considered as innovative.	
30.	We have a realistic but challenging vision for the organization.	
31.	Organization has the systems to implement our strategy.	
32.	We have company files and database that are kept up-to-date	
	L1-Feed forward learning flow	
33.	Lessons learnt by one group are actively shared with others.	0.856
34.	Individuals have input into the organization's strategy.	
35.	Groups propose innovative solutions to organization-wide issues	
36.	Recommendations by groups are adopted by the organization.	
37.	Time is not wasted doing something already done by other people but on something more worthwhile.	
38.	Individuals collect information for everyone to use.	
39.	Individuals challenge the assumptions of the group.	
40.	The company utilizes the intelligence of its workforce.	
41.	The group of the organization knows what the other groups are doing.	

42.	Outcomes of the group are used to improve products, services and processes	
	L2-Feed-back learning flow	
43.	Policy and procedures is established to guide the individual's work.	0.845
44.	Rewards systems recognize the contribution made by groups.	
45.	Group decisions are supported by individuals.	
46.	All individuals inside the organization understand the vision and goals of the organization.	
47.	Organisation has a database to store information and it's easily accessible by individuals.	
48.	Organization's database and files can provide the useful information to individuals to do the work.	
49.	Information systems make it is easily for individuals to share information.	
50.	Cross-training, job rotation and special assignment are used for individuals to gain different experiences and develop flexible workforce.	

Multiple regression analysis between knowledge stocks, learning flows and performance

Multiple regression analysis was conducted to explore the interdependent relationship between knowledge stocks, learning flows and performance. The stepwise method was selected in this multiple regression analysis. The knowledge stocks and learning flows were selected as independent variables in the multiple regression analysis to investigate the linear relationships between the three levels of performance. The result of the multiple regression analysis is shown in Table 4. Model 1 showed that individual performance in the organization was only positively associated with the feed forward learning flow (L1), which could explain 32.8% of the variance. Group performance in Model 2 was found to be positively associated with organization level knowledge (K3) and group level knowledge (K2), explaining 60.3% of the variance. Organization level performance was found in Model 3 to be only positively associated with organization level knowledge (K3), explaining 53.1% of the variance.

Furthermore, interdependent relationship between knowledge stocks and learning flows were examined by multiple regression analysis. The knowledge stocks were selected as the independent variable to investigate the linear

relationship with the learning flows. The result is also shown in Table 4. Model 4 showed that feed forward learning flow was positively associated with group level knowledge (K2) and organization level knowledge (K3), explaining 58.7% of the variance while in Model 5, feed-back learning flow was positively associated with organization level knowledge (K3) and group level knowledge (K2), explaining about 63.0% of the variance

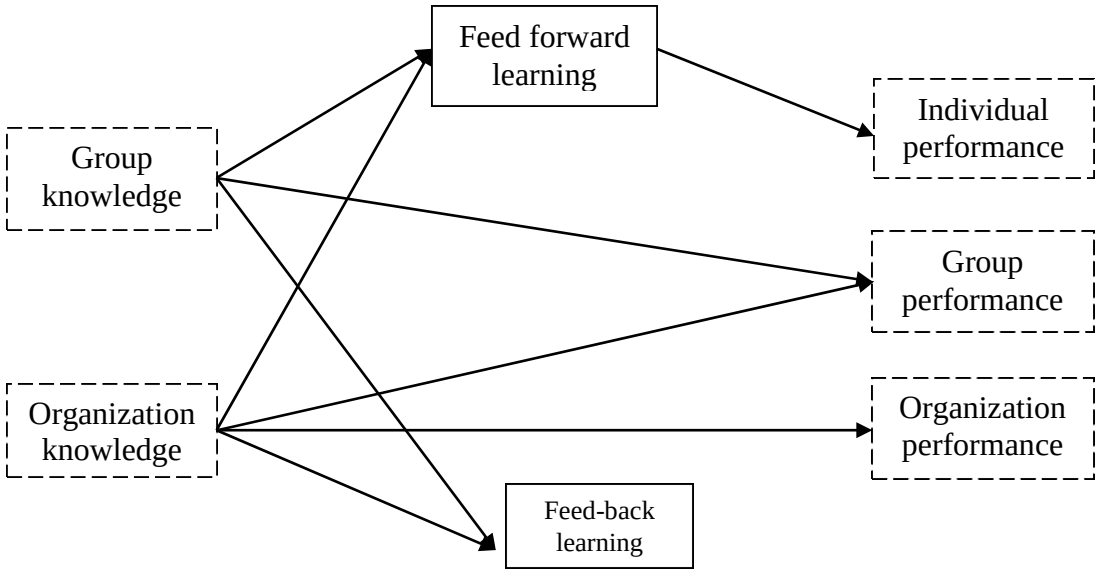
Table 4Regression Model for knowledge stocks, learning flows and performance

	Model	β	S. E.	Sig.	VIF	R	R^2	ANOVA	
								F	Sig.
1	**Individual performance**	←		**Knowledge stocks and learning flows**					
	Constant	3.042	1.012	0.004		0.573	0.328	25.428	0.000
	L1: Feed forward learning flow	0.135	0.027	0.000	1.000				
2	**Group performance**			**Knowledge stocks and learning flows**					
	Constant	1.713	1.315	0.199		0.777	0.603	38.753	0.000
	K3: Organization level knowledge	0.183	0.043	0.000	2.046				
	K2: Group level knowledge	0.109	0.046	0.022	2.046				
3	**Organization performance**	←		**knowledge stocks and learning flows**					
	Constant	3.770	1.842	0.046		0.729	0.531	58.991	0.000
	K3: Organization level knowledge	0.331	0.043	0.000	1.000				
4	**Feed forward learning flows**	←		**Knowledge stocks**					
	Constant	7.324	3.662	0.051		0.766	0.587	36.295	0.000
	K2: Group level knowledge	0.473	0.129	0.001	2.046				
	K3: Organization level knowledge	0.331	0.120	0.008	2.046				
5	**Feed-back learning flows**	←		**Knowledge stocks**					
	Constant	4.025	2.814	0.159		0.794	0.630	43.377	0.000
	K3: Organization level knowledge	0.412	0.092	0.000	2.046				
	K2: Group level knowledge	0.249	0.099	0.015	2.046				

Note: S.E. = standard error; Sig. = significance; VIF = variance inflation factor.

