Adoption of financial innovation in the Ghanaian banking industry

Daniel Domeher[#], Joseph M. Frimpong[*] and Thomas Appiah[†]
[#,*]Kwame Nkrumah University of Science and Technology, School of Business
[†]Valley View University, Department of Banking and Finance, Ghana
[#]Corresponding author: dommedann@yahoo.com

Abstract

This century has been full of innovations: new technologies, new products, new services and a plethora of new industries have emerged. Yet the call for innovation in business, especially in financial services, has never been more intense. Although research on this topic exists, there is no empirical evidence regarding the critical factors influencing customer adoption of electronic banking innovation in Ghana's banking industry. The aim of this article is therefore to investigate the factors influencing the adoption of financial innovation in Ghana's banking industry. Surveys were conducted involving 405 clients of the six major banks in the country. Using logistical regression, the results amongst other things show that innovation attributes such as lack of complexity, compatibility and perceived usefulness provided by financial innovation, increase the likelihood of e-banking adoption. In light of these findings, the study recommends that banks should focus on designing both useful and easy-to-use e-banking products that will attract potential and existing customers.

Keywords: e-banking, financial innovation, Ghana, technology, West Africa

1   Introduction

The banking industry globally has undergone a substantial change over the years. The impact has been evident in changes in the way financial services are delivered to customers. While the traditional functions performed by banks have remained relatively unchanged over the past few decades, the structure of the industry has witnessed dramatic change. Over the past decade, there has been a significant increase in the number of alternative channels available for the delivery of financial services. Traditional delivery methods have given way to new delivery technologies which include e-banking products such as Internet banking, mobile banking and various Automated Teller Machine (ATM) products. As indicated by Sweeny and Morrison (2004), innovations in the banking industry have changed retail banking as far as the delivery of financial services is concerned. Collaborating with hardware, software and telecommunication companies, banks are introducing new ways for consumers to access their account balances, transfer funds, pay bills, and buy goods and services without using cash, cheques or leaving home (Frei *et al.*, 1998).

Various authors such as Singh (2006), Im *et al.* (2003) and Rogers (1995) posit that innovation has become one of the most attention-grabbing subjects, drawing the interest of business and economic researchers due to its ability to give firms a competitive advantage. Innovation is important for the survival of every business

sector, and financial services are no different. Indeed, research confirms that innovation affects a firm's performance positively (Damanpour *et al.*, 2009). The extent to which the financial sector can make contributions to the economy depends, to a large extent, on the quality and quantity of the products and services it offers customers. Business entities wishing to restore customer confidence need to focus on innovative products that meet their customers' needs (Kumar, 2011). The benefits offered by banking innovations are two-fold: Banks relish cost reduction and market expansion while customers enjoy a wide range of services/products and convenient banking. Innovations provide an impetus for banks to improve their market performance by recovering from palpable inefficiencies prevalent in the banking industry, as is the case in Ghana and other emerging countries (Frimpong, 2010). Liberalised domestic regulations, intensified competition, rapid innovations in new financial instruments, and the massive growth in information technology have fueled the growing desire for innovation in the banking industry (Frei *et al.*, 1998).

While the vital importance of innovation in today's competitive climate has been widely proclaimed, innovation is not without its challenges. Many such challenges relate to how customers adopt related innovations. According to Woldie *et al.* (2008), it is one thing to innovate, but entirely another for the innovation to be accepted by consumers. Although innovation continues to enjoy massive interest on the part of business researchers, in Ghana the key factors influencing customers' adoption of such innovations in the banking industry have not been empirically examined. In the wake of expectations of increased competition, growing customer demands and new regulations in Ghana being likely add complexity to banks' business models (Ghana Banking Survey, 2010; 2011), developing and planning effective innovative strategies are critical for their growth and survival. The aim of this article is to examine the critical factors which determine whether or not banking innovations are adopted. The study has a number of theoretical and managerial implications: First, drawing from innovations diffusion theory (Rogers 1995), the study offers a model for understanding the key factors that influence consumer adoption of innovative e-banking products. Since no prior study exists in Ghana on the subject matter, this article will contribute significantly to the body of knowledge on innovation adoption in the Ghanaian banking industry. From a managerial point of view, this article provides a guide to industry players and policy makers on how to strategically facilitate the operations of the industry by implementing policies that will enhance customer adoption of innovative products. Indeed, industry experts will now be better informed when designing innovative products. This will ensure that they take into consideration the findings of the study to produce tailor-made products that fit the peculiar characteristics of Ghanaian banking clients. Theoretically, the article forms the basis for other, more extensive studies of the topic. The findings noted here reveal that innovation attributes (e.g., lack of complexity, compatibility and the relative advantage provided by financial innovations) have a significant positive effect on consumers' adoption of those innovations. Perceived financial risk has a significant negative effect on consumers' adoption of financial innovations.

The study also found that the education level of a bank's customers significantly influences the adoption of innovative banking products.

The rest of the article is organised as follows: Sections two is devoted to a literature review. The methodology adopted in conducting this research, the results and discussions, are outlined in sections three and four respectively. The final section provides the summary and conclusion of the study.

1.1 Financial innovation in the Ghanaian banking sector

Information and communication technologies (ICTs) are changing the way financial products are assessed by customers in sub-Saharan Africa (Abor, 2004). In Ghana, technological developments have created new delivery channels for banking products and services, such as Automated Teller Machines (ATMs), Internet banking and PC and mobile banking. Over the years, these innovations have grown increasingly important in Ghanaian banks (Abor, 2004). Traditionally, banks have sought technologies which enabled them to serve their clients more cost-effectively and made them more useful to their clientele. Their main concern has been to serve clients more conveniently, while growing their profits and improving their competitiveness. Arguably the most revolutionary electronic innovation in Ghana (and the world) has been the ATM (Abor, 2004). In Ghana, banks that offer ATM services have networked their machines, to increase their utility to customers. Since Trust Bank Ghana introduced ATMs in 1995, the technology has found acceptance on a massive scale from the banking industry. Today, almost all commercial banks in the country offer ATM services to their clients. The combined services of the automated and the human tellers means Ghanaian banks have become more productive during banking hours. Also, bank customers benefit immensely as a result of shorter queues in banking halls. Since ATM services offer an alternative to queuing in banks, customers are able to invest such time saved in other productive activities. As indicated by Rose (1999), ATMs have become a cost-efficient means of yielding higher productivity.

Internet and mobile banking have received massive acceptance from the banking industry. Most banks collaborate with telecommunication companies to provide banking services via the Internet and mobile phones, which they hope will help them gain sustainable competitive advantage (Hinson *et al*., 2006; Asante *et al*., 2011). The idea of Internet banking, according to Essinger (1999), is 'to give customers access to their bank accounts via a web site and to enable them to undertake certain transactions on their account, given compliance with stringent security checks'. In Ghana, most banking firms have introduced Internet banking in their operations. By its nature, Internet banking offers customers greater convenience and flexibility, coupled with virtually absolute control over their banking. Mobile banking (Internet banking using mobile devices, also known as M-banking, embanking, SMS banking etc.) has also become an important channel for delivering financial products to Ghanaian banking customers. With the development of mobile applications, customers are able to perform account balance and transaction history inquiries,

transfer funds and pay bills via mobile devices such as cell phones, smartphones and PDAs (personal digital assistants).

