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## INNOVATIONS IN MOBILE DEVICE TESTING FOR BANKING APPLICATIONS

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### Abstract

These days, people's lives are growing increasingly reliant on mobile banking applications because of their flexibility and ease. Its rise in emerging states is exceeding forecasts, even with these advantages. It was risky, nevertheless, to use mobile devices for financial transactions. It also looks at the impact of perceived danger and engagement on the desire to use continuously. The purpose of this research is to ascertain how innovative features affect consumers' intentions to use mobile banking. The research examined the combined impact of the eight innovation-related characteristics—relative advantage, compatibility, complexity, image, outcome demonstrability, visibility, trial ability, and voluntariness—on adoption intention. 311 college students, who are considered to be young prospects, provided the data, and SEM was used to assess the research hypothesis. The findings substantiate the predicted correlation between the use of mobile banking and its relative benefit and compatibility. But there was no connection discovered between the image, trial ability, complexity, outcome demonstrability, and adoption intention.

**Keywords:** Mobile Banking, Adoption Intention, Demonstrability, Visibility, Usage Intention, Financial Transactions, Self-Congruence, Perceived Risk, Continuous Usage Intention, Mobile Applications, Result, Risk.

### I. INTRODUCTION

Through mobile banking, customers may use any device to access their bank reserves while they are on the go, at any convenient time, and from any location. In addition to location-based transactions, it offers financial services including savings accounts, inter-account money transfers via mobile platforms, and expense payments for items or delivered services [1]. The introduction of contemporary smartphones improved productivity in other commercial organisations as well as the banking industry. There has been a discernible increase in the number of smartphones used in industrialised and a few developing countries worldwide [2]. These days, smartphones enable banks to provide their clients with a variety of services because most, if not all, of them are now releasing various applications for financial transactions [1, 2]. The concept of what is now known as mobile banking originated with people using their smartphones for financial purposes. In a similar vein, as of 2019 there were more over one billion smartphone users globally [1, 2].

The primary cause of the growth is probably the device's flexibility and movability, which allows for account portability and flexibility. Additionally, mobile banking applications shorten operating times for users and eliminate geographical restrictions since they allow users to send money to friends, family, and coworkers using just the keypad on their device—as opposed to traditional transactions that call for the users' physical presence [2].

Furthermore, because mobile devices quickly increase transaction speed and flexibility while lowering transaction costs, they are crucial to the way that banking and other commercial operations are conducted. But even with all of these advantages—and many more—as previous research has shown, such as [2], its expansion in the majority of developing countries is substantially slower than that of developed countries. Additionally, there haven't been many studies done in Nigeria [2, 3] about online and mobile banking.

In general, m-banking is regarded as one of the cutting-edge services provided by a financial services company, such as a bank, for carrying out non-financial (such as finding the location of an ATM, transferring funds, paying bills, and making investments) and financial (such as locating an ATM, checking balance, and making investments) transactions using a portable device, such as a smartphone, tablet, or mobile phone [3, 4].

Short Messaging Services (SMS) or downloaded m-banking software are two ways that these m-banking services can be provided [3, 4]. While SMS depends on conventional Global System for Mobile Communication (GSM) networks, m-banking applications need an Internet connection on the mobile device. Furthermore, previous research has largely concluded that mobile wallets, or m-wallets, are highly advanced and versatile mobile applications that, in contrast to mobile banking applications, include a number of features like the ability to conduct mobile transactions, or m-payments, which store sensitive personal data like credit card numbers, PIN codes, and encrypted online shopping accounts, as well as information related to membership cards, loyalty cards, and travel cards. The idea of "consumer engagement" is a new and fascinating subject [5, 6].