DISCUSSION AND CONCLUSION

Based on the analysis shown in Table 4, a knowledge stock-learning flow-performance (KS-LF-P) model was developed for quantity surveying firms in Nigeria which is shown in Figure 2. It was revealed that feed forward learning flow can be predicted by group knowledge and organization knowledge while the feed-back learning flow was the reverse order of the prediction in the feed forward learning flow. Of the learning flows, only the feed forward learning flow was found to predict individual performance with no other relationship between the learning flows and performance. Relationships also exist between the knowledge stocks and performance. The model shows that group knowledge and organization knowledge could predict group performance while organization knowledge will predict only the organization performance. None of the knowledge stocks could predict individual performance.



Note: → - positive causal relationship revealed in correlation and regression
- refers to knowledge stocks
- refers to learning flows
- refers to performance

Figure 2 Interrelationships between Knowledge Stocks, Learning Flows and Performance of Quantity Surveying Firms

The study revealed that there is a relationship between the different levels of knowledge and the different levels of performance. This is consistent with previous findings that a strong positive relationship exists between organizational learning and performance of an organization (Goh et al., 2012; Hussein et al., 2014; Jiang & Li, 2008; Theriou & Chatzoglou 2014).

The study also revealed that the feed learning flow in a quantity surveying firm begins with the group knowledge. This finding is however inconsistent with the SLAM framework that indicates that learning flow begins with the individual knowledge (Bontis et al., 2002). The inconsistency may be caused by differences in organization structure and culture. The feed forward learning shows that the learning flow begins from the group knowledge to the organization knowledge stocks indicating that the individual knowledge does not significantly contribute to the learning flow in quantity surveying firms. This may be due to the fact that in most quantity surveying firms, the team is made up of individuals with different level of experience in handling projects (i.e. an AQs and/or TQs in the organization may be attached to a Qs/SQs). The SQs leads the group and collaborates with colleagues to complete assigned tasks. Tasks are executed by integrating individual experiences and knowledge at group level. The completion of the task in an efficient manner is critical to attaining success and organizational performance. The findings of the present study show that feed-back learning flow begin from the organization knowledge to the group knowledge which ensures that there is a balance in the system, which is consistent with those reported in Bontis et al. (2002).

The study also indicated that individual performance is the resultant effect of the feed forward learning flow process. This reflects that the performance of an individual in an organization is a product of integrating his idea, experience and knowledge in the group and organization. Due to the similarity in the content of the curriculum used for academic training and mode of assigning task, it is important for quantity surveyors to integrate knowledge (i.e. competence, experience, ideas, etc.) in order to contribute significantly to group and organizational performance. The performance of the group is the resultant effect of the integration of the knowledge of group members and some additional contribution from the organization (see

Table 4 and Figure 2)

CONCLUSION AND FURTHER STUDIES

The construction industry is increasingly dynamic and quantity surveying firms (performing cost and contract management function) could exploit the use of organizational learning for competitive advantage and sustained growth. The present study aims at investigating the relationship between organisational learning and performance using the SLAM framework. Previously validated scale for measuring key variables were identified and adopted in the study. This ensured that valid inferences can be drawn from the results of the cross-sectional survey.

Three levels of performance were established from factor analysis using the performance measures by Bontis et al (2002). Although the result of the correlation analysis shows that all the knowledge stocks and learning flows are significantly related, only the group and organization knowledge stock and the feed forward learning flow will significantly influence any level of performance in the organization. Therefore, quantity surveying firms should give priority to activities that will encourage meeting and improving collaboration at group and organization levels. This will create an atmosphere for individuals to share opinions and ideas which is vital for improving performance. Also, open plan office and holding events for team building (such as lunch, coffee break, etc.) will stimulate discussions among employees which can result in group learning within the organization. Furthermore, firms can organize workshop, in-service training and mentoring programs which can motivate younger quantity surveyors to ask questions thereby providing an atmosphere for learning. Finally, continual professional development can be organized by professional bodies to update quantity surveyors on technological advances in the profession. This can induce learning and ensure the performance of quantity surveying firms in Nigeria.

Although the study has established the relationship between organizational learning and performance, the relatively small sample size and the use of self-report survey may limit the ability to generalize the result. However, some measures were put in place to reduce the possibility of bias. Firstly, the scales used for measurement were selected from previously validated studies and statistically tested for reliability. Secondly, selected firms were duly registered and licensed to practice quantity surveying in Nigeria. Lastly, selected firms have a minimum of 5 employees with varied level of experience, which is believed will facilitate learning within the organization. Therefore, it is believed that the actions taken will eliminate bias in the study and can form the basis for further large-scale studies. The study can also be replicated among other professionals in the construction industry.

The present study has revealed the relationship between knowledge stocks, learning flows and performance in quantity surveying firms. In order to cross-validate the results of the current questionnaire survey and further explore the implications of the study, triangulation method using personal interviews and an objective approach (e.g., case studies) is suggested in future studies. The results of the case study approach will provide definitive evidence of the impact of the SLAM framework on the performance of firms, and also establish a complex relationship between knowledge stocks, learning flows and performance in quantity surveying firms.

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