Backed by improvements in IT, these innovations in the Ghanaian banking industry are helping to improve financial intermediation. The widespread introduction of these products onto the banking market means customers are benefiting from such innovations. The introduction of technological (e-banking) innovations has meant shorter queues inside banks, which has helped to improve the convenience of banking. Also, these innovations have helped to reduce inefficiencies in the banking industry (see Frimpong, 2010). As observed by Acquah (2006), innovations in electronic banking (e-banking) in Ghana have helped to improve not only efficiency but also financial intermediation. However, the factors influencing the adoption (usage) of such innovative products have not been examined empirically in the context of the Ghanaian banking industry, and this gap is what largely informed this study.

2   Theoretical literature review

The need for innovation in the financial services industry as a whole cannot be overemphasised. Merton (1992) argues that financial innovation drives the financial system towards the theoretically limiting goals of zero transaction costs and dynamically 'complete' product markets. The ultimate criterion when judging financial innovation is the extent to which it increases the efficiency of financial intermediation; as with innovations in other industries, financial firms can invent a brand new class of products (financial instruments, techniques and markets), modify existing products, or combine the characteristics of several different products, thereby making financial intermediation more efficient (Llewellyn, 1992). Two categories exist – product and process innovations. The former are exemplified by new derivative contracts, new corporate securities or new forms of pooled investment products, while the latter are typified by new means of distributing securities, processing transactions or pricing transactions (Tufano, 2011).

The *framework of innovation adoption* is key to understanding consumer acceptance of new products, as explained by the theory of innovations diffusion. The diffusion process involves how innovations spread within a market (Schiffman & Kanuk, 2009). Adoption therefore has to do with the acceptance and/or use of a product by the people for whom it was designed. Determinants of innovation adoption may include the perceived attributes of an innovation, the voluntary nature of the decision to adopt it, and the channels by which an innovation reaches the adopter (Rogers, 1995). Although personal characteristics have been identified as major predictors of consumers' adoption of an innovation, several researchers have shown that it is the perceived attributes of the innovation itself, rather than the characteristics of the innovators, that are stronger predictors of the adoption decision (Black *et al.*, 2001; Polatoglu & Ekin, 2001).

The adoption of a product or service involves a process. According to Rogers and Shoemaker (1971), before consumers are ready to adopt goods or services, they go through the process illustrated in Figure 1.
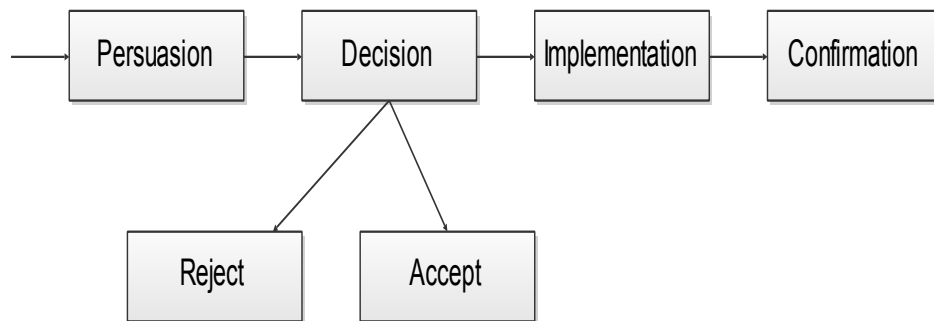
Daniel Domeher, Joseph M. Frimpong and Thomas Appiah

Figure 1: Innovations adoption process

Source: Adapted from Rogers, 1995.

The first stage of the process involves consumers learning about the innovation; i.e., consumers are informed or educated on the use and importance of the innovation. Having accomplished this, knowledge is deemed to have been acquired. Persuasion occurs when the person forms either a positive or negative attitude towards the innovation. Decision occurs when the person decides to either reject or accept the innovation. Implementation occurs when the person implements the idea or starts using the innovation. Confirmation occurs when the person seeks confirmation of or reinforcement regarding the innovation – their perception of the innovation may be negative or positive, depending on their experience.

Two sets of factors are thought to influence consumer adoption of innovations: 1) The characteristic of the innovation (perceived ease of use/lack of complexity, relative advantage/perceived benefit, compatibility, financial risk, and information on products); and 2) the characteristics of potential users of the innovation (e.g., age, educational background and income).

2.1 Empirical literature review and hypothesis development

The current study investigates the extent to which perceived innovation attributes and adopter characteristics influence e-banking innovation adoption in the Ghanaian banking industry. All the variables hypothesised in the study and their expected effects on customers' attitudes towards adopting innovative e-banking innovations are discussed next.

2.1.1 Innovation attributes influencing adoption

E-banking innovations are technological innovations since they allow customers to access financial services in a convenient and quick manner, without having to visit the premises of a financial facility. Such innovations also help to improve the efficiency of financial intermediation within the financial services industry (Laukkanen, 2007). The extent to which innovation attributes influence the adoption of innovation has been copiously documented in the literature. Lean *et al*. (2009); Tan and Thoen (2001) and Teo and Pok (2003) have shown that perceived innovation

attributes significantly influence decisions regarding the adoption of technology-based innovations. According to Rogers (1995), five important innovation attributes may affect adoption decisions: 1) perceived usefulness (the extent to which innovation may bring about benefits to customers); 2) ease of use; 3) compatibility (the extent to which innovation is consistent with the existing values, beliefs and experiences of the adopters); 4) observability (the extent to which innovation is visible to others); and 5) triability (the degree to which an innovation may be experimented with). All these attributes may influence the uptake and use of innovations, but perceived usefulness, ease of use and compatibility have been identified as the most important attributes influencing the adoption and diffusion of e-banking innovations (Vijavasarathy, 2004; Papies & Clement, 2008). Thus, for the purposes of this study, these three perceived attributes are considered. In addition, perceived financial risk, and information and guidance offered by banks are also deemed likely to impact the adoption of innovative e-banking products.

Perceived ease of use (PEU) describes the extent to which innovative e-banking products are easy to understand and operate. Innovations which customers perceive as difficult to understand may be underutilised, since they would require much time and effort to master. As indicated by Black *et al.* (2001) innovations which customers perceive as complex will take a lot of time before being adopted – banks will need to win over their customers. In other words, perceived ease of use when it comes to innovative e-banking products is expected to have a positive influence on adoption. A study conducted by Kent *et al.* (2008) in Estonia established that the PEU of innovative banking products positively influences customer adoption of such innovations. Based on the above information, the first hypothesis is formulated as follows:

H1. Perceived ease of use of e-banking innovations increases the likelihood of adoption (continuous usage)

Financial risk refers to the potential for monetary loss due to transaction errors or bank account misuse. Kuisma *et al.* (2007) indicate that many consumers resist using innovative e-banking products because they fear such losses. Off-line banks generally employ clerical personnel to verify whether the payee's account number and the sum desposited or withdrawn are accurate, but such safeguards are rarely available in online banking, and this can evoke feelings of insecurity and uncertainty. Several researchers have added perceived risk to the set of factors important for adoption (Tan & Teo, 2000; Polatoglu & Ekin, 2001). Consumers' perceptions of risk are deemed to influence their evaluations, choices and behaviour strongly (Campbell & Goodstein, 2001). Lack of security and possible privacy concerns have been recognised as major obstacles to adoption: Howcroft *et al.* (2002) found security concerns to be the major factor discouraging the adoption of electronic banking services – they argue that perceived risk, as a critical attribute, is particularly applicable to services where it is not possible to derive quality cues from tangible aspects. Perceived risk increases with higher levels of uncertainty or with an increased chance of negative consequences (Campbell & Goodstein, 2001). Yiu *et*

al. (2007) observe that risk is a major factor impeding the adoption of Internet-based financial products. In Australia, Sathye (1999) conducted a study on the adoption of Internet banking among bank customers, with local residents and business firms making up the respondents. The study found that security concerns are one of the main obstacles to the adoption of e-banking innovations in Australia. Therefore, the following hypothesis is proposed:

H2. Perceived financial risk associated with e-banking products reduces the likelihood of adoption (continuous usage)

Rogers (2003, p. 15) states that 'compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters'. An innovation which is incompatible with an individual's needs may negatively affect his or her innovation adoption (Sherry, 1997; McKenzie, 2001). Vijayasarathy (2004) observes that compatibility is one of the best perception-based indicators of attitudes towards the adoption of online innovation: If an innovation is compatible with an individual's needs, then uncertainty will decrease and the rate of adoption will increase. In Singapore, Gerrard and Cummingham (2003) examined the factors affecting the adoption of e-banking innovations. Their study identified eight characteristics which influence the rate of adoption, among which is compatibility as an innovation attribute influencing the adoption of e-banking innovations such as Internet and mobile banking. The study therefore expects that perceived compatibility of innovation will have positively influenced e-banking innovation adoption. Hence, the third hypothesis:

H3. Perceived compatibility of e-banking innovations increases the likelihood of adoption (continuous usage).