In fact, one of the top research priorities according to the Marketing Science Institute (MSI) is customer involvement. In light of the recent push in marketing and IS literature to prioritise Customer Engagement (CE), more studies on the subject are only now beginning to surface. CE is described as a consumer's positively valenced cognitive, emotional, and behavioural activity connected to mobile apps during or related to focused consumer and m-application interactions in the context of m-applications [5, 6]. It has recently been found that, in the brand domain, when the impacts of satisfaction, perceived value, and perceived quality are controlled, customer involvement can contribute more predictive power to loyalty intentions [6, 7].

Technology advancements have brought about changes in the banking industry. Banking apps have been converted to electronic and even mobile devices thanks to the growing usage of information technology. Banks are finding great success with electronic banking as a retail distribution channel. The number of customers utilising e-banking has increased significantly since the service was introduced in 1995 [7, 8]. For banks to continue being profitable in the future, e-banking is essential. Mobile banking is becoming more and more popular these days [8]. The adoption of mobile devices in financial services has been driven by advancements in telecommunications. The definition of mobile banking is the,

*“A method of providing financial services whereby the client uses mobile devices and mobile communication methods as part of an electronic procedure”.*

Customers can access their accounts, pay bills, check account balances, and carry out other banking operations using their cell phone [8, 9]. Since mobile banking adds another revenue stream to telecom providers and banks alike, it is a significant application of mobile commerce. Mobile banking has been characterised as the primary retail banking distribution method of the 2000s. But unlike new mobile gadgets, mobile banking has not taken off as quickly [9, 10]. Part of the reason for this delayed start is the outdated technology in the cell phones. However, the adoption of mobile phones was increased by the new generation and their lower costs. As a result, it is still expanding, and there is room for the growth of mobile banking applications. It is projected that the global user base for mobile banking and associated services would increase from 55 million in 2009 to 894 million in 2015 [10, 11].

Organisational and national cultures have an impact on the efficacy and efficiency of ICT innovation and implementation [11]. One way to define culture is as the collective mental programming that sets one group or category of people apart from another. Acquired information has a crucial role in producing and interpreting social behaviour and decision-making styles [11, 12].

In addition to theoretical claims that imply that shared views and values among a group of people have an [12], impact on people's attitude towards ICT deployment and transformation, cultural influences have been demonstrated to be significant in ICT usage behaviour [12, 13]. ICT adoption is anticipated to be impacted by the relative influences of a nation's cultural values in a way that is unique to that culture.

Numerous academics have also confirmed that the acceptance of ICT innovation is influenced by culture, and socio-cultural factors have not received much attention in the literature on the initiation, acceptance, and adoption of information and communication technology innovation, particularly in developing nations like Africa.

As an intangible service and a high-tech service delivery channel, mobile banking services are innovative. Given that it is a novel application, it is critical to comprehend how mobile banking is perceived as innovative. In addition, research in the literature has shown that acceptance behaviour is significantly influenced by how innovative traits are perceived. The intention to use mobile banking was discussed in the literature [12, 13] in connection to the TAM (Technology Acceptance Model), trust, and company reputation. The impact of experience, perceived risk, banking requirements, self-efficacy, and certain innovation features (relative advantage, perceived compatibility, perceived complexity, and trial ability) on the intention to use.

## 1.1 Mobile Banking Applications

M-commerce refers to commercial transactions carried out over the internet or mobile communication networks. Convenience, ubiquity, adaptability, and contextual relevance are the distinguishing characteristics of m-commerce [13, 14]. Customers may do both traditional and sophisticated financial activities using mobile banking, which also offers the wireless and mobile benefits of m-commerce. The banking service must be activated and a cell phone with



a built-in chipset or WAP (Wireless Access Protocol) enabled in order to utilise the service [13, 14].

The banks need to take into consideration the needs of their customers while developing mobile banking applications. These fall into four categories: design, security, usability, and technological needs [15]. Technically speaking, both types of available mobile devices should be able to be used. The program need to automatically adjust to the mobile device's settings. Customers of any MNO must be able to use the service. Additionally, as little data as feasible should be transferred. The ability to use the program offline is essential for usability. Data entry should be done in a more straightforward manner.

