Insights into The Push Factors of Innovation Adoption of Professional Services Firms: The Case of Ghanaian Quantity Surveying Firms (QSF)

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Abstract:
Construction industry is a universal driver of an economy but it is largely affected by its reluctance to innovate. This paper aims to identify the drivers of innovation adoption in Ghanaian Quantity surveying firms by looking at related previous literatures. The study adopted Quantitative research approach with census sampling technique, where questionnaires were sent to and retrieved from the top management of Quantity Surveying firms in Ghana. The study then adopted the use of mean score ranking, and hypothesis (H) was tested to check the significance level of all the push factors using One Sample Wilcoxon Signed rank test. 29 out of 43 questionnaires were retrieved from the quantity surveying firms (QSFs) at a response rate of 67.44%. Mean score ranking analysis clearly display that technological capability has the power to drive innovations in Quantity surveying (QS) firms. One Sample Wilcoxon Signed rank test concluded that effective information gathering is not important to the Quantity Surveying firms because it had a significant level of 0.384, which is greater than 0.05. Therefore, this research study has discovered that, programmes promoting access to technology is the main driver of technological capability towards innovations in professional service firms. The finding of this study is valuable to the Quantity Surveying firms as well as the other professionals in the construction industry as well as innovation policy makers and stakeholders, as it will help invest in technological capabilities including programmes promoting access to technology with the aim of driving innovations in the professional service firms.

Keywords:
Adoption, Drivers, Innovation, Ghanaian Quantity Surveying, Proefessional Services Firms

1 Introduction

Innovation adoption is a process that brings about assimilation of a product, process or a practice that is new to the adopting organization (Kimberly and Evanisko, 1981; Walker, 2008). Many researches on innovation have come out with the fact that innovation has the ability to create value, achieve incremental improvement to systems or products and ultimately reduce costs (Radjou, 2006). Construction industry consultants generally referred as knowledge-based professionals are persons or organizations employed to: provide expert analysis and advice that will enhance decision-making; provide specialized and one-of service(s); and perform task(s) that are

not ordinarily available within the departments or agencies of the Clients (Ijigah et al., 2012). The construction industry operates in an environment which is occasionally undergoing transformation, causing the materials, technologies and other inputs implemented in construction to also experience changes at a very fast rate; making it essential for the QS firm to intermittently keep their practices up to date (Ofori, 2012). Furthermore, the object of Ghana Institute of Surveyors (GhIS) is among all things is to secure the adoption of innovation in the advancement of the profession of surveying and its members (Ghana Institute of Surveyors, 2015). However, the advancement of an industry can be achieved by enhancing or adopting new approaches to delivery of projects (Kissi et al., 2012). Agolla et al. (2016) did a study on the empirical investigation into the drivers and barriers of innovation in public sector organizations regarding developing countries to identify some available factor that can push innovation adoption in the public sector, as well as the challenges that are capable of limiting innovation adoption. Torku et al. (2017) also identified the impedance to innovation practices in the Ghanaian Construction Industry, particularly the Quantity surveying firms. Torku et al. (2017) furthered his research activity to find out the measures to enhance the innovation adoption in Ghanaian Quantity Surveying firms, with less focus on the drivers of innovation. In Ghana, less focus has been on the push of innovation adoption regarding professional service firms, especially Quantity Surveying firms. This paper resolves the problem by aiming to address the available push factors of innovations in Ghanaian Quantity surveying firms. The outcome of the paper is expected to elucidate understanding of these push factors for policy discussion in order to help comprehend how innovation occurs in practice. The study uses 5-point Likert Scale with the help of Mean Score Rank Analysis and One Sample Wilcoxon Signed Rank Test to measure the responses from the population. Ghanaian Quantity Surveying Firms and Policy makers will benefit from the outcome of this study by investing in the drivers of innovations especially programmes promoting access to technology, so as to enhance innovation adoption in the professional services firms.

