



# University of HUDDERSFIELD

## University of Huddersfield Repository

Ifeonu, Robert Odera

Investigating the impact of technology trust on the acceptance of mobile banking technology within Nigeria

### Original Citation

Ifeonu, Robert Odera (2014) Investigating the impact of technology trust on the acceptance of mobile banking technology within Nigeria. Doctoral thesis, University of Huddersfield.

This version is available at <http://eprints.hud.ac.uk/id/eprint/23734/>

The University Repository is a digital collection of the research output of the University, available on Open Access. Copyright and Moral Rights for the items on this site are retained by the individual author and/or other copyright owners. Users may access full items free of charge; copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational or not-for-profit purposes without prior permission or charge, provided:

- The authors, title and full bibliographic details is credited in any copy;
- A hyperlink and/or URL is included for the original metadata page; and
- The content is not changed in any way.

For more information, including our policy and submission procedure, please contact the Repository Team at: [E.mailbox@hud.ac.uk](mailto:E.mailbox@hud.ac.uk).

<http://eprints.hud.ac.uk/>

INVESTIGATING THE IMPACT OF TECHNOLOGY TRUST ON THE ACCEPTANCE  
OF MOBILE BANKING TECHNOLOGY WITHIN NIGERIA

BY

IFEONU ROBERT ODERA

A THESIS SUBMITTED TO THE UNIVERSITY OF HUDDERFIELD IN PARTIAL  
FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF  
PHILOSOPHY

DECEMBER 2014

## **ACKNOWLEDGMENT**

The completion of this thesis would not have been possible without the grace of God. He is truly the author and finisher of all things. I would also like to dedicate this thesis to my late father, Robert Ifeonu Snr, whom I wish was here to experience this achievement. I am also eternally grateful to Esther Ifeonu, my remarkable mother who is a pillar of support, love and inspiration. I would like to express my unconditional love for my siblings, Paschalene and Collins Ifeonu, whose emotional support have motivated me throughout this period. Finally, special thanks to Dr Rupert Ward, whose knowledge, direction and support throughout this process has provided me with invaluable guidance.

# TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>10</b>
1.1	BACKGROUND OF STUDY .....	10
1.2	CONTEXT OF MOBILE BANKING IN NIGERIA .....	11
1.2.1	CASHLESS BANKING TECHNOLOGIES IN NIGERIA .....	18
1.3	MOBILE PENETRATION IN NIGERIA .....	22
1.4	DEFINITION AND EVOLUTION OF MOBILE BANKING .....	24
1.4.1	BUSINESS NEED EVOLUTION .....	25
1.4.2	EVOLUTION OF MOBILE BANKING SERVICES AND TECHNOLOGY .....	27
1.5	MOBILE BANKING ADOPTION IN NIGERIA .....	30
1.6	DEMOGRAPHICS AND ADOPTION TRENDS .....	31
1.6.1	GENDER .....	32
1.6.2	OCCUPATION AND EMPLOYMENT STATUS .....	34
1.6.3	AGE .....	34
1.6.4	EDUCATION LEVEL .....	36
1.6.5	MARITAL STATUS, TECHNOLOGY COMPETENCE.....	37
1.7	CHALLENGES OF MOBILE BANKING IN NIGERIA.....	37
1.8	RESEARCH QUESTIONS .....	41
1.9	STATEMENT OF PROBLEM.....	42
1.10	OPERATIONALISATION OF RESEARCH CONSTRUCTS .....	43
1.11	RESEARCH AIM.....	48
1.12	RESEARCH OBJECTIVES .....	48
1.13	SIGNIFICANCE OF STUDY .....	49
1.14	ASSUMPTIONS .....	50
1.15	DELIMITATIONS .....	51
1.16	CONCLUSION AND SUMMARY OF CHAPTERS.....	52
<b>2</b>	<b>LITERATURE REVIEW .....</b>	<b>53</b>
2.1	INTRODUCTION.....	53
2.2	DEFINING TRUST.....	53
2.3	TYPES OF TRUST .....	56
2.3.1	TECHNOLOGY TRUST .....	58
2.3.2	IMPORTANCE OF TECHNOLOGY TRUST IN MOBILE BANKING TECHNOLOGY ADOPTION.....	59
2.4	TECHNOLOGY ADOPTION, TRUST AND DEMOGRAPHIC RELATIONSHIPS.....	61
2.4.1	TECHNOLOGY TRUST AND GENDER.....	61
2.4.2	TECHNOLOGY TRUST AND AGE.....	63
2.4.3	TECHNOLOGY TRUST AND OCCUPATION AND INCOME LEVEL.....	64