With just a few "**clicks**," the user should be able to resume using the program and access the information. The application's design should be customised. Switching to an application version with more features should be simple for the user. Push capabilities should be included in the application [15, 16]. A large variety of capabilities, akin to that of electronic banking, ought to be included. Data transfer must be encrypted for security reasons. Prior to use, authorisation is required for data access, and this authorisation process must be straightforward.

Applications for mobile banking add value for banks as well as for clients. Mobile banking enhances customer service, lowers expenses, boosts responsiveness, expands market share, and strengthens brand image [16].

## 1.2 Innovation Characteristics

One way to describe innovation is,

*“A concept, item, or artefact that the applicable unit of adoption views as novel”.*

Innovation is present when a potential customer perceives a product as novel or distinct from others. While some innovations are seen as important, others are considered as modest. The qualities of an invention affect how a consumer views the product. "The process by which an innovation is communicated through certain channels among the members of a social system over time" is known as diffusion [16]. An innovation's qualities influence the possibility and pace of purchasing.

Five key features of innovation: Comparative benefit,

*“Is the extent to which a new concept is thought to be superior to the one it replaces? It will be adopted more quickly the larger the apparent proportional advantage.”.*

*“The degree to which an invention is thought to be compatible with the needs, prior experiences, and current values of a potential user is known as its compatibility. Prior to adopting an incompatible invention, a new value system must be adopted, which is a process that takes time”.*

The degree to which an innovation is thought to be challenging to use and comprehend is known as its complexity. Innovations that are easier to grasp are embraced more quickly than those that necessitate the adopter to acquire new knowledge and abilities [16, 17].

*“Trial ability is the extent to which a new idea can be tested in a restricted setting. An invention that can be tested out gives the adopter less uncertainty”.*

Observability,

*“Is the extent to which an innovation's effects are apparent to others? Relatively less noticeable breakthroughs spread more slowly”.*

Three further features were noted by Moore and Benbasat (1991: 195–203) as follows: Image, [16],

*“The extent to which employing an invention is seen to improve one's standing or reputation within a certain system. One of the main reasons people accept innovations is the desire to rise in social standing”.*

Voluntariness of use,

*“How much the adoption of an invention is seen as voluntary or a matter of free choice. The flexibility to choose which invention to implement when it's required. The perception of voluntariness influences conduct far more than real voluntariness”.*

Result demonstrability,

*“The observable outcomes of using an invention [15, 16]. The higher the perceived demonstrability of the outcome, the higher the adoption rate”.*

## II. LITERATURE REVIEW

(Laukkanen, T. 2016) [17] According to this study, customer resistance to innovations is a given, and it needs to be overcome before a product is adopted. Uncertainty surrounds the factors causing resistance to service innovation. The current study looks at how three consumer demographics—income, gender, and age—as well as five theory-driven adoption barriers—usage, value, risk, tradition, and image—affect consumer adoption vs rejection decisions in Internet and mobile banking in order to better explain this behaviour. Binary logit models are used to evaluate hypotheses comparing mobile banking adopters with non-adopters, mobile banking postpones versus rejecters, and Internet banking postpones versus rejecters based on data from two large countrywide surveys performed in Finland (n = 1736 consumers).

(Rahman, Z. 2015) [18] This study examines the different antecedent beliefs that influence consumers' attitudes towards and adoption of Self-Service Technologies (SSTs) offered by banks. To create and evaluate a conceptual model of adoption for each of the three self-service banking technologies (SSBTs), a descriptive study design using survey technique is employed. The comparison analysis's findings demonstrated how various SSBTs have varied antecedent beliefs that influence adopters' attitudes. The technology acceptance model (TAM) is expanded upon and put to the test by adding two more antecedents from adoption behaviour theories.