2 Literature Review

2.1 Innovation by Quantity Surveying Firms (QSFs)

Innovation is the ability of Quantity Surveyors to use different ways to approach client needs without causing excessive problems. Barrett et al. (1998) supported by explaining innovation in construction as the act of introducing and using new ideas, technologies, products and processes aimed at solving problems, viewing things differently, improving efficiency and effectiveness, or enhancing standards of living. Consultancy services in construction are executed by highly educated professionals who are expert in solving problem, judgment and giving advice to people (Sandberg, 2003). Construction industry consultants are usually approached and commissioned by clients to provide services relating to the conceptualization, planning as well as the execution of the construction projects (Ibironke, 2004). This implies that the higher the level of innovation practices inputted into the services rendered by the QS consultancy firms the greater the probability that it will increase its contributing to the growth of the economy (Blayse and Manley, 2004).

2.2 Conceptualizing the Push factors of Innovation Adoption in QSFs

This paper made use of four main factors that are capable of driving innovation adoption in Ghanaian Quantity Surveying Firms. These include environmental pressures, Technological capability, knowledge exchange and boundary spanning.

2.2.1 Environmental Pressures

The environmental pressure constitutes the influences that force and stimulate organizations to innovate (Gann and Salter, 2000). Miozzo and Dewick (2002) did a research and found the development of strategic innovations and the operational capabilities of the largest contractors in Germany, Sweden, Denmark, France and the United Kingdom. Bossink (2004) also did research on environmental pressures that include innovation stimulating regulation, market pull, governmental client with innovative demand, subsidies for innovative application and material and governmental guarantee for markets for innovative firms. According to Arditi et al. (1997), market forces have made the innovation rate in construction equipment in the United States over a period of 30 years and found that the innovation rate increased. This then displays that environmental pressure has the capability to drive innovation adoption in Quantity surveying firms, as it helps to draw strategies to change from traditional way of executing project to new ways.

2.2.2 Technological Capability

Technological capability consists of factors that enable organizations to make and develop innovative products and processes (Gann and Salter 2000). This supports that, technological capability deals with the factors that can help to enhance the innovative development of product and processes. Seaden and Manseau (2001) named the evaluation of new process, technology and product before market launch, as an instrument to guarantee the innovation quality. According to Bossink (2004), technological capability includes Technology leadership strategy, Technology push, Programmes promoting access to technology, Finance for pilot projects, Technology fusion, and product evaluating institutions. Seaden and Manseau (2001) and Goverse et al. (2001) stressed the necessity of programs and bridging institutions facilitating access for organizations to the technology needed mostly to innovate. Contributions from Miozzo and Dewick (2002) stated that, long-term relations between external knowledge centres and firms in the construction industry facilitated access to, and adoption of, new technologies.

2.2.3 Knowledge Exchange

Knowledge exchange consists of the arrangements that facilitate the sharing of information and knowledge needed to innovate in and between organizations (Kangari and Miyatake, 1997; Gann and Salter 2000; Goverse et al., 2001). Bossink (2004) said, development of new knowledge that can be used to innovate is facilitated by exchange of knowledge. Seaden and Manseau (2001) listed programs promoting collaborative arrangements between organizations as an innovation stimulator and driver. Bossink (2004) said, another way of becoming an innovative firm in the field of sustainability, an organization had, or developed, a broad view of risk. Sharing of knowledge and information is an effective mean of encouraging innovation in Quantity surveying firms as it helps to create, stabilize and upgrade knowledge network.

2.2.4 Boundary spanning

Boundary Spanning deals with the initiatives to co-innovate across the boundaries of partnerships, organizations and departments (Gann and Salter, 2000). According to Bossink (2004), boundary spanning is the capability of institutions and organizations to co-innovate with other institutions and organizations. According to Barlow (2000), he stated that the establishment of financial mechanisms for sharing project risks and benefits is needed to ensure that innovations are defined and it is clear how costs and

revenues are shared between project participants. Bossink (2004) contributed that, sharing of the risks and benefits of the innovation trajectories were according to fixed price contract. Boundary spanning is also an effective way to push innovation as it helps to co-innovate across boundaries of Quantity surveying firms in the construction industry.