2.4.4	TECHNOLOGY TRUST AND EDUCATION LEVEL .....	65
2.4.5	TECHNOLOGY TRUST AND TECHNOLOGY COMPETENCE .....	66
2.4.6	FACTORS OF TECHNOLOGY TRUST.....	67
2.5	USER ADOPTION AND TECHNOLOGY ACCEPTANCE .....	69
2.5.1	THE THEORY OF REASONED ACTION (TRA).....	69
2.5.2	THE THEORY OF PLANNED BEHAVIOUR (TPB) .....	72
2.5.3	TECHNOLOGY ACCEPTANCE MODEL.....	75
2.5.4	THE DIFFUSION OF INNOVATION THEORY (DOI).....	81
2.6	CONCEPTUALIZATION OF AN INTEGRATIVE MODEL.....	101
2.7	THE THEORETICAL MODEL.....	106
2.8	CONCLUSION .....	109
<b>3</b>	<b>METHODOLOGY .....</b>	<b>111</b>
3.1	RESEARCH PHILOSOPHY .....	111
3.2	RESEARCH APPROACH .....	112
3.2.1	QUANTITATIVE APPROACH .....	112
3.3	RESEARCH DESIGN.....	113
3.4	INSTRUMENT DEVELOPMENT .....	114
3.4.1	Q-SORT EXERCISE.....	114
3.5	DATA SAMPLING AND COLLECTION METHODS .....	117
3.6	ETHICAL CONSIDERATIONS .....	119
3.7	DATA PREPARATION.....	121
3.8	STRUCTURAL EQUATION MODELLING.....	122
3.8.1	THE MEASUREMENT MODEL .....	123
3.8.2	CONFIRMATORY FACTOR ANALYSIS .....	124
3.9	GOODNESS OF FIT INDICES .....	128
3.10	THE STRUCTURAL MODEL .....	130
3.11	CONCLUSION .....	130
<b>4</b>	<b>RESULTS AND ANALYSIS .....</b>	<b>132</b>
4.1	INTRODUCTION.....	132
4.2	DEMOGRAPHIC PROFILE OF RESPONDENTS .....	132
4.3	ANALYSIS OF DATA AND INTEPRETATION OF RESULTS .....	134
4.4	THEORETICAL MODEL A.....	135
4.4.1	EVALUATION OF MODEL A .....	136
4.4.2	MEASUREMENT LEVEL FOR MODEL A.....	139
4.5	THEORETICAL MODEL B .....	142
4.5.1	EVALUATION OF MODEL B.....	144
4.6	THEORETICAL MODEL C .....	147
4.6.1	EVALUATION OF MODEL C.....	148

4.7	RELIABILITY AND VALIDITY OF MEASUREMENT ITEMS .....	152
4.7.1	RELIABILITY .....	152
4.7.2	VALIDITY .....	154
4.8	STRUCTURAL EVALUATION OF MODEL A.....	158
4.8.1	INTRODUCTION OF CONTROL VARIABLES .....	163
4.8.2	STRUCTURAL MODEL MODIFICATION AND REVALUATION.....	163
4.8.3	HYPOTHESIS EVALUATION.....	165
4.9	CONCLUSION .....	172
<b>5</b>	<b>DISCUSSIONS, IMPLICATIONS AND FUTURE WORK .....</b>	<b>176</b>
5.1	INTRODUCTION.....	176
5.2	DISCUSSION OF KEY FINDINGS .....	176
5.2.1	ANTECEDENTS OF TECHNOLOGY TRUST .....	177
5.2.2	TECHNOLOGY TRUST, PERCEIVED EASE OF USE AND INTENTION TO ADOPT .....	183
5.2.3	TECHNOLOGY TRUST, PERCEIVED USEFULNESS AND INTENTION TO USE .....	184
5.2.4	TECHNOLOGY TRUST AND INTENTION TO ADOPT .....	186
5.2.5	INTENTION TO USE AND ACTUAL USE.....	187
5.2.6	ADOPTION AND TIME.....	188
5.3	IMPLICATIONS AND CONCLUSION .....	189
5.3.1	THEORETICAL IMPLICATIONS .....	190
5.3.2	TECHNOLOGY AND POLICY IMPLICATIONS .....	191
5.4	LIMITATIONS .....	195
5.5	FUTURE WORK .....	196
<b>6</b>	<b>REFERENCES .....</b>	<b>198</b>
<b>7</b>	<b>APPENDIX A.....</b>	<b>218</b>
<b>8</b>	<b>APPENDIX B.....</b>	<b>261</b>
<b>9</b>	<b>COPYRIGHT STATEMENT .....</b>	<b>268</b>