Perceived usefulness as an attribute of innovation adoption means that a new innovative service must be perceived to be better than its predecessor (Eriksson *et al*., 2008). In the case of innovative banking products such as Internet banking, ATM and mobile banking, perceived usefulness is achieved primarily through added convenience in the form of freedom from time and special constraints. Such innovative banking products help consumers manage their personal budgets more efficiently, enabling them to keep an eye on the status of their accounts and on other financial matters. According to Tan and Teo (2000), perceived usefulness is measured primarily by assessing an innovation's superiority in terms of overall convenience. Studies by Kolodinsky *et al*. (2004) indicate that perceived usefulness is positively related to consumers' adoption (continuous usage) of innovative banking products. In reviewing the literature, perceived usefulness or relative advantage have been identified as crucial constructs which positively affect the acceptance of e-banking innovations (Taylor & Todd, 1995; Lu *et al*., 2003). The fourth hypothesis is therefore formulated as follows:

H4. Perceived usefulness (relative advantage) offered by e-banking innovations increases the likelihood of adoption (continuous usage)

Current and prospective customers need to know and understand the new financial products which their banks introduce. The extent to which consumers will adopt (continue to use) such products depends on their understanding of such products. According to a study by Laukkanen and Kiviniemi (2010), the education and guidance a bank offers has the most positive significant effect on customers' acceptance of innovations. According to the authors, the quality of information provided by the banks when new products are introduced creates the necessary awareness and enhances customers' confidence when it comes to adoption. Also, Lee and Chung (2009) empirically verified that the quality of education offered by banking firms has a positive impact on the adoption of technological financial innovations. Therefore, the following hypothesis is proposed:

> **H5**. The quality of education and guidance offered by banking firms increases the likelihood of adoption of e-banking innovations

2.2.2 Demographic characteristics influencing innovation adoption

The personal characteristics of bank customers (age, education level and income) have been identified as influencing innovation adoption. Rogers (1995) makes several generalisations about those adopter characteristics which affect innovativeness. The relationship between age and innovativeness is generalised as insignificant. However, some studies found that early adopters are younger, e.g., AbuShanab and Pearson (2007) found age to be a significant factor that positively influences the adoption of e-banking innovations. Another generalisation which Rogers arrived at, is related to the level of education of individuals. Rogers (1995) found that those with more formal education are more likely to understand the processes involved in conducting e-banking transactions and are therefore more likely to adopt such innovations. Customers' income levels are another major demographic factor which influences the adoption of e-banking innovations. According to AbuShanab and Pearson (2007), income levels positively influence the adoption of e-banking, since those with higher incomes will more readily adopt e-banking products to facilitate access to their funds. Kolodinsky *et al.* (2000) found that the likelihood of adopting e-banking innovations rose amongst customers with greater financial assets and higher levels of education. They also found that individual consumer attitudes and beliefs were stronger influences than demographics. However, Laforet and Li (2005) established an insignificant relationship between level of education and e-banking innovation adoption.

To sum up, the demographic characteristics of customers (education and income levels) affect innovation adoption. Therefore, the following hypotheses are generated:

> **H6:** Customers with higher levels of education are more likely to adopt (continue to use) e-banking products
> **H7:** Customers with higher incomes are more likely to adopt (continue to use) e-banking innovations.

H8: Younger individuals are more likely to adopt (continue to use) e-banking products.

3 Methodology

This section presents the methodology adopted for achieving the objectives of the study. Specifically, the section examines the data sources and techniques employed for data analysis.

3.1 Data

The survey was conducted in 2013, amongst 405 customers of the six major banks in Ghana. A structured questionnaire was developed to solicit responses from customers regarding their perception of e-banking innovations introduced by banking firms in Ghana. Respondents constituted bank customers who were aware of e-banking products such as ATMs, and Internet and mobile banking.

3.2 Measurement instruments

The research variables were measured using multiple item scales which were adapted from previous studies. The scales of the three innovation attributes (perceived usefulness, compatibility and perceived ease of use) were adapted from a study by Karahana *et al.* (1999). The construct used to assess information quality and perceived financial risk was adopted from Yiu *et al.* (2007). Data on age, monthly income levels and level of education were solicited from the respondents through the research instruments. Their attitudes towards the adoption of innovative banking products (dependent variable) were measured as either positive or negative. The items used in the measurement were coded on a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5). Each construct involved a number of items used in the measurement (see attached questionnaire). Table 1 provides a summary of the variables and how they were measured.

Table 1: Measurement and notations of dependent and independent variables

Variable	Measure	Notation
Dependent variable **(Adoption intentions)**	Positive attitude towards adoption (coded 1) and negative attitude towards adoption (coded 0)	
Independent variables Perceived ease of use	Likert scale	$PEU(X_1)$
Perceived financial risk	Likert scale	$PFR(X_2)$
Compatibility	Likert scale	$COMP(X_3)$
Perceived usefulness	Likert Scale	$PU(X_4)$
Education and guidance	Likert Scale	$INFO(X_5)$
		$EDCL(X_6)$
Education level of respondents	Years in formal education	$INCL(X_7)$
		$AGE(X_8)$
Income level of respondents	Monthly income (GH¢)	
Age of respondents	Age in years	

3.3 *Justification of research model*

A logistic regression technique was employed to examine the factors influencing the adoption of innovative e-banking products. This technique was employed to find the model which would best fit in describing the relationship between the dichotomous characteristic of interest (adoption intentions) and the eight independent variables. Logistic regression has been recognised as a new approach to obtain more precise estimates on the level of adoption in social sciences (Adeogun *et al.*, 2008). Before conducting the logistic regression, an exploratory factor analysis was done to group various variables embedded in the 21 questions into five constructs, namely: Ease of use, relative advantage, perceived financial risk, compatibility with client needs and information on the innovation. These construct were then used in the regression as independent variables to determine their influence on the adoption of innovative products. The five constructs together were found to explain 65 per cent of variations in innovation adoption.

Table 2: Factors loading of the various constructs employed in the study

Constructs	Factor loadings					Commu-nalities
	F1	F2	F3	F4	F5	
Perceived ease of use						
PEU1	0.832					0.742
PEU2	0.815					0.686
PEU2	0.775					0.614

Perceived usefulness					
PU1		0.803			0.652
PU2		0.752			0.579
PU3		0.742			0.620
PU4		0.699			0.610
PU5		0.683			0.702
Bank information					
BANKINFO1			0.852		0.743
BANKINFO2			0.830		0.728
BANKINFO3			0.810		0.648
BANKINFO4			0.603		0.458
Perceived financial risk					
PFR1				0.909	0.843
PFR2				0.828	0.821
PFR3				0.721	0.699
PFR4				0.707	0.603
Compatibility					
COMP1					0.851	0.743
COMP2					0.793	0.678
COMP3					0.775	0.621
COMP4					0.673	0.578
COMP5					0.591	0.514
Cronbach's Alpha	0.853	0.828	0.842	0.827	0.679	
No. of items	3	5	4	4	5	

Notes: Extraction method: principal component analysis; Rotation method: varimax with Kaiser Normalization. Rotation converged in 7 iterations.

