Delphi Panel Discussion of F-TAM

Delphi Panel Discussion of F-TAM: Industry Experts and Academic Perspectives

Conference Paper · September 2018

CITATION
1

READS
225

5 authors, including:

Joshua Doe
Open Universiteit Nederland
11 PUBLICATIONS **19** CITATIONS
SEE PROFILE

Rogier van de Wetering
Open Universiteit Nederland
107 PUBLICATIONS **905** CITATIONS
SEE PROFILE

Ben Honyenuga
Ho Technical University
34 PUBLICATIONS **98** CITATIONS
SEE PROFILE

Johan Versendaal
Hogeschool Utrecht
80 PUBLICATIONS **812** CITATIONS
SEE PROFILE

Delphi Panel Discussion of F-TAM: Industry Experts and Academic Perspectives

Doe, Joshua Kofi[1] [dlas1274@yahoo.com], Van de Wetering, Rogier[2] [rogier.vandewetering@ou.nl], Honyenuga, Ben[3] [bhonyenuga@htu.edu.gh], Versendaal, Johan[4] [johan.versendaal@ou.n] and Boateng, Richard[5] [richboateng@ug.edu.gh]

[1] Ph.D. student, Open University of the Netherlands

[2&3] Faculty of Management, Science & Technology, Open University of the Netherlands,

[4] Ho Technical University, Ghana

[5] Department of MIS, University of Ghana Business School, Ghana

Abstract: Contextual issues that surround the adoption of mobile digital innovations have become a topical issue for both academics and industry experts. In an attempt to bridge this knowledge gap, Doe et al.(2017) developed the Firm Technology Adoption Model (F-TAM) through a systematic literature review. The authors suggested an exploratory study among industry experts to further validate the model.

This paper employs the Delphi technique among academics and industry experts to further refine the F-TAM model. The study sought to to examine the degree to which the F-TAM reflect the adoption pattern among SMEs in Ghana, whether there are other factors of variables that are not accounted for in the F-TAM, and whether a change in the model makes the model more valid?

Findings of this paper suggested a very high degree of facial validity of the variables from the initial F-TAM model. Twelve new variables, one new construct, and seven changes are suggested to the initial F-TAM model.

Recommendations are made in for future studies on the bases of the findings.

Keywords: Mobile digital innovations adoption, diffusion, developing countries contexts, SMEs,

1 Introduction

The discussion of diffusion and use of digital innovations among SMEs in Ghana for their marketing and business processes has become a topic of discussion in the industry as well as within the academic debate (Attopley, 2016; Tagoe, 2016; Bank of Ghana, 2016). Even though diffusion of digital innovations, in general, has been slow in Ghana, the diffusion of mobile technologies has been very impressive with a total mobile phone subscription rate of 36,138,706 subscribers as at the first quarter of 2016 (National Communications Authority (N.C.A.), 2016). This adoption rate represents a mobile phone subscription rate of 130.97%. Allied digital innovation, such as mobile phone payment systems, has similarly realized a total subscription rate of 14,697,570, as at the first quarter of 2016 (N.C.A., 2016). This represents approximately 52% market penetration since it was introduced in 2009 (Bank of Ghana, 2016). This increased industrial and academic interest in the debate on digital innovations for marketing and business purposes is apparent due to the need for further expansion of mobile technologies and its allied innovations for accelerated growth of SMEs.

Studies have found that the factors indicated in earlier models and theories have been, in many cases, present in developing countries, yet many digital innovations have not been widely adopted (Datta, 2011). This is partly because they have posited antecedents of behavioral intention, sidestepping the context within which this intention will occur. The contextualization of adoption factors has, therefore, become very imperative in the quest for factors that enhance widespread and speedy adoption of innovations such as the case of mobile technologies.

As an initial step toward the development of a model of adoption within the Ghanaian context, Doe et al. (2017) developed an initial Firm-Level Technology Adoption Model (F-TAM) through a systematic literature review and analysis. The F-TAM posited four factors at the personal level, five factors at the firm level and four factors at the societal level that inter-relate to realize firm level adoption of digital innovations, as shown in figure 1. From this model, the authors posited the following propositions.

Proposition 1: Individual level factors directly lead to firm-level adoption of digital innovation. Proposition 2: Individual level factors of adoption directly influence firm-level factors of adoption. Proposition 3: Firm-level factors of adoption leads to firm level adoption. Proposition 4: Firm-level adoption is moderated by societal level factors.