3 Research Methodology

Literature was extensively reviewed to increase understanding of the topic and to accurately determine the data to be collected for the research (Walliman, 2011). Quantitative research technique was used and questionnaires were sent out to Ghanaian Registered Quantity Surveying firms to check if actually innovation management is bringing good impact or bad impact. A five-point Likert scale was adopted in this study to measure the response of each respondent. The five-point Likert Scale helps to give better understanding on what options the respondents should choose for his or her answer. Scaling style was adopted because the data was primarily ordinal where 1= Not High, 2 = Less High, 3 = Moderately High, 4 = High and 5= Very High. The type of questions used involves the use of close ended questions. According to Copper and Schindle (2008), the nature of the aim of the research determines the type of research methodology to adopt, thus from the stated aim the exploratory research design will be employed. Census Sampling was adopted due to the small number of data collected. The population sample constituted the Ghanaian Registered Quantity Surveying firms because they are the target group. The research study targeted the 43 registered Quantity Surveying Firms in the two major regions of Ghana: Greater Accra region and Ashanti region as a pilot study for all the Quantity Surveying firms in Ghana. Out of 43 total questionnaires sent out to the population, 29 were retrieved. The collected data were coded and analysed using the Statistical Package for Social Sciences (SPSS) version 20 or current version. Tables were used for Interpretation of data to get valid meaning to the responses. Means score Ranking Analysis was used to rank the dependent variables obtained to establish how they are prioritized by the Ghanaian Registered Quantity Surveying (QS) Firms. One sample Wilcoxon Signed Rank Test was then used to test the relationship of the dependent variables according to the level of importance using hypothetical median of four (4).

3.1 Hypothetical test

Wilcoxon signed rank test was used to check the level of importance or significance. Therefore, each group of the items was subjected to One sample Wilcoxon signed rank test and the result is shown in Table 2. The testing posited the null hypothesis that these variables were not important. A summary of the test results is shown in Table 2. For each factor identified, the null hypothesis was that the factor was unimportant (H0: $\eta = \eta 0$) and the alternative hypothesis was that the attribute was important (Ha: $\eta > \eta 0$), where $\eta 0$ is the population median ($\eta 0$ was fixed at 4.0). The significance level was place at 95% in accordance with conventional risk levels.

4 Findings and Discussion

This section of the paper establishes statistical evidence base on the result shown on Table 1, using Mean score ranking. This was done with the help of SPSS tool. One sample Wilcoxon Signed Rank Test was then used to test the relationship of the dependent variables according to the level of importance using hypothetical median of four (4). This is shown clearly on Table 2.

Table 1. Ranking of push factors of Innovation Adoption base on mean score

(Source: Field Survey, 2017)

PUSH FACTORS	Mean	Standard deviation	Rank
TECHNOLOGICAL CAPABILITIES	3.496	0.864	1st
Programs promoting access to technology	3.66	0.814	1st
Technology fusion	3.62	0.942	2nd
Technology push	3.52	0.986	3rd
Technology leadership strategy	3.52	0.738	3rd
Product evaluating design	3.38	0.677	5th
Finance for pilot project	3.28	1.032	6th
KNOWLEDGE EXCHANGE	3.495	0.870	2nd
Effective information gathering	3.86	0.875	1st
Creation of knowledge network	3.66	0.769	2nd
Training of workers on the site	3.55	1.121	3rd
Broad view of risk	3.52	0.738	4th
Stimulation of research	3.45	0.910	5th
Lateral communication structures	3.34	1.045	6th
Integrated and informal R & D function	3.34	0.814	6th
Programme promoting collaboration	3.24	0.689	8th
BOUNDARY SPANNING	3.388	0.981	3rd
Involvement of the client	3.59	0.946	1st
Innovation from suppliers	3.45	0.948	2nd
Strategic alliances and long-term relationships	3.41	1.150	3rd
Integration of design and build	3.41	1.086	3rd
Explicit coordination of the innovation process	3.38	1.015	5th
Mechanism for sharing financial risk and benefits	3.38	0.942	5th
Coordination of participation groups	3.38	0.862	5th
Empowerment of innovation leaders and innovation champions	3.10	0.900	8th
ENVIRONMENTAL PRESSURES	3.248	1.030	4th
Subsidies for innovative application and material	3.48	1.271	1st
Innovation stimulating regulation	3.34	0.974	2nd
Market pull	3.28	1.032	3rd
Government client with innovative demand	3.14	1.026	4th
Government Guarantee for market for innovative firms	3.00	0.845	5th

Technological capability (3.496) was indicated as the highest driver or push factors of innovation adoption in Ghanaian Quantity Surveying firms with a mean of 3.496 among the drivers' categories or divisions because technology has the capability of bringing an idea into existence. This concludes that technological capability is an important factor that drives an innovation adoption. Seaden and Manseau (2001) and Goverse et al.