Source: Field data, November 2013

To examine the factorability of the data, Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy were employed. The result shows that Bartlett's test of sphericity was significant (p=0.00<0.05), indicating that the factor analysis was appropriate. Also, the KMO index was 0.686, greater than the minimum requirement of 0.6 (Tabachnick & Fidel, 2007), showing that the data were good for factor analysis. As indicated in Table 2, most of the factor loadings were greater than 0.60, implying a reasonably high correlation between extracted factors and their individual items. The communalities of the 21 items ranged from 0.5 to 0.85, indicating that a large amount of variance was extracted by the factor solution (Hair *et al*., 2006).

The result of the reliability analysis shows that the Cronbach's alpha coefficients of the extracted factors range from 0.68 to 0.86. This is well above the minimum value of 0.6, which is considered acceptable as an indication of scale reliability (Hair *et al*., 2006). Thus, these values suggest good internal consistency of the factors.

3.4   Econometric model specification

The econometric model adopted for the study is modeled as

$$logit(p_i) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_n X_{ni}$$

Where P_i=is the probability of the presence of characteristic of interest. The logit transformation is defined as logged odds:

$$p_i = \frac{p_i}{1 - p_i}$$

Therefore, the logits (natural logs of the odds) of the unknown binomial probabilities are modeled as linear function of the X_i as;

$$logit(P) = Ln\left(\frac{P_i}{1-P_i}\right) - \beta_0 + \sum_{j=i}^{n} \beta_j X_{ji},$$

, thus the logit (P_i) is assumed to be a random variable which predicts the likelihood of consumer adoption of financial innovation:

$$\text{Likelihood of adoption} = P_i = \left(\frac{1}{1 + e^{-Logit(P_i)}}\right) = \frac{e^{Logit(P_i)}}{1 + e^{Logit(P_i)}}$$

The functional form of the regression model estimating the factors that affect the adoption of financial innovations in the banking industry was presented as follows:

Y= f (X$_1$, X$_2$, X$_3$, X$_4$, X$_5$, X$_6$, X$_7$, X$_8$,), Where:

Y= Adoption intentions

X₁: *Perceived ease of use*

X₂: *Perceived financial risk*

X₃: *Compatibility*

X₄: *Perceived usefulness*

X₅: *Education and support*

X₆: *Education level*

X₇: *Income*

X₈: Age

4   Results and discussion

4.1   Descriptive statistics

Table 3 provides a summary of the descriptive statistics of the independent variables used in the model. The average age of respondents is 32.5 years with standard deviations of 4.20. The average monthly income of the respondents is GH¢ 640 which is equivalent to $320. The average years in formal education are 13.5, indicating that respondents on average are high school leavers. On the scale of 1 to 5, the means of compatibility and perceived usefulness are 3.48 and 3.84 respectively.

Table 3: Descriptive statistics of independent variables

Variable	Minimum	Maximum	Mean	Standard deviation
PEU(X₁)	1	5	3.0708	0.79
PFR (X₂)	1	5	3.1136	0.78
COMP (X₃)	1	5	3.4810	0.63
PU(X₄)	1	5	3.8435	0.71
INFO(X₅)	1	5	3.4340	0.76
EDCL (X₆)	6	15	13.5	3.20
INCL(X₇)	450	2100	640	98.4
AGE (X₈)	19	62	32.5	4.20

Key: Perceived ease of use (PEU); Banking information/support (INFO); Perceived usefulness (PU); Perceived financial risk (PFR); Compatibility (COMP); Education level (EDUCL); Income level (INCL); Age (AGE)

4.2   Validation of the logit regression model

To examine the suitability of the logistic regression model, a number of tests were conducted. The Omnibus Tests of Model Coefficients gives an overall indication of how well the model performs (Pallant, 2011). This is referred to as a 'goodness-of-fit' test. For this set of results, a highly significant value is required. The results in Table 4 show that the test is highly significant (at $p<0.05$). Hence, the relationship between the combination of the independent variables and the dependent variable is verified and validated. The result of the Omnibus test is confirmed by the Hosmer-Lemeshow Goodness-of-Fit Test (see Table 5). The Hosmer-Lemeshow test provides a validation of the logit model and is appropriate when the significance value is greater than 0.05 (Pallant, 2011). To diagnose the presence of multicolinearity in the logit model, the tolerance test was performed – it shows how much of the variability of the specified independent variable is not explained by the other independent variables in the model. All the observed tolerance values are greater than 0.10, indicating that there is no problem of multicolinearity in the regression model (Pallant, 2011).

Table 4: Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	170.518	16	.000
	Block	170.518	16	.000
	Model	170.518	16	.000

Source: Field data

Table 5: Hosmer and Lemeshow test

Step	Chi-square	Df	Sig.
1	10.691	8	0.220

Source: Field data

4.3   The model

To examine the contribution of each predictor variable to the model, the Wald test was employed (see Table 6). The useful piece of information on the variables in the equation table is provided in the Exp (β) column. These values are the odds ratios (OR) for each of the independent variables representing 'the change in odds of being in one of the categories of outcome when the value of a predictor increases by one unit (Tabachnick & Fidell, 2007)

Table 6: Variables in the equation (likelihood ratio test)

Independent variables	B	S.E.	Wald	Df	Sig(P-value)	Exp(β) (OR)
PEU (X_1)	0.810	0.197	16.892	1	0.000***	2.248
PFR (X_2)	-0.650	0.197	10.855	1	0.001***	0.522
COMP (X_3)	0.791	0.331	5.727	1	0.017**	2.206
PU (X_4)	1.321	0.329	16.129	1	0.000***	3.538
INFO (X_5)	0.255	0.265	0.921	1	0.037**	1.748
EDUCL (X_6)	1.489	0.514	23.451	1	0.000***	4.43
INCL (X_7)	-0.619	0.335	3.408	1	0.065*	0.538
AGE (X_8)	-0.146	0.296	0.243	1	0.622	0.865
Constant	-12.29					

***,** and * represent 1%, 5% and 10% level of significance, respectively.

a. Variable(s) entered on step 1: X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8 (95.0% CI for EXP(B))

4.4 *Discussion and implications of findings*

From Table 6 the coefficient of perceived ease of use (X_1) is 0.810 and the probability of the Wald statistic for the variable PEU (X_1) is significant at one per cent (P< 0.001). Thus, the null hypothesis that the β coefficient for PEU(X_1) is equal to zero is rejected. It can be deduced from the result that the greater the level of ease clients associate with the use of a particular innovative product, the more likely they are to adopt it. This confirms the hypothesis that perceived ease of use of e-banking innovations increases adoption. The finding is in agreement with that of Lockett and Littler (1997), Karjaluoto *et al.* (2002) and Jayawardhena and Folley (2000), who identified perceived innovation attributes such as perceived ease of use as a positive predictor of adoption intentions. Bandura (1986) suggests that perceived ease of use plays an important role in affecting motivation and behavioural intention to use a new technology. A study by Clarke (2000) also shows that, among the factors affecting the use of e-banking innovations, perceived ease of use greatly influences adoption. The study further supports the assertions by Rogers (2003) and Cooper (1997) that when an innovation is found to be less complex, the likelihood of adoption increases. In contrast, the study by Laforet and Li (2005) in China reveals that perceived ease of use is not a significant factor influencing e-banking innovation adoption, implying that Ghanaian banking customers are more concerned about the design of e-banking innovations than their Chinese counterparts. It can therefore be inferred from the above discussion that financial innovations that are easy to understand and use are more likely to gain a high level of acceptance by customers than those that are perceived to be complex to use. The implication of this finding is

that in developing new products, Ghanaian banks need to incorporate mechanisms that will make it possible for potential clients to understand how to use them with very little effort. Whenever the use of new products requires more than just a few simple steps, people who are naturally resistant to change may be very reluctant to try them – even if such products have the potential to deliver superior benefits. This is because complicated procedures increase the likelihood of clients making mistakes which may have severe financial consequences.