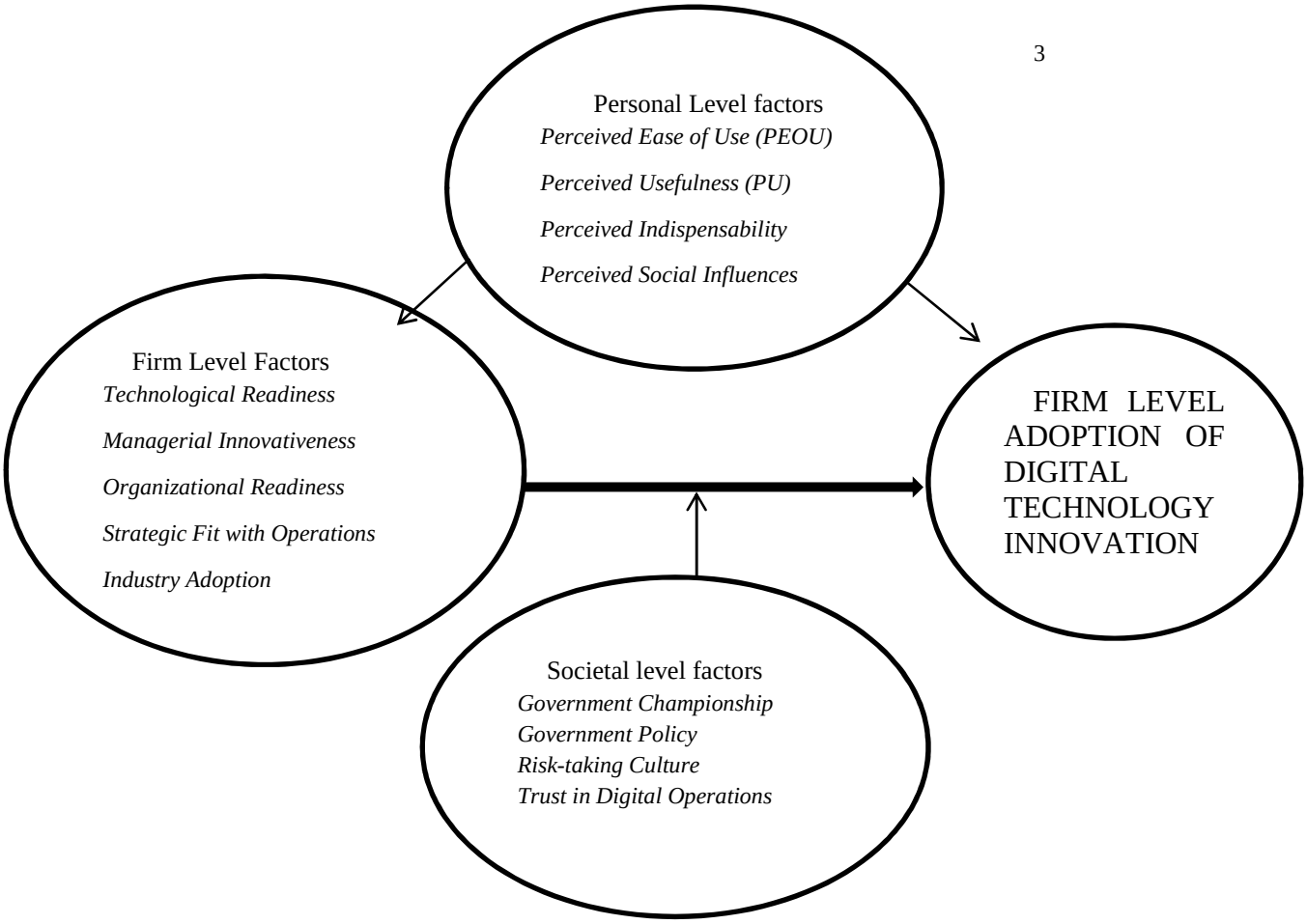

Figure 1: Initial F-TAM, *Source: Doe et al. (2017)*

Doe et al. (2017) recommended an exploratory study of industry experts to further strengthen the F-TAM model for the context of its development. The objective of this Delphi discussion, therefore, is to further develop the initial F-TAM (Doe et al., 2017) by interviewing experts in industry and academia. Specific research questions to be addressed in this study are:

a) *To what degree does the F-TAM reflect the adoption pattern among SMEs in Ghana?*

b) Are there other factors that are not accounted for in this model?

c) Could changes in the model make the model more valid?

2 Context of the Study

2.1 Developing Country.

The World Bank defines a developing country as having low to middle income (0 - $3,255 per capita income). Bannock et al. (1992) define a developing country as a country that has reached neither growth of industrialization nor a level of national in-

come sufficient to finance investment for further growth. One crucial aspect of Bannock's (1992) definition is that developing countries, such as Ghana, lack domestic savings required to finance investment that is necessary for further growth such as mass adoption of mobile technology innovations.

While digital innovations in general could accelerate Ghana's development process (Hinson & Sorensen 2006; Boateng et al., 2008), SMEs in Ghana live with the digital divide (UNCTAD, 2003; Falch, 2004), which has been argued to be a poverty gap (Zachary, 2002).

2.2 SMEs

The Ministry of Trades in Ghana defines micro to medium-sized enterprises as any organization that employ between 1 to 5 persons to be micro enterprises, 6 to 29 people with total assets less than $100,000 as small enterprises and 30 to 99 people with total assets of up to $1 million as a medium enterprise (Mensah, 2004). It is widely accepted that SMEs constitute the backbone of the private sector in any economy (Bannock, 2005), making up over 90 percent of business units in the world and account for 50 to 60 percent of total employment (Kennedy & Hobohm, 1999).

2.3 Impediments to the Adoption of Digital Technologies

SMEs are in an excellent position to adopt new technologies due to low bureaucracy (Payne, 2002). However, Karanasios (2008) reported macro factors that impede effective adoption by SMEs as inadequate telecommunications infrastructure, lack of payment options, legal and regulatory issues, trust and security, socio-cultural factors, and lack of skills in the workforce. Micro level factors include financial constraints, lack of knowledgeable employees, internet security issues, among other factors (Karanasios, 2008).

3 Methodology

This exploratory study employs the Delphi panel discussion in examining the F-TAM model, primarily because of its ability to assemble groups of experts to reply to interview rounds involving the discussion of a specific question or questions. The technique helped to sample views of both academics and industry experts who may have varying opinions on the adoption of mobile technology innovations in Ghana. The rounds procedure repeats itself with the goal of reducing the variety of responses until a consensus is achieved (Linstone & Turoff, 2002). Two rounds of interviews were conducted.

Round 1 Delphi Interview: In the first round of interviews, the respondents were asked to comment on the original variables of the F-TAM model (Doe et al., 2017), as well as the relationships that were posited to exist. Respondents were asked to suggest any variable they believe should be added or deleted based on their experiences and knowledge of how SMEs adopted mobile digital innovation. Any new variable discovered was added as part of the second round of interviews.

Round 2 Delphi interview: In the second round, respondents were asked to comment on the revised variables, restricting the comment to agreement, disagreement, and neutrality. Respondents were given an option to indicate any other comment they may have.

The role of the researchers in this study was restricted to that of a planner, facilitator, recorder and reviewer or synthesizer of the data (Avella, 2016).

3.1 Qualification for participants membership

For both industry and academic participants, the authors conferred to be sure that they are willing to give either oral or written communication, had time to respond, and have an interest in the topic (Avella, 2016). Industry participants were completely anonymous. Academic membership, however, was not entirely anonymous due to the use of snowball sampling. Industry criteria for inclusion were that the participant/company had introduced a mobile technology innovation (payment, sms, etc) into the Ghanaian business community that had been adopted by SMEs. Academic participants must have five years academic (teaching and publication) experience in addition to industry practice, or an academic with at least a Ph.D., and has published in the areas of mobile technology innovation or any related field.