(2001) stressed on the necessity of programs and bridging institutions facilitating access for organizations to the technology needed mostly to innovate. This agrees to the fact that the activities of the world are now driven by technology.

Furthermore, the variables under technological capability (3.496) were also ranked. Programmes promoting access to technology (1st) evolved as the highest ranked variable under technological capability and finance for pilot project (6th) being the least ranked. This concludes that, programmes promoting access to technology is the most important factor chosen by the respondents in the Quantity Surveying firms. Programmes promoting access to technology will pave a way to get in touch with technologies that can transfer an idea into a reality. This is consistent with Seaden and Manseau (2001) and Goverse et al. (2001) stressing that the necessity of programs and bridging institutions facilitating access for organizations to the technology needed mostly to innovate.

Knowledge exchange (3.495) was emerged as the second push factor division of innovation adoption. Effective information gathering (1st) emerged was the highest ranked variable under the knowledge exchange category, and programme promoting collaboration (8th) became the least ranked. This concludes that effective information gathering was considered as the most important factor among the others by the respondents because it will seek to provide validity and reliability on information gathered that will help to satisfy the client. This agrees to the fact that Kangari and Miyatake (1997) and Veshosky (1998) included effective information gathering as an important innovation driver.

Boundary spanning (3.388) also evolved as the third under the divisions that push innovation in Ghanaian Quantity Surveying Firms. Involvement of the client (1st) was emerged the highest rank variable under the boundary spanning division and the empowerment of innovation leaders and innovation champions (8th) as the least rank. This then concludes that involvement of the client is the most significant variable under boundary spanning because involving the clients on innovation decision taking will help him to get what he will be satisfied with. This also supports the fact when Bossink (2004) said specific wishes and demands of clients can help stimulate architects to come up with innovative solutions and ideas.

Environmental pressure (3.248) emerged as the last ranked division among the four divisions that push innovation adoption in Ghanaian Quantity Surveying firms. Subsidies for innovative application and material were also the most important variable under the environmental pressure. This then proves what Goverse et al. (2001) came out with, that subsidies for innovative applications and materials were also very critical driver of innovation, and can be used as a regulatory measure.

Table 2. Push Factors After One Sample Wilcoxon Signed Rank Test

(Source: Field Survey, 2017)

PUSH FACTORS	SIG. LEVEL	DECISION
ENVIRONMENTAL PRESSURES		
Market pull	0.002	Reject null hypothesis
Government Guarantee for market for innovative firms	0.000	Reject null hypothesis
Subsidies for innovative application and material	0.035	Reject null hypothesis
Innovation stimulating regulation	0.002	Reject null hypothesis
Government client with innovative demand	0.000	Reject null hypothesis
TECHNOLOGICAL CAPABILITIES		
Product evaluating design	0.000	Reject null hypothesis
Programs promoting access to technology	0.032	Reject null hypothesis
Finance for pilot project	0.002	Reject null hypothesis
Technology fusion	0.040	Reject null hypothesis
Technology leadership strategy	0.003	Reject null hypothesis
Technology push	0.015	Reject null hypothesis
KNOWLEDGE EXCHANGE		
Stimulation of research	0.004	Reject null hypothesis
Creation of knowledge network	0.025	Reject null hypothesis
Programme promoting collaboration	0.000	Reject null hypothesis
Broad view of risk	0.003	Reject null hypothesis
Integrated and informal R & D function	0.000	Reject null hypothesis
Effective information gathering	0.384	Retain null hypothesis
Training of workers on the site	0.041	Reject null hypothesis
Lateral communication structures	0.003	Reject null hypothesis
BOUNDARY SPANNING		
Integration of design and build	0.009	Reject null hypothesis
Involvement of the client	0.027	Reject null hypothesis
Mechanism for sharing financial risk and benefits	0.002	Reject null hypothesis
Coordination of participation groups	0.002	Reject null hypothesis
Empowerment of innovation leaders and innovation champions	0.000	Reject null hypothesis
Innovation from suppliers	0.006	Reject null hypothesis
Explicit coordination of the innovation process	0.004	Reject null hypothesis
Strategic alliances and long-term relationships	0.013	Reject null hypothesis

All the factors under the environmental pressures, namely market pull (0.002), Government guarantee for market for innovative firms (0.000), subsidies for innovative application and material (0.035), innovation stimulating regulation (0.002), and government client with innovative demand (0.000), are all important. This is because they had the significance level to be less than 0.05 (Sig. < 0.05). Therefore, maintaining

the hypothesis (Ha) that all the factors under environmental pressure are important or significant.