(Okon, A. N., 2015) [19] Nigerian banks have adopted the worldwide trend of digitalisation in financial operations throughout the last several years. As a result, many banks have automated their operations, simplified and improved their facilities, and customised their services following the consolidation and recapitalisation processes. Banks are now expanding their e-banking offerings in an effort to stay one step ahead of their rivals in the fierce rivalry. Even yet, it's unclear if advancements in electronic banking have had a major and beneficial influence on Nigerian banks' performance, given how quickly these technologies have developed.

### III. RESEARCH METHODOLOGY

Model of Research Figure 1 displays the research model for the study that was taken from the literature. The model incorporates the adoption intention of mobile banking together with eight PCI instruments, in line with the theory proposed in [20]. Below is the major research hypothesis:

*H1: The intention to adopt is influenced by how innovation is viewed in respect to mobile banking.*

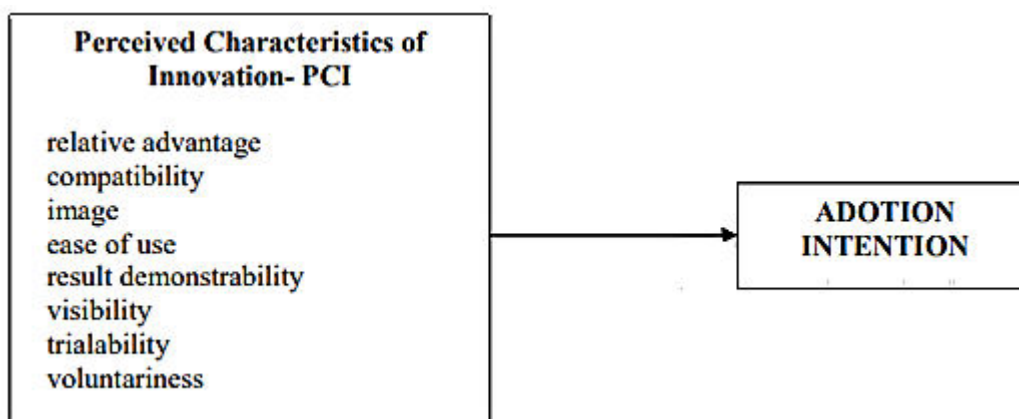


Fig. 1 Frameworks for Research.

#### 3.1 Measures and Data Collection

The structure of the questionnaire included multi-item assessments of the perceived attributes of innovation and intention to adopt. Each scale has five points, similar to the Likert scale. The PCI scale was designed and used to evaluate adoption intention in order to assess perceived innovative features [21, 22].

Internet banking was established using the PCI scale. The Appendix contains the scales. Face-to-face interviews were the method employed to obtain the data for the study. Undergraduate and graduate students are the study's subjects. The example demonstrates the traits of a prospective mobile banking client. Furthermore, those that embraced technology advancements sooner are sometimes characterised as being younger [22], more educated, earning more money, and working in higher-paying professions. As a result, the sample was made up of potential customers for mobile banking. Additionally, the sample's participants did not use mobile banking applications. Table 1 [22] provides the sample's social demographics.

Table 1 The samples' demographic characteristics. [23]

Category	Sub-category	Frequency	Percentage
Gender	Female	174	59.89%
	Male	137	55.68%
Age	18-20	9	2.9%
	20-22	35	26.59%
	22-24	75	65.9%
	24-25	55	16.96%
	25 above	29	21.65%
Family income	2000 \$ below	136	44.59%
	1000-3500 \$ usd	73	26.5%
	3502 \$-above	102	39.6%
Monthaly Expenditure	376 \$below	26	9.68%
	376-750 \$	56	19.69%
	1.159-1.596 \$	164	69.89%
	1598 USD	49	22.98%

#### IV. RESEARCH FINDINGS

In the study, structural equation modelling, or SEM, was employed to assess the research hypothesis. Reliability and validity analyses were conducted prior to hypothesis testing since multi-item scales were utilised [23, 24]. The findings of the validity and reliability study are shown in Table 2. In order to ensure validity, exploratory factor analysis was conducted, and Cronbach's Alpha was utilised to ensure reliability.