3.2 Sampling

Purposive sampling enabled the authors to select industry experts who have introduced mobile innovations into the marketplace (Saunders et al., 2007). For manageability purposes, ten (10) industry experts were purposively sampled (Eisenhardt 1989; Yin 1994) from The 7th Ghana Information Technology & Telecom Awards nominee list (http://gittawards.com.gh). These are firms or individuals who have excelled in introducing and managing mobile technology innovations in Ghanaian society. Only five responded to the first interview, and four responded to the second interview. Seven academics were targeted, using snowball sampling in the first round. Five responses were received in both first and second rounds of interviews

3.3 Delphi discussion process

Appointments with the sampled experts were made a week ahead of time. The model and the questionnaire to be discussed were likewise given to them ahead of time (Maimbo & Pervan, 2005). The first interviews were administered between November 2017 and February 2018, covering sixteen weeks. The second round of interviews were conducted mid to late March 2018. Both interviews were administered orally or sent by email. Interview data was collected with either a voice recorder, or an open-ended questionnaire. Voice data was transcribed into text, using content analysis (Yin, 2013) to scan out the main issues being discussed.

3.4 Data Analysis

Qualitative data analytical processes, content analysis, and pattern matching were employed to fish out relevant issues that confirm, add to or subtract from the original model.

Within case analysis process: Content analysis, a systematic analytical technique to compress large amounts of words into fewer content categories based on explicit rules of coding (Berelson, 1952) became a useful mode of analysis to confirm or test a pre-existing theory (Ezzy, 2002), in this case, the variables, and relationships of the F-TAM model

Cross-case analysis process: The concept-centric approach to qualitative data organization (Webster & Watson, 2002) was used after that to arrange the contents of discussion into building blocks or themes.

Model refinement: Pattern matching, compares an observed pattern with a predicted one, theoretical realm (Yin, 2013). The inferential task involves the attempt to relate, link or match these two patterns.

Consensus: Typically, the consensus within Delphi studies ranges from 55 to 100% agreement, with 70% considered the standard (Vernon, 2009). New variables discovered from the first round of interviews were tested in the second interview before accepted or rejected. A variable index was developed by first giving the responses a weighting of two (2) for agree, one (1) for neutral and zero (0) for disagree. Second, the scores were multiplied by the frequency and then summed up to arrive at the index. The index formula is thus $\sum[(f\ ) + (f\ ) + (f\ )]$**.** Variables that realised a mean index score of 12 (0.67) or above were maintained. For the expected linkages between the constructs, each linkage was expected to realise an index of 10 (0.56) or above. For linkages where reverse relationships were realised, the linkage with the higher index was chosen. These are explained further under the discussion of the results. At the personal level, a total of six (6) variables were retained. At the firm level, a total of 10 (ten) variables were retained and re-classified into two sub-groups of firm internal characteristics and industry characteristics. At the societal level, a total of seven (7) variables were retained.

Validity: Validity concerns in this study are researcher bias, reactivity (Maxwell, 2005) and interpretive validity (Burke, 1997). Validity was improved in this study by participant feedback embedded in the Delphi discussion process, and the use of pattern matching in the data analysis process.

Generalizability: Generalizability (Schofield, 2002) concerns in this study mainly involves internal dimension of generalizability. Generalizability is enhanced through the verification of the findings in round one, as well as the use of triangulation of evidence from industry to academia, and the synthesis of the results with theoretical patterns (Finfgeld-Connett, 2010).

Table 2: Variable Score Tabulation

Variable	New Variables	Delphi Round One				Delphi Round two				Literature support for new variables	Accept, Delete, or Change name
		A=2	N=1	D=0	**X**	A=2	N=1	D=0	X		
Personal Level Factors	***Employee Factors (Attitudes and perceptions)***										Change Name
Perceive Ease of Use	*Efficiency (self-efficacy), Confidence*	zzzzzyyy			16	yyyyyzzzz			18	Venkatesh and Bala (2008)	Accept
Perceived Usefulness	*Convenience*	zzzzzyy			14	yyyyyZzzz			18	Gurtner, Reinhardt and Soyez (2014); Chang, Yan and Tseng (2012).	Accept
Perceived Indispensability		zzzzzyyy			16	Yyy zzz	zyy		15		Accept
Perceived Social Influences		yy	yyy zz	Zz	9	yyyyyzz	z	Z	15		Accept
	Trial feedback	zz			4	yyyyzzz	z		15	Shiffman and Kanuk (2009), Rogers (1962)	Accept
	Employee Self interest/ Self Enhancement Motives	zz yy			8	yyyyzzzz		Y	16	Yun, Takeuchi and Liu (2007).	Accept
Firm Level Factors	Internal characteristics										Change Name
Technological Readiness	*Firm trust in digital operations, Past experiences*	zzzy	zz		10	yyyyyZzzz			18	Vize, Coughlan, Kennedy and Ellis-Chadwick (2013)	Accept
Managerial Innovativeness	*Leadership Orientation*	zzyy	zz	Z	**10**	yyyyyzzzz			18		Accept
Organizational Readiness	*Organizational Learning,*	zzzy	zz		**10**	yyyyyzzzz			18		Accept
Strategic Fit with Operations		zzzzzyy			**14**	yyyyzzzz	y		17		Accept
	Ease of Support	zz y			**6**	yy zzzz	y		13	Grandon and Pearson (2004)	Accept
	Firm Ownership Structure (institutional and foreign)	y			**2**	yy zz	yyz	Z	11	Choi, Park and Hong (2012).	Reject
	Organizational Culture (Firm propensity to take risk)	zzy			**6**	yyyyzzz	z		15	Škerlavaj, Song and Lee (2010)	Accept
Industry Adoption	**Industry factors**										
	Organization Partner Requirements	zzzzyyy			**14**	yyyyzzzz			16	Dimaggio and Powell (1983)	Accept