Perceived financial risk was found to be a significant factor impeding Ghanaian banking customers' adoption of e-banking innovations. This is indicated by the β value of -0.650 which is significant at one per cent. Thus, the hypothesis that perceived financial risk reduces the likelihood of e-banking adoption is accepted. The results indicate that the level of financial risk perceived to be inherent in the use of the innovation is inversely related to the likelihood of consumers adopting that innovation. The findings support previous research showing that perceived security risk is an important predictor of Internet banking adoption (Daniel, 1999; Sathye, 1999; Westland, 2001; Pavlou, 2002). For instance, Pavlou (2002) argues that perceived risk arises from the uncertainty customers face when they cannot foresee the consequences of their e-banking transactions. This result confirms the findings of Chung and Paynter (2002) who identified consumers' fears regarding transaction security as an inhibitor to the adoption of Internet banking. The financial services industry is exposed to significant amounts of risk, which may lead to a loss of clients' funds. Indeed, it has been established that 80 per cent of global phishing attacks in the first quarter of 2005 targeted the financial services sector (IDC, 2005). It is therefore not surprising that the study identified perceived financial risk as inhibiting e-banking adoption. In contrast, a study conducted by ACNielsen (2005) found that risk is not a major factor hindering the adoption of e-banking innovations. The convenience associated with adopting e-banking products was seen as more important than the perceived risk. In this study, however, Ghanaian banking customers were equally concerned about the risk associated with e-banking adoption. The above findings show that in order for Ghanaian banks to retain and expand their current customer base, efforts must be made to incorporate risk-reducing strategies in their e-banking products, in order to help inspire confidence in potential and existing customers.

The results in Table 6 also indicate that perceived compatibility increases the likelihood of e-banking innovation adoption. The odd ratio (OR) of 2.206 indicates that bank customers who perceive innovative banking products as compatible with their needs are 2.206 times more likely to adopt (continue to use) innovative banking products. This finding shows that customer perception about the compatibility of innovating banking products with their needs, experiences and values influences their attitude towards adoption. This finding concurs with that of Rogers (2003), who established that customers who perceive innovations as compatible with their needs are more likely to adopt such innovations. Also, McKenzie (2001) found that a lack of compatibility between innovation and individual needs negatively affects adoption. Vijayasarathy (2004) observes that compatibility is one of the best

perception-based indicators of attitude towards the adoption of online innovation. The implication is that customers who prefer fast and hassle-free banking services may find innovative e-banking products congruent with their preferences. This is in line with the observation by Rogers (2003) that if customers perceive a particular innovation as similar and congruent with existing understandings of similar or past ideas, products or practices, then the likelihood is very high that such innovations will be adopted. Thus, banking innovations that fit into an individual's existing understanding or schema will be more easily adopted than those that are not compatible with their needs. In light of this revelation, to attract customers banks must introduce innovative products which they believe will suit the lifestyle of their customers.

The study also finds that perceived usefulness (PU) of e-banking innovations increases adoption. This is indicated by a significant level of one per cent and a beta (β) value of 1.32, which can be observed in the likelihood ratio test (see Table 6). This shows that perceived usefulness has a significant and positive effect on the intention to adopt e-banking products. The odd ratio of 3.54 indicates that bank customers who see innovative banking as a better option than previous offerings are 3.54 times more likely to adopt such products. The result supports studies by Kolodinsky *et al.* (2004) who established a positive relationship between perceived usefulness and the adoption of e-banking innovations. In addition, perceived usefulness or relative advantage has been noted as a crucial construct that positively affects the acceptance of e-banking innovations (Taylor & Todd, 1995; Lu *et al.*, 2003). It can therefore be deduced from the results that the perceived usefulness of innovative banking products encourages customers' to form a more favourable attitude towards their adoption. In other words, bank customers who see innovative banking as a better option than traditional banking products are more likely to adopt such innovations. This finding mirrors that of Rogers (1995), who discovered that if individuals perceive that an innovation will be better, compared to similar ideas, products or practices, they are more likely to adopt or continue to use such products. In contrast, some studies have established that the risk associated with e-banking innovations may force customers to overlook the associated benefits. Consumers who may be required to provide myriad personal information before being permitted to use an innovation may be inhibited from adopting a given e-banking service, even though they stand to benefit from it (Abbate, 1999; Snel, 2000; Karjaluoto *et al.*, 2002). What this finding indicates is that Ghanaian banks must endeavour to introduce innovative products that offer more benefits to customers in terms of convenience, cost and reliability. People use these products to satisfy various needs, and the extent to which a product helps to meet those needs is critical in the decision to either accept or reject the innovation.

The result in Table 6 further indicates that the quality of education and guidance offered by banks impacts positively on e-banking innovation adoption. Thus, the hypothesis that the education and guidance offered by banks increases the likelihood of e-banking innovations adoption is accepted. The odd ratio (OR) of 1.75 indicates that customers who obtain more information on innovative banking products are 1.75

times more likely to adopt or continue to use such products. The finding supports that of Laukkanen and Kiviniemi (2010), who established that education and guidance offered by a banks have the most positive significant effect on customers' acceptance of innovations. According to them, education and guidance create the necessary awareness and enhance customers' confidence of innovative technology. Lee and Chung (2009) empirically verified that the quality of education offered by banking firms increases the likelihood of technological financial innovations being adopted. This outcome is not surprising; educating customers does not just create awareness of the existence of an innovation, but goes a long way towards providing information on its benefits, offering guidelines on how to use it, informing potential users of the real risks associated with their adoption, and teaching them how to avoid or mitigate such risks. Indeed, properly educating the public on a given innovation can eradicate any misconceptions that customers may have regarding a given innovation. By providing appropriate information on the innovation, that influences the other factors which determine the adoption rate of any given innovation (e.g., perceptions on the riskiness, usefulness and complexity). Therefore, by committing the requisite amount of resources to public awareness campaigns, banks are able to whip up interest and ensure the subsequent adoption of their innovations. It must be noted, however, that the quality of the information disseminated depends to a large extent on the quality of the innovation itself; no matter how a well a bank communicates with the public about a product that is inherently bad, adoption will, at best, be poor.