Factors underneath the technological capabilities including product evaluating design (0.000), programs promoting access to technology (0.032), finance for pilot project (0.002), technology fusion (0.040), and technology leadership strategy (0.003) and technology push (0.015) are all also important. They also had significance level below 0.05. Therefore, retaining the hypothesis (Ha) that all the factor making up the technological capabilities are significant.

In Knowledge exchange, stimulation of research (0.004), creation of knowledge network (0.025), programme promoting collaboration (0.000), broad view of risk (0.003), integrated and informal R & D function (0.000), training of workers on the site 0.041) and lateral communication structures (0.003) are all less than 0.05, except effective information gathering (0.384), which had more than 0.05. This concludes that, excluding effective information gathering, all the factors under the knowledge exchange are important because they had significance level to be less than 0.05. Therefore, rejecting their null hypothesis. Effective information gathering was not proved enough to reject its null hypothesis (Ho) because it had significance level to be 0.384, therefor retaining its null hypothesis.

Finally, factors under boundary spanning: integration of design and build (0.009), involvement of the client (0.027), mechanisms for sharing financial risk and benefits (0.002), coordination of participating groups (0.002), empowerment of innovation leaders and innovation champions (0.000), innovation from suppliers (0.006), explicit coordination of the innovation process (0.004), and strategic alliances and long term relationships (0.013) are all having significance level being less than 0.05 (Sig. <0.05). This then concludes that all the factors are significant thereby rejecting the null hypothesis (Ho) that they are not important.

4.1 Practical Implication

The importance of this study can also be extended to the other sectors apart from the construction sector in Ghana including innovation policy makers. Firstly, push factors of innovation adoption have been clearly identified as a research gap to be catered for in the professional service firms, especially Ghanaian Quantity Surveying firms. It has been revealed that technological capability is an important factor that can drive innovations in both public and private sectors. The outcome of the study will be beneficial to stakeholders as it will help them invest in programmes promoting access to technology with the aim of driving innovations in the professional service firms. The study continuously discloses that programmes promoting access to technology adoption is a critical factor that can help to drive innovations in professional service firms in Ghana. There is a need for government and leaders to consider investing in programmes that can help workers to access technology in order to make their innovative ideas real and attainable. This paper has contributed to the research gap by making it known to both public and private sector the push factors to help adopt innovation in the firms.

4.2 Theoretical Implication

The study will further seek to enhance the understanding of innovation adoption in the professional service firms, especially the Quantity Surveying firms by making it available the push factors of innovation adoption. This is an important theoretical gap

the study has contributed to, and it is reliable for further studies of innovations in both the public and the private sector.

5 Conclusion and Further Research

The results as seen throughout this research have pointed the definition of innovation, which has provided integrating focus to categorize the drivers of innovation adoption in Ghanaian Quantity firms. It was concluded that technological capability has the most ability to drive innovation adoptions in firms. The paper further established clearly that programmes promoting access to technology is the most important push of innovation by the Ghanaian Quantity Surveying Firms. The paper therefore makes a strong case to back the drivers of innovation in Ghanaian Quantity Surveying Firms.

The list of registered Ghanaian Quantity Surveying firms collected from the Ghana Institute of Surveyors covered the two major regions in Ghana namely Accra and Kumasi. Meanwhile there are other eight (8) regions left, in so doing, may affect the generalization of the results. The study was steered with a sample size of 29 out 43 registered Quantity Surveying firms purposively collected from Ghana Institute of Surveyors, thereby the extent to which the results can be comprehensive may be in distrust. Relying alone on the significance level to drive conclusion is quite simplistic, and can there affect the trust of the study. Lastly, the study was purely quantitative, henceforth, there is a need to have incorporate the qualitative method, which could have reduced the weaknesses found in the use of only quantitative method. It is recommended that further research work is undertaken to identify: factors that will enhance implementation of innovation adoption in Ghanaian Quantity Surveying firms, and the process of innovation management in professional service firm in the construction industry: the perceptive of Ghanaian Quantity Surveying Firms.

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