	Competitive Pressure	yy			**6**	yyyyy zzzz			18	Soares-Aguiar and Palma-Dos-Reis (2008)	Accept
	Needs of Customers	zzzyy			**10**	yyyyy zzzz			18	Hauser, Tellis and Griffin (2006), Lin, Tan and Geng (2013)	Accept
	Global Influence on the Industry	**z**			**2**	yyz z	z	Z	9		Reject
Technology characteristics											
	Technology Flexibility (Adjustability of innovation to firm needs)	zzz			**6**	yyyyy zz zz			18	Rogers (1962)	Accept
	Observability of innovation	Z			**2**	yy zz	yyzz		12	Rogers (1962)	Accept
	Perceived valuability/ Relative Advantage	Y			**2**	yyyy zzzz	y		17	Rogers (1962)	Accept
	Simplicity/ Complexity					yyyy z z	zz		14	Rogers (1962)	Accept
Societal level factors											
Government Championship		zzzzy			**10**	yyyy zzz	yz		16		Accept
Government Policy		zzzzy y			**12**	yyyyy zz	z	Z	15		Accept
Societal Risk-taking Culture		z	z	Z	**3**	yyyyz	z	zz	11		Reject
Societal Trust in Digital Operations		zzz			**6**	yyzz	zz	Y	10		Reject
	Government Regulation/ Laws	zzy			**6**	yyyy zzzz			16	Tornatzky and Fleischer (1990)	Accept
	Innovation Infrastructure	zzy			**6**	yyy zzz	yz		14	Tornatzky and Fleischer (1990)	Accept
	Opinion leadership (Media discussion, Innovation community characteristic)	z			**2**	yyy zzz	y	Z	13	Rogers (1962)	Accept
	Successive government commitment	yy			**4**	yyyy zzz	z		15	Mathews (2012)	Accept
Relationships											
Personal level factors leads to firm adoption		zzyyy			**10**	yyy zzz	zy z		15		Accept
Personal level factors leads to firm factors		zzz yyy			**12**	yyy zzz	yz		14		Accept
Firm factors leads to firm adoption		zzy yyy,			**12**	yyyy zzzz			16		Accept
Societal level factors moderates firm adoption		zzzzy yy			**14**	yyyy zzzz			16		Accept
	Personal level factors moderates between firm factors and firm adoption	z			**2**	yyy zzz	zy		14		Accept

	Personal level factors leads to societal level factors	zzy			**6**	y zz	zyy	yz	9		Reject
	Firm level factors leads to personal level factors	zyy			**6**	yy zz	z	yyz	9		Reject
	firm level factors leads to Societal level factors	zzy			**6**	y zz	z	zzy y	7		Reject
	Firm adoption influences firm level factors	y			**2**	y zzz	Yyz	Y	11		Suspend
	Firm adoption influences personal level factors	zzy			**6**	yy zzz	Y	yz	11		Suspend
	Firm adoption influences societal level factors.	zzy			**6**	yzy yz		yzz	10		Suspend
	Societal Level factors influences personal level factors	zzy			**6**	yyz z	Zy	yz	10		accept
	Societal level factors influences firm level factors	zzy			**6**	yyy zzz	Z	Y	13		Accept
	Societal level factors leads to firm adoption	zy		Zy	**4**	yy zzz	Zy	Y	12		Accept
	Technology factors influences employee factors,					zzzyy	Y	zy	11		Accept
	Technology factors influences firm characteristic and industry factors					zyyzz	Y	zy	11		Accept
	Technology factors influences societal factors					yZyz	Zy	zy	10		Accept

Key: Agree (A), Neutral (N), Disagree (D), Item Score in round one- Item Content Validity Index (X), Item score in round two- Item Content Validity Index (X1), responses from Industry (z) responses from academia (y); X or X1 is calculated by $\sum(f\ ) + (f\ ) + (f\ )$, Where *f* is frequency.

4 Findings and Discussion

4.1 Personal Level Factors

From the discussions, it appears that personal level factors can better be described as ***Employee Attitudes and Perceptions***. This clearly demarcates a particular firm's employee factors from the general public human factors captured in society level factors.

Perceived Usefulness (PU) and **Perceived Ease of Use (PEOU**) both received overwhelming support with a variable index of 18 (1.0) in both the first and second round of interviews. PEOU and PU are therefore accepted in the model for further testing.

Perceived Indispensability (Doe et al., 2017) realized a variable index of 16 (0.89) in the first round and 15 (0.83) in the second round, and is therefore accepted in the model.

Trial Feedback is a consequence of triability of an innovation (Rogers, 1962). In the diffusion theory, triability is posited as one of the technology characteristics that enhances adoption. Trial purchase is known in the adoption process as an initial usage (Rogers, 1962). In the second round interview, *Trial Feedback* realized an index score of 15 (0.83) therefore is accepted in the model.

Employee Self Interest or employee self enhancement motives has been found to be positively related to task performance and organizational citizenship behavior (OCB) (Yun, Takeuchi & Liu, 2007). Employee Self Interest has been reported from both industry and academic interviews as a major determinant of employee adoption of innovation. In the second round interview, *Employee Self Interest* realized an index score of 16 (0.89), therefore is accepted in the model.

Perceived Social Influences was described in the first round of interviews as completely irrelevant by two industry experts, while two academic respondents said it was generally relevant as a personal level factor. Given that these are qualitative responses, perceived social influence was included as part of the variables at the personal level factors for the second round of the interviews. *Perceived Social Influence* realized a variable index score of 15 (0.83) in the second round and therefore was accepted in the model.

4.2 Firm-level factors

Firm and industry trust in digital operations came up as an indicator of firm adoption. Vize, Coughlan, Kennedy and Ellis-Chadwick (2013) found that *industry trust* and *Past experience of the firm* lead to firm technology readiness. Thus, it can be measured under *Technology Readiness* of the firm.

Ease of support from the firm environment has been mentioned by two industry experts and one academic as an important factor in firm-level adoption of an innovation. This is the ready availability of a technical hand to assist the firm in resolving initial problems that may arise. Grandon and Pearson (2004) in the study of e-commerce adoption by SMEs found it to be very relevant. *Ease of support* realized an index score of 13 (0.72) in the second round of interviews, and therefore is accepted in the model.

Firm ownership structure was mentioned by one academic as an important variable in the developing country context. Choi, Park and Hong (2012) reported a similar outcome. In the second round of interviews, however, firm ownership structure realized an index score of 11 (0.61), therefore is rejected.

Organizational culture was mentioned in the first interview by two industry exerts and a academic as very influential in firm level adoption. Škerlavaj, Song and Lee (2010) reported that an organizational learning culture has an impact on organizational innovativeness. In the second round interview, *Organizational culture* realized an index score of 15(0.83), therefore is accepted in the model.

Customer needs (market demand) has been cited by five respondents (three industry experts and two academics) as very important in firm adoption of technology. This falls in line with the marketing orientation where an organization responds to its customer innovativeness by adopting an innovation (Hauser, Tellis & Griffin, 2006). Customer needs was implied in the initial F-TAM model (Doe et al., 2017) as an item under industry adoption, however industry adoption is now decomposed into competitor pressure, customer or market needs and industry partner requirements. In the second round interview, *Customer needs* realized an index score of 18(1.0) and is therefore accepted in the model.