From Table 6 it can be observed that education has a significant positive relationship with the likelihood of e-banking innovations being adopted. In other words, the higher the level of a customer's education, the more likely s/he is to adopt e-banking innovations. The result supports the findings of Kolodinsky *et al.* (2000), who established that the likelihood of e-banking innovations being adopted rose with the education levels of customers. This is not surprising from both a theoretical and a practical point of view: Most innovations in banking are technology related, and often require some level of education on the part of customers, to appreciate their usefulness. Customers who are highly educated are likely to understand the benefits and risks associated with financial innovations, and are therefore more likely to adopt such innovations than their counterparts with low levels of education. Furthermore, education enables customers to easily work their way around innovations by simply following displayed instructions. Hence the inability to read and understand such instructions, for instance, will make the use of related innovation difficult if not impossible for illiterates. Prior research has shown that individuals with more years of formal education are expected to adopt new technologies more easily than those with less schooling (Rogers, 1995). Even though Kolodinsky *et al.* (2000) found that the likelihood of e-banking innovations being adopted rose amongst better-educated customers, they asserted that individual consumer attitudes and beliefs were stronger influences than demographics. The findings in this study seem to contradict this assertion, since level of education had the highest odd ratio of 23.45. The study also contradicts the findings of Laforet and Li (2005), who established that the level

of education did not influence online/mobile banking adoption. Given the general perception in Ghanaian society that e-banking products require specials skills and knowledge to access, it is not surprising that the education level of customers is the most important factor influencing the adoption of e-banking products.

The hypothesis that higher incomes amongst customers increase the likelihood of them adopting e-banking innovations is rejected. This is because the β value of -0.619 and odd ratio of 0.538 contradict the expected positive value of the coefficient (β). It is often postulated that customers with higher income levels are more likely to adopt innovative banking products than their counterparts with low income levels (Kolodinsky *et al.*, 2000). A study conducted in South Africa by Singh (2004) also found that adopters of e-banking innovation are those in the high-income bracket. This study conversely failed to establish any significant relationship between the two variables. Although this finding contradicts what is often found in the literature, it nonetheless makes a lot of sense since the interplay of income level and the other factors influencing innovation adoption could determine whether or not an innovation is adopted by higher-income clients. For instance, a rich client who is uneducated may find it very difficult to use or adopt a particular innovation. In such a situation, income level per se will fail to exert any significant influence on the decision to adopt a given innovation. This may explain why this particular study failed to show a significant relationship between income level and innovation adoption in the banking sector.

Also, the study hypothesised that there is an inverse relationship between age and the likelihood of e-banking innovation adoption. The result in Table 6 indicates that this hypothesis is not supported. Age is often regarded in the literature as having a negative relationship with the possibility of innovation adoption, because the youth are often more adventurous and more fascinated by technology than the old (Schiffman & Kanuk 2009). In this study, however, though the coefficient of age as a variable is negative, the probability of the Wald statistic was not significant (see Table 6). This indicates that there is no significant difference between the young and the old as far as the intention to adopt e-banking innovations is concerned. This particular finding differs from the result obtained by Schiffman and Kanuk (2009), who indicate that young and educated people are normally more likely to adopt new products. The finding does, however, confirm the observation by Rogers (1995) that the relationship between innovation adoption and age is insignificant.

4.5   *The predictive power of the model*

The predictive power of the model was tested using pseudo Cox & Snell R Square as well as Nagelkerke R Square tests (see Table 5). The result from the Cox & Snell test indicates that 32.6 per cent of variations in the dependent variable are explained by the model. The Nagelkerke R Square test, however, shows that 45.6 per cent of variations in the likelihood of adopting an innovation are explained by the combined effect of the independent variables. Hence, the model predicts variations in the innovation adoption decision of bank clients by about 32 to 45.6 per cent. Since R^2

exceeds 0.3 in both instances, it is evident that the model's performance is good for prediction (Farid, 2010).

Table 7: Model summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	349.784	0.326	0.456

Estimation terminated at iteration number 6 because parameter estimates changed by less than .001

Source: Field data, November 2013.

5 Summary and conclusion

The overall purpose of the research is to identify and analyse the key factors influencing the adoption of innovative banking products. From this study it emerged that the ease with which customers can use the innovation, the compatibility of the innovation with customers' needs, the perceived usefulness thereof, the amount of information provided on the innovation and the level of customers' education all have a significant positive impact on the adoption of e-banking innovations in the Ghanaian banking industry. However, perceived risk was found to have a negative influence on the adoption of e-banking innovations. Hence, as the banking industry continues to expand and banks keep introducing a variety of innovative products to gain the competitive advantage, the above factors must be taken into consideration during the design and implementation stages. This study provides a basis for banks to evaluate the potential success of new products which they plan to launch. Although both perceived usefulness and perceived risk have a significant influence on e-banking innovation adoption, the study shows that the former is more influential. In light of this, banking firms should focus on designing useful and easy-to-use e-banking products to attract potential and existing customers.

The study further established that customers' level of education significantly influences the adoption of e-banking innovations. However, since banks do not have control over their customers' level of education, the study underscores the importance of education within the broader context of business and economic development. Hence, any policies at the national level that will promote education and equip the citizenry with basic literacy at least, will boost the performance of the banking industry with their positive spillover effects on the rest of the economy. The study also established that perceived financial risk reduces the likelihood of e-banking innovation adoption. This is not surprising, given that 80 per cent of global phishing attacks in the first quarter of 2005 targeted the financial services sector (IDC, 2005). It is therefore recommended that Ghanaian banks employ risk-reducing strategies to help inspire confidence in potential customers. This study suggests that banks consider focusing on preventing intrusion, fraud and identity theft. For example, building secure firewalls, developing methods to strengthen

encryption, and authenticating websites to prevent fraud and identity theft are all measures that should be considered.

The study had a number of limitations that need to be addressed in future research. First, the study was conducted by sampling a cross-section of customers from the Ashanti region of Ghana, and since cultural differences may affect adoption intentions, it is recommended that the study be replicated in other parts of the country, to determine whether regional variations exist in terms of the above findings. Also, the study was limited to commercial banks in Ghana. Future studies should consider non-bank financial institutions (NBFIs).

Biographical notes

Daniel Domeher is a lecturer in Banking and Finance at KNUST School of Business. He obtained his PhD in Real Estate Finance from Liverpool John Moores University, UK. Daniel also holds an MA in Banking and Finance from Sheffield Hallam University, UK, and a BA degree in Economics (First Class) from KNUST, Ghana. His research interests include financial innovation, real estate financing in developing countries and SME financing. He has published extensively in peer-reviewed journals. He can be contacted at ddomeher. cass@knust.edu.gh, or dommedann@yahoo.com

Joseph Magnus Frimpong is a Professor in Finance, Head of Department (Accounting and Finance) and Acting Dean of the KNUST School of Business. He is also a business consultant. He holds a Teachers' Diploma in Mathematics (Winneba), a BA in Economics/Law (KNUST), an MSc. in Project Analysis, Finance and Investment (York, UK) and an Advanced Diploma in Professional Studies (London). His research interests cut across all areas of economics and finance. He can be contacted at Jf_magnus@yahoo.com

Thomas Appiah is a lecturer at Valley View University. He holds a Master of Philosophy in Finance from Kwame Nkrumah University of Science and Technology, Kumasi, and an Honours in Economics from the University of Ghana, Legon. His research interests include financial innovations and other aspects banking. He can be contacted at tommep2003@ yahoo.com or appiah.thomas225@gmail.com.

Acknowledgement

References

Abbate, A. (1999). 'For small banks, future lies in technology and tight focus', *American Banker*, vol. 164, no. 17, p. 8.

Abor, J. (2004). 'Technological innovations and banking in Ghana: An evaluation of customers' perceptions', *African Journal Online*. Available at http://www.ajol.info/index.php/ifep/cart/view/23668/20166 (accessed 13 September 2013).

AbuShanab, E. and Pearson, J.M. (2007). 'Internet banking in Jordan: The unified theory of acceptance and use of technology (STAUT) perspective', *Journal of Systems and Information Technology*, vol. 9, no. 1, pp. 71–97.