Table 2 Reliability and Validity Analysis Outcome. [24]

Scales	No. of items	Cronbach's alpha	Total variance explained
F1: Relative	9	.594	.259
F2: Trial ability	4	.968	.961
F3: Results demonstrability	4	.948	.255
F4: Complexity	4	.613	.549
F5: Adoption	4	.369	.348



Intention			
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Eight factors were removed from the PCI scale and a five-factor solution was found as a consequence of the validity and reliability investigation; however, no variables were removed from the adoption intention scale. The innovation qualities "visibility" and "voluntariness" were found to have low Cronbach's Alpha values (.570 and .617) and were removed from the scale [24]. The attributes of innovation "relative advantage" and "compatibility" were found to be loaded on Factor 2. These outcomes resemble the research.

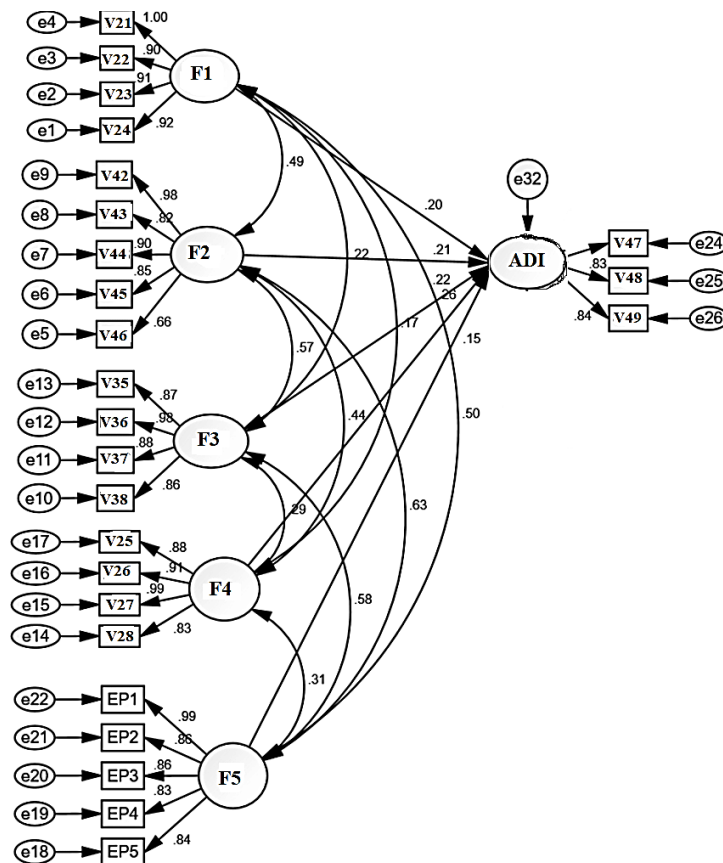


Fig. 2 Structural Research Model. [25]

Following the examination of validity and reliability, structural equation modelling (SEM) was used to assess the research hypothesis [25, 26]. The structured model is shown in Figure 2. Table 3 lists the variables that make up the model.

Table 3 The Research Modeling's variable. [27]

Variables	No.
No. of variables in the model.	54
No. of observed variables.	23
No. of unobserved variables.	31
Number of exogenous variables.	29
Number of endogenous variables.	22

Table 3 shows that there are 53 variables in the model. Thirty of them are unobserved variables, while twenty of the variables are observed. Six latent variables and 24 variables

that exhibit error and are designated as "e" are among the unobserved variables. Table 3 provides a detailed set of evaluation criteria and values pertaining to the fitness of the data and the model.

Table 4 illustrates that a number of factors are considered when assessing the goodness-of-fit between the simulation and the data [25]. The likelihood ratio for chi-square statistics is the first metric. There is statistical significance for this result ( $p=0.000$ ). The 2 / SD ratio is 2.431, and it should be between 2 and 5.