Competitive Pressure was implied in the initial F-TAM model (Doe et al., 2017) as an item under industry adoption. This is described in the diffusion theory (Rogers, 1962) as competitive pressure, and in the institutional theory as mimetic pressure (Soares-Aguiar & Palma-Dos-Reis, 2008). *Competitive Pressure* realized an index score of 18 (1.0), in the second round of interviews and is therefore accepted in the model.

Partner requirements is implied in the initial F-TAM under industry adoption (Doe et al., 2017). This is described as coercive pressure (Dimaggio & Powell, 1983) or normative institutional pressure (Iacovou, Benbasat & Dexter, 1995). In the second round of interviews, *Partner Requirements* realized an index score of 16(0.89), and is therefore accepted in the model.

4.3 Technology factors

Technology related factors have been mentioned by respondents as influential in firm level technology adoption. These include *innovation flexibility, observability, and relative advantage of innovation.* These are constructs posited by Rogers (1962) in addition to *innovation triability,* and *innovation complexity* as innovation related characteristics that affect adoption of any innovation. Triability of the innovations is subtly measured under trial feedback. Technology factors variables are classified as a construct called *Technology Characteristics.* In the second round interview, *technology characteristics* received a realized index scores of 18 (1.0) for innovation flexibility, 12 (0.67) for observability, 17(0.94) for relative advantage of innovation, and 14(0.78) for complexity (negatively related). Thus, these *Technology Characteristics* are accepted in the model.

4.4 Societal Level factors

Societal risk culture as a variable did not get enough support from the first round of interviews. One respondent indicated that "*risk culture is dependent on the type of innovation being adopted. Innovations with implicit risks will depend on risk consciousness of the adopters. Especially innovations in which financial loses easily occur"*. This appears to be a passive response. Another respondent who disagreed said that "*for societal level, risk-taking culture might not be very relevant and impactful when it comes to adoption of mobile innovations at firm level"*. The only respondent who agreed, gave a general endorsement for each of the variables at the societal level. This dilemma was resolved by measuring risk culture at both the firm level, and societal level. From responses of the second round interview, *firm level risk culture* realized an index score of 15 (0.83) while *societal risk culture* realized an index score of 11 (0.61), therefore *societal risk culture* is rejected from the model.

Trust is another variable of culture. In the first round of interviews it did not get any negative comment or disagreement. It got three support from industry with one stating its effect as "*trust is built over time. But it (trust) affect the continuous use of the innovation. This is directly linked, and fundamental"*. In the second round interview *Societal Trust* realized an index score of 10 (0.56), therefore is deleted from the model.

In the discussion of **Government Policy** there was a distinction made by one academic respondent and two industry repondents, between laws and policy. One explanation was that "*laws are legal instruments to enable the mobile innovation,*

while policies are frameworks and focus to guide government actions". Thus in their view, government policies regarding an innovation may simply indicate what government preference and direction will be and what government chooses to support. Laws on the other hand indicates what is permitted and what is not permitted. In this regard therefore, *government regulation* on innovation (Tornatzky & Fleischer, 1990) is now decoupled from *government policy***.** From the second round interview, government laws realized an index score of 16 (0.89) while government policy realized an index score of 15 (0.83), therefore both *government laws* and *government policy* are accepted in the model.

The availability of a reliable **Digital Media Infrastructure** was mentioned as a necessary bedrock for adopting mobile innovations. One example was that *"the availability of 2.0 internet technology in Ghana enabled the use of social media in Ghana"*. This concept in captured in the TOE framework as technology support infrastructure (Tornatzky & Fleischer, 1990). *Innovation Infrastructure* is cited in the second round on interviews as an overarching construct to cover all technical readiness and it realized an index score of 14 (0.78). Therefore, it is accepted in the model.

Media discussion on the mobile innovation (Opinion leadership) was mentioned as another important environmental factor that affects its adoption. This is confirmed from the diffusion theory by a construct called opinion leadership (Rogers 1962). Rogers (1962) argued that the active adoption, promotion or discussion on an innovation by opinion leaders, escalates the adoption of an innovation. In the second round interview, *Opinion leadership* realized an index score of 13(0.72), therefore is accepted in the model.

Successive government commitment to promoting an innovation has been cited as an important variable in the developing country context. This is summarized from one respondents as follows: *"there needs to be a new variable on political actions. That is commitment of successive governments' actions towards the previous government championed innovations, and policy. For developing country context, the politics associated with any innovation can affect the success of the innovation"*. The discussions noted that, for developing country contexts, successive governments have consistently abandoned previous government's initiatives in an attempt to undo their achievements or to commit the limited resources to their own initiatives. This has been the bane of innovation initiatives of every government. If successive governments are committed to previous government innovative initiatives, it will inspire organizations to adopt that innovation, knowing that the innovation has a future use in the country. In the study of government initiatives Mathews (2012) found that the commitment of successive government to a previous government initiative is critical to the success of an initiative (Innovation). Successive government commitment realized an index score of 15 (0.83) from the second round responses, therefore *Successive government commitment* is accepted in the model.

4.5 New relationships discovered

Data collected from the first round suggested an overwhelming support from both industry and academia for some new relationships, which were not anticipated in the F-TAM model (Doe et al., 2017). These include –

Personal level factors influences societal level factors and vice-versa. It is widely expected that the employees of the firm will influence their peers who do not work within the same working environment, and their peers will likewise do the same. From the second round of interviews, the link from personal level factors to societal level factors realized an index score of 9 (0.5) and therefore is rejected. The link from societal level factors to personal level factors received an index score of 10 (0.56). *Thus societal level factor is accepted in the model to lead to personal level factors.*

Personal level factors moderates the link between the firm factors and firm adoption. The personal attitudes and perceptions of employees will make them support and embrace the innovation faster, thus being a moderating effect. The second

round of interviews shows that this link realized an index score of 14 (0.77). Thus, personal level factors are ***accepted*** in the model to moderates the link between the firm factors and firm adoption.

Firm level factors have a reciprocal effect on personal level factors. As firm level factors are realized, it affects the perceptions and attitudes of employees. This linkage realized an index score of 9 (0.5) in the second round of interviews, and is therefore ***rejected***.