Daniel Domeher, Joseph M. Frimpong and Thomas Appiah

Acquah, P. (2006). 'The emerging Ghanaian banking environment', *BIS Review*, vol. 75, pp. 1–2.

Adeogun, A., Ajana, A.M., Ayinla, A., Yarhere, M.T. and Adeogun, M.O. (2008). 'Application of Logit Model in adoption decision: A study of hybrid clarias in Lagos State, Nigeria', *American-Eurasian J. Agricultural & Environmental Sci.*, vol. 4, pp. 468–472.

Asante, S., Agyapong, D. and Adam, A.M. (2011). 'Bank competition, stock market and economic growth in Ghana', *International Journal of Business Administration*, vol. 2, no. 4, pp. 33–41.

Black, N.J., Lockett, A., Winklhofer, H. and Ennew, C. (2001). 'The adoption of Internet financial services: A qualitative study', *International Journal of Retail and Distribution Management*, vol. 29, no. 8, pp. 390–398.

Bontempo, R.N., Bottom, W.P. and Weber, E.U. (1997). 'Cross-cultural differences in risk perception: A model-based approach', *Risk Analysis*, vol. 17, no. 4, pp. 479–488.

Campbell, M.C. and Goodstein, R.C. (2001). 'The moderating effect of perceived risk on consumers' evaluations of product incongruity: Preference for the norm', *Journal of Consumer Research*, vol. 28, pp. 439–449.

Chung, W. and Paynter, J. (2002). 'An evaluation of Internet banking in New Zealand', Proceedings of the 35th Hawaii International Conference on System Sciences, p. 10.

Clarke, R. (2000). 'Appropriate research methods of eCommerce', International *Journal of Electronic Commerce*, http://www.anu.edu.au/people/Roger.Clarke/E C/ResMeth.html (accessed 17 November 2013).

Cooper, R.G. (1997). 'Examining some myths about new product winners', in Katz, R. (ed.). *The human side of managing technological innovation*, Oxford, pp. 550–560. Available at http://www.ebsco.com (accessed 13 November 2013).

Damanpour, F., Walker, R.M. and Avellaneda, C.N. (2009). 'Combinative effects of innovation types and organizational performance: A longitudinal study of service organizations', *Journal of Management Studies*, vol. 46, no. 4, pp. 650–675.

Daniel, E. (1999). 'Provision of electronic banking in the UK and the Republic of Ireland', *International Journal of Bank Marketing*, vol. 17, no. 2, pp. 72–82.

Essinger, J. (1999). *The virtual banking revolution: The customer, the bank and the future*, 1st edition, International Thomson Business Press, London, UK.

Farid, H., Silong, A.D. and Sarkar, S.K. (2010). 'Application of Logit Model in innovation adoption', Faculty of Educational Studies Laboratory of Applied and Computation Statistics, *INSPEM*, vol. 9, no. 3, pp. 282–287.

Frei, F.X. and Kalakota, R. (1998). 'Frontiers of online financial services', in Cronin, M.J. (ed.). *Banking and finance on the Internet*, Van Nostrand Reinhold Press, New York.

Frimpong, J.M. (2010). 'Investigating efficiency of Ghana banks: A non-parametric approach', *American Journal of Scientific Research*, vol. 7, pp. 64–76.

Gerrard, P. and Cunningham, J.B. (2003). 'Diffusion of Internet banking among Singapore consumers', *International Journal of Bank Marketing*, vol. 21, no. 1, pp. 16–28.

Ghana Banking Survey (2010). *Risk management in well capitalized banks*, PriceWaterhouseCoopers, Accra.

Ghana Banking Survey (2011). *Sustaining growth: Challenges and opportunities*, PriceWaterhouseCoopers, Accra.

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.K. (2006). *Multivariate data analysis*, 6th edition, Pearson Prentice Hall, Upper Saddle River.

Hinson, R., Amidu, M. and Mensah, R. (2006). 'Determinants of Ghanaian bank service quality in a universal banking dispensation', *Bank and Bank Systems*, vol. 1, no. 2, pp. 69–81.

Howcroft, B., Hamilton, R. and Hewer, P. (2002). 'Consumer attitude and the usage and adoption of home-based banking in the United Kingdom', *International Journal of Bank Marketing*, vol. 20, no. 3, pp. 111–121.

IDC (2005). 'Financial insights: Asia/Pacific identifies Internet banking security as a key focus for financial institutions', Available at http://www.idc.com/AP/pressrelease.jsp?containerId=prSG00212505 (accessed 10 February 2014).

Im, S., Bayus, B.L. and Mason, C.H. (2003). 'An empirical study of innate consumer innovativeness', Available at http://mansci.highwire.org/content/15/5/215.short (accessed 12 October 2013).

Jayawardhena, C. and Foley, P. (2000). 'Changes in the banking sector – the case of Internet banking in the UK', *Internet Research: Electronic Network Applications and Policy*, vol. 10, no. 1, pp. 19–31.

Karahanna, E., Straub, D.W. and Chervany, N.L. (1999). 'Information technology adoption across time: A cross-sectional comparison of pre-adoption and post-adoption', *MIS Quarterly*, vol. 23, no. 2, pp. 183–213.

Karjaluoto, H., Mattila, M. and Pento, T. (2002). 'Factors underlying attitude formation towards online banking in Finland', *International Journal of Bank Marketing*, vol. 20, no. 6, pp. 261–272.

Kent, E., Kerem, K. and Nilsson, D. (2008). 'The adoption of commercial innovations in the former Central and Eastern European markets', *International Journal of Business Management*, vol. 26, no. 3, pp. 158–169.

Kolodinsky, J., Hogarth, J.M. and J.F. Shue. (2000). 'Consumer adoption of electronic banking technologies', *Consumer Interests Annual*, vol. 46, pp. 180–184.

Kolodinsky, J.M., Hogarth, J.M. and Hilgert, M.A. (2004). 'The adoption of electronic banking technologies by US consumers', *International Journal of Bank Marketing*, vol. 22, no. 4, pp. 238–259.

Kuisma, T., Laukkanen, T. and Hiltunen, M. (2007). 'Mapping the reasons for resistance to Internet banking: A means-end approach', *International Journal of Information Management*, vol. 27, no. 2, pp. 75–85.

Kumar, K.S.V. (2011). 'Innovations in modern banking and innovative financial inclusion – issues and challenges', *CLEAR IJRCM*, vol. 1, no. 2 (Jul-Dec), pp. 147–196.

Laforet, S. and Li, X. (2005). 'Consumers' attitudes towards online and mobile banking in China', *International Journal of Bank Marketing*, vol. 23, no. 5, pp. 362–380.

Laukkanen, T. (2007). 'Measuring mobile banking customers' channel attribute preferences in service consumption', *International Journal of Mobile Communications*, vol. 5, no. 2, pp. 123–138.

Laukkanen, T. and Kiviniemi, V. (2010). 'The role of information in mobile banking resistance', *International Journal of Bank Marketing*, vol. 28, no. 5, pp. 372–388.

Lean, O.K., Zailani, S., Ramayah, T. and Fernando, Y. (2009). 'Factors influencing intention to use e-government services among citizens in Malaysia', *International Journal of Information Management*, vol. 29, no. 6, pp. 458–475.

Lee, K.C. and Chung, N. (2009). 'Understanding factors affecting trust in and satisfaction with mobile banking in Korea: A modified DeLone and McLean's model perspective', *Interacting with Computers*, vol. 21, no. 5, pp. 385–392.