75911

## TABLE OF FIGURES

Figure 1:1: Cost of cash to the Nigerian financial system (CBN, 2012) .....	14
Figure 1:2: Direct cost of cash to the Nigerian economy in 2009 (CBN, 2012) .....	14
Figure 1:3: Architecture of electronic card infrastructure (Richard Sullivan, 2013).....	21
Figure 1:4: Service and technology evolution of mobile banking (Infosys, 2009) .....	27
Figure 1:5: Reasons for not adopting mobile banking in Nigeria (EFINA, 2013) .....	40
Figure 2:1: Factors of technology trust (Hwang et al, 2007).....	68
Figure 2:2: Theory of Reasoned Action. (Fishbein & Ajzen, 1980) .....	70
Figure 2:3: Theory of Planned behaviour (Icek Ajzen, 1991). .....	73
Figure 2:4: Technology acceptance model (Venkatesh & Davis, 1996) .....	75
Figure 2:5: Technology acceptance model with integrated trust (Wend & Tseng, 2011).....	78
Figure 2:6: The adoption decision process (Sahin Ismail, 2006).....	86
Figure 2:7: Adopter Categorization on the Basis of Innovativeness (Everett Rogers, 2003)..	89
Figure 2:8: Adopter Categorization showing propensity to adopt (Les Robinson, 2009).....	89
Figure 2:9: Conceptual research model .....	108
Figure 4:1: Theoretical Model A .....	135
Figure 4:2: Theoretical model B .....	143
Figure 4:4: Theoretical model C .....	147
Figure 4:5: Tested measurement model.....	152
Figure 4:6: Structural model for evaluation.....	158
Figure 4:8: Final structural model for this study .....	174

## TABLE OF TABLES

Table 1:1: Transaction activity of customers in banks for 2010 (CBN, 2013).....	13
Table 1:2: Nigerian mobile subscriber data and teledensity. (NCC, 2014).....	23
Table 2:1: Previous researcher's identified technology trust antecedents.....	55
Table 3:1: Variable mapping with number of survey items and literature reference .....	116
Table 3:2: Variables and respective method of measurement .....	121
Table 3:3: Model fit criteria and literature reference.....	131
Table 4:1: Demographic profile of respondents .....	133
Table 4:2: initial factor loadings for model A hierarchical component.....	137
Table 4:3: Initial model fit indices for hierarchical component of model A .....	138
Table 4:4: Final model fit indices for hierarchical component in model A.....	139
Table 4:5: Measurement level values for model A.....	140
Table 4:6: Latent variable correlations for model A.....	141
Table 4:7: Model fit indices for model A .....	141
Table 4:8: Factor loadings for hierarchical component in model B .....	144
Table 4:9: Model fit indices for hierarchical component in model B.....	145
Table 4:10: Comparison between Model A and Model B fit indices .....	145
Table 4:11: CFA results for Model C hierarchical component.....	148
Table 4:12: Initial model fit indices for hierarchal technology trust component in model C	150
Table 4:13: Final model fit indices for hierarchical component in model C.....	150
Table 4:14: Model fit indices for models A, B and C.....	151
Table 4:15: Composite reliability and Cronbach alpha table.....	153
Table 4:16 Convergent validity and construct reliability .....	155
Table 4:17: Discriminant validity via AVE comparison with covariance.....	157
Table 4:18: Summary of constructs, variables and hypotheses .....	159
Table 4:19: Regression weights of structural model.....	160
Table 4:20: structural model fit indices .....	162
Table 4:21: Initial model fit values for model with all covariates.....	163
Table 4:22: Final model fit indices for structural model .....	165
Table 4:23: Summary of hypotheses evaluations .....	165
Table 7:1: Table of constructs, number of items and references .....	218
Table 7:2: Table of shortlisted questions and references for Q-sorting.....	220
Table 7:3: Table of shortlisted questions and re-phrased for Q-sorting .....	230