Firm adoption leading to societal level factors. As one respondent captures it "*private firms are always first to adopt an innovation before government reacts with policies and regulations. But where governments champion the adoption of an innovation, it diffuses (mass adoption) faster*". Thus, when a firm adopts an innovation, that firm becomes an opinion leader within the innovation society, thereby creating the need for government regulations, discussions, and support. This linkage realized an index score of 10 (0.56). However, this linkage is suspended as it results in a loop (feedback effect) in the model as the dependent construct (endogenous construct) of Firm Adoption, and will end up being an exogenous construct for one of its antecedents. More so, the inverse relationship of societal level factors leading to firm adoption realized a higher index score of 12 (0.67) and was accepted

Firm level factors influencing societal level factors and vice-versa. It is widely expected that firm level factors influence societal level factors. Firm level factors leading to societal level factors realized an index score of 7 (0.37) and was therefore rejected. Societal level factors leading to firm level factors realized an index score of 13 (0.72) and therefore accepted in the model.

Societal level factors moderates the link between firm factors and firm adoption. This was already anticipated in the initial F-TAM model. This relationship realized an index score of 16 (0.89) and was therefore accepted.

Firm level adoption influences personal level factors (reciprocal effect). It is widely expected that, just as personal level factors influences firm level adoption, firm level adoption influences personal level factors. This relationship realized an index score of 11 (0.61). This creates a look effect in the model, as the dependent construct (endogenous construct) ends up becoming an independent construct (exogenous construct) for one of its antecedents. Moreover, personal level factors lead to firm adoption with a higher score of 15 (0.83). Thus, firm adoption leading to personal level factors is suspended in the model.

Firm adoption influences firm level factors. As a firm adopts an innovation, its internal and external environment is influenced to adopt the innovation, thereby increasing the firm level factors further. This relationship realized an index score of 11 (0.611), however this creates a loop effect in the model as a dependent construct (endogenous construct) of firm adoption and ends up becoming an exogenous construct of one of its antecedents. Thus, firm adoption leaning to firm level factors is suspended in the model.

Whether **societal level factors directly lead to firm level adoption** it became an albatross that could not be unraveled easily. Whereas one academic and one industry respondent faintly suggested that relationship, an industry respondent vehemently disagreed with a clear explanation as *"societal level factors do not directly lead to firm level adoption of innovations. However they serve as a strong marketing point, which indirectly aids in boosting a firms interest in innovations"*. This disagreement was supported by another academic respondent. Thus in their view, societal level factors can lead to the firm level adoption *only* through firm level factors (Indirect) and moderate the speed with which firms adopt. Given that the responses were qualitative, this relationship was included in the second round of interviews, and realized an index score of 12 (0.67). Societal level factors leading to firm adoption is therefore accepted in the model.

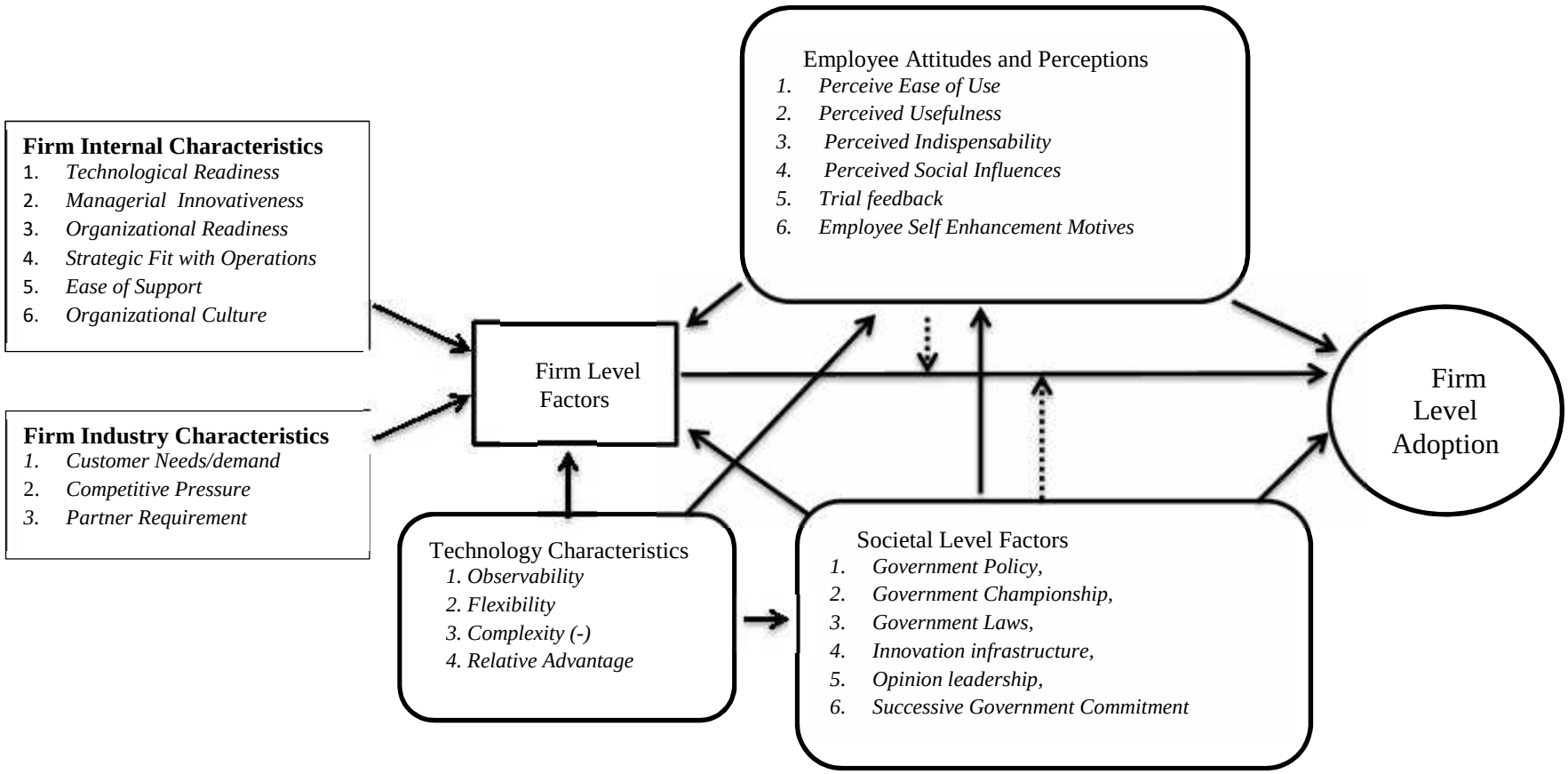

Figure 2: Revised Firm Technology Adoption Model (Revised F-TAM)