Littler, D. and Melanthiou, D. (2006). 'Consumer perceptions of risk and uncertainty and the implications for behaviour towards innovative retail services: The case of Internet banking', *Journal of Retail Consumer Services*, vol. 13, pp. 431–443. Available at http://dx.doi.org/10.1016/j.jretconser.2006.02.006 (accessed 1 December 2013).

Llewellyn, D. (1992). 'Financial innovation: A basic analysis', in Cavanna, H. (ed.). *Financial innovation*, Routledge, London.

Lockett, A. and Littler, D. (1997). 'The adoption of direct banking services', *Journal of Marketing Management*, vol. 13, pp. 791–811.

Lu, J., Yu, C., Liu, C. and Yao, J. (2003). 'Exploring factors associated with wireless Internet via mobile technology acceptance in Mainland China', *Communications of the Information Management Association*, vol. 3, no. 1, pp. 101–120.

McCloskey, W.D. (2006). 'The importance of ease of use, usefulness, and trust to online consumers: An examination of the technology acceptance model with older consumers', *Journal of Organizational and End User Computing*, vol. 18, no. 3, pp. 47–65.

McKenzie, J. (2001). 'How teacher learn technology best', *From Now On: The Educational Technology Journal*, vol. 10, no. 6. Available at http://www.fno.org/mar01/howlearn.html (accessed 1 March 2014).

Merton, R. (1992). 'Operation and regulation in financial intermediation: A functional perspective', in Englund, P. (ed.). *Operation and regulation of financial markets*, Ekonomiska Radet, Stockholm.

Pallant, J. (2011). *SPSS survival manual: A step-by-step guide to data analysis using SPSS*, 4th edition, Everbest Printing Co, China.

Papies, D. and Clement, M. (2008). 'Adoption of new movie distribution services on the Internet', *Journal of Media Economics*, vol. 21, no. 3, pp. 131–157.

Pavlou, P. (2002). *Integrating trust in electronic commerce with the technology acceptance model: Model development and validation*, AMCIS Proceedings, Boston, MA.

Polatoglu, V.N. and Ekin, S. (2001). 'An empirical investigation of the Turkish consumers' acceptance of Internet banking services', *International Journal of Bank Marketing*, vol. 19, no. 4, pp. 156–165.

Rogers, E.M. (1995). *Diffusion of innovations*, 4th edition, Free Press, New York, NY.

Rogers, E.M. (2003). *Diffusion of innovations*, 5th edition, Simon & Schuster, New York, NY.

Rogers, E.M. and Shoemaker, F. (1971). *Communications in innovation*, Free Press, New York, NY.

Rose, P.S. (1999). *Commercial bank management*, 4th edition, Irwin/McGraw-Hill, Boston, MA.

Saunders, M., Lewis, P. and Thornhill, A. (2009). *Research method for business students*, Pearson Education Limited, Harlow, England.

Sathye, M. (1999). 'Adoption of Internet banking by Australian consumers: An empirical investigation', *International Journal of Bank Marketing*, vol. 17, no. 7, pp. 324–334.

Schiffman, L.G. and Kanuk, L.L. (2009). *Consumer behaviour*, Pearson Education, New Jersey.

Sherry, L. (1997). 'The Boulder Valley Internet Project: Lessons learned', *THE (Technological Horizons in Education) Journal*, vol. 25, no. 2, pp. 68–73.

Singh, A.M. (2004). 'Trends in South African Internet banking', *Aslib Proceedings: New Information Perspectives*, vol. 56, no. 3, pp. 187–196.

Singh, L. (2006). 'Innovations, high-tech trade and industrial development: Theory, evidence

and policy', *UN-WIDER Research Paper* No. 2006/27, United Nations University-World Institute for Development Economic Research, Helsinki, Finland. Available at http://www.wider.unu.edu/stc/repec/pdfs/rp2006/rp2006-27.pdf

Sweeney, A. and Morrison, M. (2004). 'Clicks vs. bricks: Internet-facilitated relationships in financial services', *International Journal of Internet Marketing and Advertising*, vol. 1, no. 4, pp. 350–370. Available at http://www.inderscience.com/10.1504/IJIMA.2004.006329 (accessed 10 February 2014).

Tabachnick, B.G. and Fidell, L.S. (2007). *Using multivariate statistics*, 5th edition, Pearson Education, Boston, MA.

Tan, M. and Teo, T.S.H. (2000). 'Factors influencing the adoption of Internet banking', *Journal of the Association for Information Systems*, vol. 1, pp. 1–44.

Tan, Y.H. and Thoen, W. (2001). 'Toward a generic model of trust for electronic commerce', *International Journal of Electronic Markets*, vol. 5, no. 2, pp. 61–74.

Taylor, S. and Todd, P. (1995). 'Assessing IT usage the role of prior experience', *MIS Quart*, vol. 19, no. 4, pp. 561–570.

Teo, T.S.H. and Pok, S.H. (2003). 'Adoption of WAP-enabled mobile phones among Internet users', *Omega: The International Journal of Management Science*, vol. 31, no. 6, pp. 483–498.

Tufano, P. (2003). 'Financial innovation', in Constantines, G.M., Harris, M. and Stulz, R. (Eds.). *The Handbook of the Economics of Finance*. vol. 1, pp. 307–335.

Vijayasarathy, L.R. (2004). 'Predicting consumer intentions to use on-line shopping: The case for an augmented technology acceptance model', *Information and Management*, vol. 41, no. 6, pp. 747–762.

Westland, J.C. (2001). 'Transaction risk in electronic commerce', *Decision Support Systems*, vol. 33, no.1, pp. 87–103.

Woldie, A., Hinson, R., Iddrisu, H. and Boateng, R. (2008). 'Internet banking: Initial look at Ghanaian Bank consumer perception', Available at http://dspace.uabs.edu.ua/bitstream/123456789/7467/1/Atsede%20Woldie.pdf (accessed 12 November 2013).

Yiu, C.S., Grant, K. and Edgar, D. (2007). 'Factors affecting the adoption of Internet banking in Hong Kong: Implications for the banking sector', *International Journal of Information Management*, vol. 27, no. 5, pp. 336–351.

APPENDIX: Survey instrument

Section A: Demographic characteristics of respondents

1. Age (In years)………………………………….

2. Income [Monthly (GH¢)]……………………………..

3. Education level (Please tick**)**; Primary education [ ], High school or below [ ],

    University [ ], Postgraduate [ ], Other (Specify)…………………….

Section B: This section aims at finding out your opinion about innovative banking products (e.g., Internet banking, mobile banking, ATM, etc.).

4. Please read the following statements and circle the number that best describes your understanding of innovative banking product (Internet, mobile banking and ATM), where Strongly Disagree (SD) = 1; Disagree (D) = 2; Neutral (N) = 3; Agree (A) = 4; Strongly Agree (SA) = 5

Statement	SD	D	N	A	SA
Perceived usefulness (relative advantage)					
In my opinion, the use of innovative banking products (Internet banking/mobile banking ATM, etc.) services are economical	1	2	3	4	5
In my view the use of innovative banking products increases one's ability to control his/her financial matters better.	1	2	3	4	5
I believe using innovative banking services helps to accomplish banking activities more quickly.	1	2	3	4	5
In my opinion, using innovative banking products are useful for banking activities	1	2	3	4	5
Using innovative banking services enhances the productivity of banking activities	1	2	3	4	5
Innovative banking products provides freedom of time and place constraints	1	2	3	4	5

Section C: Adoption behaviour of customers

1. I have adopted some of the innovative banking products (ATM, Internet banking, Mobile banking, etc):

Yes [ ]   No [ ]

2. My attitude towards the adoption (or continuing use) of innovative banking products (e.g., Internet banking, mobile banking ATM) is: Positive [ ]   Negative [ ]