Table 4 Goodness of Fit. [26, 27]

Fit Measure	Default model	Saturated	Abbreviation
Discrepancy ( $x^2$ )	596.261	0.000	CMIN
Degrees of freedom	249	0	DF
P	.259		P
Discrepancy/Df ( $x^2/sd$ )	2.659	1.000	CMINDF
Goodness of Fit	.986	1.000	GFI
Adjusted Goodness of Fit	.849		AGFI
Normed fit Index	.979	1.000	NFI
Relative fit index	.689		RFI
Incremental fit index	.749		IFI
Tucker-Lewis Index	.954	1.000	TLI
Comparative fit Index	.896		CFI
RMSEA	.978	0.5<RMSEA<0.9	RMSEA
Hoelter.0.5 Index	.987		HFIVE
Hoelter.0.1 Index	.698		HONE

The regression weights are presented in Table 5. It is evident that the only factor that significantly influences the inclination to use mobile banking is "relative advantage & compatibility." The adoption of mobile banking is not greatly impacted by the other innovative features, such as trial ability, image, [26], outcome demonstrability, and complexity.

Table 5 Regressions Weights.

	Estimate	S.E.	t	Sig.
Adoption intention >-- Relative Adv. & Compatibility	.968	.149	.625	***
Adoption Intention >-- Trial ability	.978	.924	.159	.986
Adoption intention >-- Image	.654	.964	.689	.689
Result intention >-- Result Demonstrability	.986	.896	.648	.978

Adoption intention >--	.682	.893	.654	.986
Complexity				

As a result, the study hypothesis received some acceptance. R2 values were used to determine the model's explanatory power.  $R^2$  values, which in this study were determined to be 0.785 [26], indicate the overall appropriateness of the model and the explanatory power of the dependent variables. This indicates that 18% of the inclination to embrace mobile banking may be explained by relative benefit and compatibility. This may not seem like a lot, but just innovative features were looked at in this study; many other factors also influence the inclination to embrace mobile banking. Thus, the  $R^2$  value may be deemed appropriate [28].

## V. DISCUSSION

Adoption is defined as,

*“A choice to fully use an innovation as the most effective accessible strategy. Rejection is the choice to reject a novel idea”.*

An innovation's perceived qualities have a significant role in determining how quickly it is adopted. The impact of innovative features on the intention to use mobile banking is investigated in this study. The premise that there is a combined influence of innovation features was generated from the underlying theory.

Relative advantage and compatibility, rather than all innovation features, were shown to be predictors. The idea that innovation is a superior concept is known as relative advantage. It is most frequently determined to be substantial and is mentioned as an impressive variable in the adoption intention. The comparison that prospective adopters make between the new technology and the current technology leads to their perception of relative advantage [28, 29]. According to this survey, prospects are more likely to use mobile banking when they believe it would speed up, improve, or simplify banking [29], allow them more control over their banking experience, or improve their banking activities.

The idea that an invention is compatible with the requirements, prior experiences, and current values of a potential user is known as compatibility. It has to do with how effectively the innovation blends into the social structure already in place among the adopters. When a new idea is viewed as compatible, it is seen as fitting into a person's particular circumstances.

## VI. CONCLUSION

According to this study, compatibility is a crucial innovative feature that significantly influences adoption intention. Prospects are more likely to accept mobile banking when they believe it will work with all facets of banking, be fully integrated with their existing banking practices, and complement their preferred banking methods. Furthermore, it was discovered that the desire to embrace mobile banking is unaffected by factors such as image, trial ability, result demonstrability, and complexity. As a result, the banks should concentrate on distributing information that highlights the relative benefits of mobile banking over conventional banking channels as well as how well it fits with current values, prior

experiences, and anticipated requirements. To enhance my writing, I would like to explore the adoption intention of mobile banking by incorporating other underlying factors and developing a more thorough model.

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