In the revised F-TAM model shown in figure 2 above, the following propositions are confirmed:

Proposition 1: Personal level factors lead to firm adoption

Proposition 2: Personal level factors lead to firm factors

Proposition 3: Firm factors lead to firm adoption

Proposition 4: Societal level factors moderate the relationship between firm level factors and firm adoption

The following new propositions made:

Proposition 5: *Personal level factors moderate the relationship between firm factors and firm adoption*

Proposition 6: *Societal level factors influence personal level factors*

Proposition 7: *Societal level factors influence firm level factors*

Proposition 8: *Societal level factors lead to firm adoption*

Proposition 9: *Technology factors influence employee factors*

Proposition 10: *Technology factors influence firm level factors*

Proposition 11: *Technology factors influence societal factors*

5 Conclusions and Recommendations

In this study, the authors sought to examine: a) the degree to which the F-TAM reflect the adoption pattern among SMEs in Ghana, b) whether there are other factors of variables that are not accounted for in the F-TAM, and c) whether a change in the model makes the model more valid?

a) To what degree does the F-TAM reflect the adoption pattern among SMEs in Ghana? Data from the first and second round of Delphi interviews indicates a very high degree of facial validity. All variables at the personal level, as well as the firm level, were seen to be valid. None were rejected. Only two variables at the societal level were rejected at that level, but they were re-introduced at the firm level and found to be valid. On the whole, the variables in the revised F-TAM model contain 62% of variables from the initial F-TAM model (Doe et al., 2017). While some old variables, such as industry adoption at the firm level, were decomposed into three variables of customer demands, industry pressure and partner requirement, others were reclassified. Thus, the F-TAM model of Doe et al. (2017) reflects the adoption pattern of SMEs in Ghana.

b) Are there other factors that are not accounted for in this model? By the end of the second round of Delphi interviews, two new variables were realized at both the personal level and the firm level; four new variables were realized at the societal level, thus there were eight new variables within the constructs on the initial F-TAM model. A new construct of technology characteristics was introduced into the model, containing four variables. These were unaccounted for in the initial F-TAM model, reflecting a stronger reality of mobile technology adoption among SMEs in Ghana.

c) Could changes in the model make the model more valid? Thirteen (13) changes in the model pattern were suggested by the industry as well as the academia. Three (3) of these changes were rejected. Another three (3) were suspended due to their ability

to cause a loop effect in the model. Thus, seven changes or linkages between the constructs have been accepted to make the model more representative.

5.1 Recommendation for future studies

The revised model (figure 2) reflects industry experts and an academic view point of what explains the adoption of mobile innovations among SMEs in Ghana. The authors recommend further testing of the model, using advanced statistical tools with a large sample of quantitative data from SMEs. Technology characteristics and firm adoption must be measured reflectively, while the other constructs of employee attitudes and perceptions, firm level factors, and societal level factors should be measured reflectively. In the process of building the revised model, some linkages or relationships were suspended due to their ability to cause loop effects in the model. We recommend independent testing of these linkages as well. The verification of these suspended linkages will throw further light on the total structure or linkages in the SME innovation adoption ecosystem in a developing country like Ghana.

References

1. Attopley, F.Y. (2016). Emerging Trends in the Financial Industry of Ghana. International Journal of Management and Scientific Research, 1(2), 4-9.
2. Avella, J. R. (2016). Delphi panels: Research design, procedures, advantages, and challenges. International Journal of Doctoral Studies, 11, 305-321. Retrieved from http://www.informingscience.org/Publications/3561
3. Bank of Ghana, (2016). www.ghana.gov.gh: guidelines to regulate mobile financial services- Retrieved from- http://www.ghana.gov.gh/index.php/media-center/news/1791-bog-issues-guidelines-to-regulate-mobile-financial-services, accessed:25 March 2017
4. Bannock, G. (2005), The economics and management of small business: an international perspective, Routledge, New York.
5. Bannock, G., Baxter, R. E. & Davis, E. (1992), The Penguin dictionary of economics, 5th edn, Penguin Books, London, England; New York, N.Y., USA.
6. Boateng, R., Hinson, R., Heeks, R., & Molla, A. (2008). E-commerce in Least Developing Countries: Summary Evidence and Implications. Journal of African Business, 9(2; The Haworth Press.
7. Berelson, B.(1952) Content Analysis in Communication Research. New York: Free Press.
8. Chang, C. C., Yan, C. F., & Tseng, J. S. (2012). Perceived convenience in an extended technology acceptance model: Mobile technology and English learning for college students. Australasian Journal of Educational Technology, 28(5).
9. Choi, S. B., Park, B. I., & Hong, P. (2012). Does ownership structure matter for firm technological innovation performance? The case of Korean firms. Corporate Governance: An International Review, 20(3), 267-288.
10. Datta, P. (2011). A preliminary study of ecommerce adoption in developing countries. Information Systems Journal, 21, 3–32

11. DiMaggio, P., & Powell, W. W. (1983). The iron cage revisited: Collective rationality and institutional isomorphism in organizational fields. American sociological review, 48(2), 147-160.
12. Doe, J. K., Van de Wetering, R., Honyenuga, B., & Versendaal, J. (2017). "Toward A Firm Technology Adoption Model (F-TAM) In A Developing Country Context" MCIS 2017 Proceedings. 23. http://aisel.aisnet.org/mcis2017/23
13. Ezzy, D. (2002). Qualitative analysis: practice and innovation, Allen & Unwin, Crows Nest, N.S.W.
14. Eisenhardt, K. M. (1989). Building theories from case study research. Academy of management review, 14(4), 532-550.
15. Finfgeld-Connett, D. (2010). Generalizability and transferability of meta-synthesis research findings. Journal of Advanced Nursing, 66,246–54
16. Falch, M. (2004). Tele-centres in Ghana, Center for Tele-Information, Technical University of Denmark, Telematics and Informatics - Special issue: Telecommunications development in Africa archive Volume 21 Issue 1
17. Ghobakhloo, M., Arias-Aranda, D., & Benitez-Amado, J. (2011). Adoption of e-commerce applications in SMEs. Industrial Management & Data Systems, 111(8), 1238-1269.
18. Grandon, E. E., & Pearson, J. M. (2004). Electronic commerce adoption: an empirical study of small and medium US businesses. Information & Management, 42(1), 197-216.
19. Gurtner, S., Reinhardt, R., & Soyez, K. (2014). Designing mobile business applications for different age groups. Technological Forecasting and Social Change, 88, 177-188.
20. Hauser, J., Tellis, G. J., & Griffin, A. (2006). Research on innovation: A review and agenda for marketing science. Marketing Science, 25(6), 687-717.
21. Hinson, R. & Sorensen, O. (2006). E-business and small Ghanaian exporters: Preliminary micro firm explorations in the light of a digital divide. Online Information Review, 30(2), 116-138.
22. Hofstede, G. (2003). Culture's consequences: Comparing values, behaviors, institutions and organizations across nations. Thousand Oaks, CA: SAGE Publications. ISBN 978-0-8039-7323-7
23. Iacovou, C. L., Benbasat, I., & Dexter, A. S. (1995). Electronic data interchange and small organizations: Adoption and impact of technology. MIS Quarterly, 465-485.
24. Karanasios, S. S. (2008), An E-commerce Framework for Small Tourism Enterprises in Developing Countries, Faculty of Business and Law Victoria University, Australia.
25. Kennedy, R. M., & Hobohm, S. (1999). Supporting Private Industry: Capacity Building for Private Sector Development in Africa. Working Paper 3. United Nations Industrial Development Organization, Vienna.
26. Linstone, H. A., & Turoff, M. (Eds.) (2002). The Delphi method: Techniques and applications. Retrieved from http://is.njit.edu/pubs/delphibook/delphibook.pdf
27. Maimbo, H., & Pervan, G. (2005). Designing a case study protocol for application in IS research. PACIS 2005 Proceedings, 106.
28. Mathews, J. A. (2012). Green growth strategies—Korean initiatives. Futures, 44(8), 761-769.
29. Maxwell, J. A. (2005). Qualitative research design: an interactive approach, 2nd edn, Sage Publications, Thousand Oaks, CA.
30. Mensa, S. (2004). A review of SME financing schemes in Ghana. Paper presented at UNIDO Regional conference on SME financing small and medium scale enterprises, Accra, Ghana. 15-16th March, 2004. Ghana: SEM international Associates Limited
31. Miles, M. B., Huberman, A. M., & Saldana, J. (2014). Qualitative data analysis: A method sourcebook. CA, US: Sage Publications.
32. National Communications Authority (2016). Industry Information – Telecom Subscribers for March 2016, Retrieved from http://www.nca.org.gh/downloads/Telecom_subscription_trends_for_ March_2016.pdf

33. Oliveira, T., Faria, M., Thomas, M. A., & Popovič, A. (2014). Extending the understanding of mobile banking adoption: When UTAUT meets TTF and ITM. International Journal of Information Management, 34(5), 689-703.
34. Ozturk, A. B., Bilgihan, A., Nusair, K., & Okumus, F. (2016). What keeps the mobile hotel booking users loyal? Investigating the roles of self-efficacy, compatibility, perceived ease of use, and perceived convenience. International Journal of Information Management, 36(6), 1350-1359.
35. Payne, J. E. (2002), E-Commerce Readiness for SMEs in Developing Countries: A Guide for Development Professionals, Academy for Educational Development/LearnLink.
36. Rogers, E.M. (1962). Diffusion of Innovations, NY: Free Press,
37. Saldaña, J. (2015). The coding manual for qualitative researchers. Sage Publications Ltd, London, United Kingdom.
38. Schofield, J. W. (2002). 'Increasing the Generalizability of Qualitative Research', in M. B. Miles & A. M. Huberman, (eds.), The qualitative researcher's companion, Sage Publications, Thousand Oaks; London, pp. 171-203.
39. Soares-Aguiar, A., & Palma-dos-Reis, A. (2008). Why do firms adopt e-procurement systems? Using logistic regression to empirically test a conceptual model. IEEE Transactions on Engineering Management, 55(1), 120-133.
40. Škerlavaj, M., Song, J. H., & Lee, Y. (2010). Organizational learning culture, innovative culture and innovations in South Korean firms. Expert systems with applications, 37(9), 6390-6403.
41. Tagoe, N.A. (2016). Who Regulates the Mobile Money Operations by Telco's? The Need for an Effective and Robust Legislative and Regulatory Framework in Ghana. J Bus Fin Aff, 5(208), 2167-0234.
42. Tornatzky, L. G., Fleischer, M., & Chakrabarti, A. K. (1990). Processes of technological innovation. Lexington, Mass.: Lexington Books
43. Tigre, P. B. & O'Connor, D. (2002),. Policies and Institutions for E-Commerce Readiness: What Can Developing Countries Learn from OECD Experience?, OECD Development Center.
44. UNCTAD (2004). Use of the Internet for efficient international trade: guide for SME managers, United Nations Publication, New York and Geneva.
45. Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. Decision Sciences, 39(2), 273-315.
46. Vize, R., Coughlan, J., Kennedy, A., & Ellis-Chadwick, F. (2013). Technology readiness in a B2B online retail context: An examination of antecedents and outcomes. Industrial Marketing Management, 42(6), 909-918.
47. Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. MIS Quarterly, xiii-xxiii.
48. Yin, R. K. (1994), Case study research: design and methods, 2nd edn, Sage, Thousand Oaks, CA.
49. Yin, R. K. (2013). Validity and generalization in future case study evaluations. Evaluation, 19(3), 321-332.
50. Yun, S., Takeuchi, R., & Liu, W. (2007). Employee self-enhancement motives and job performance behaviors: Investigating the moderating effects of employee role ambiguity and managerial perceptions of employee commitment. Journal of Applied Psychology, 92(3), 745.
51. Zachary, P.G. (2002). Ghana's digital dilemma. Available from:<http://www.ghanaweb.com /GhanaHome Page/features/artikel.php?ID=25024>