Table 7:4 Q-sorting results for shortlisted questions .....	237
Table 7:5: Final factor loadings for hierarchical component in model A.....	246
Table 7:6: Final factor loadings for model B measurement level.....	247
Table 7:7: Final factor loadings for hierarchical component of model C.....	249
Table 7:8: Final measurement level values for model C .....	251
Table 7:9: Regression estimates of latent constructs with all control variables .....	253
Table 7:10: Structural model values with only significant control variables .....	258

## **LIST OF ABBREVIATIONS**

**ACC:** Access control

**AU:** Actual use

**AUTH:** Authentication

**AVE:** Average variance extracted

**BBP:** Best business practices

**CBN:** Central Bank of Nigeria

**CFA:** Confirmatory factor analysis

**CONF:** Confidentiality

**DOI:** Diffusion of innovation

**INT:** Integrity

**IT:** Information technology

**IU:** Intention to use

**NCC:** Nigerian communications commission

**NOI:** Ngozi Okonjo-Iweala

**NONR:** Non-repudiation

**PEOU:** Perceived ease of use

**PIN:** Personal identification number

**PU:** Perceived usefulness

**S.E:** Standard error

**SMS:** Short message service

**SPSS:** Statistical Package for the Social Sciences

**TAM:** Technology acceptance model

**TPB:** Technology planned behaviour

**TRA:** Technology reasoned action

## **ABSTRACT**

This empirical study investigates the factors influencing Nigerians' trust and adoption of mobile banking technology; using an integrative model. Research was conducted using a questionnaire developed and distributed in Nigeria. Out of 2256 returned questionnaires, 1725 were deemed to have been completed and hence usable. The data was analysed using confirmatory factor analysis and the results showed that confidentiality, integrity, authentication, access control, best business practices and non-repudiation significantly influenced technology trust with availability showing unsatisfactory values for consideration. In addition, technology trust showed a direct significant influence on perceived ease of use and usefulness. Technology trust also showed an indirect influence on intention to use through its impact on perceived usefulness and perceived ease of use. Also, perceived ease of use and perceived usefulness showed significant influence on consumer's intention to adopt the technology. As a result of increased understanding of customer trust and adoption trends in Nigeria, these findings have important theoretical implications for researchers with interests in technology acceptance trends and the role of external factors, such as trust, in user adoption of technology. Such implications include the provision of empirical data, which highlights the role technology trust, demographic segmentations, perceived ease of use and perceived usefulness play in mobile banking adoption in Nigeria. In addition, the successful completion of this study provides justification for the use of this research's model as a suitable framework for investigating user adoption of technology.

# **1 INTRODUCTION**

## **1.1 BACKGROUND OF STUDY**

The first set banks in Nigeria were established in 1891 and due to the inception of a structural adjustment programme in 1986, aimed at liberalizing and deregulating several sectors of the Nigerian economy, the banking industry became more relaxed and receptive to new entrants. This resulted in an increase in the number of banks from 40 to 125 between 1985 and 1991 (Onoja, 2000). Since 1985, Nigerian banks provided fundamental services such as deposits, withdrawals and loans but these services were characterised by slow operation time, limited services and structural constraints that required customers to have to go to a bank branch to receive financial services (ibid). Consequently, the growth experienced between 1985 to 1991 sparked competition between financial institutions and in a bid to achieve competitive advantage banks began identifying and incorporating several services and tools to improve customer loyalty, operational efficiency and the quality of service they provided to customers. Despite its growth, Nigeria's banking industry was not immune to the effects of the global financial crisis that started in the United States of America in 2007 and Nigeria's banking industry fell victim to the ripple effect that spread from the United States to Europe and Africa (Ojeaga, 2010). The financial crisis inevitably damaged customer's trust in the industry because it had shown major inconsistencies and vulnerability during this period (ibid). In reaction to customers' declining trust in banking, financial institutions continued to take steps to implement and improve their operations and services with the restoration of customer trust being an ever-present objective for these endeavours (ibid).

In 1999, Nigeria had a telecommunication density of 0.73% (Okereocha, 2008). However, recent statistics have shown that the advent of mobile telecommunication led to a rapid growth in the nation's telecommunication industry and today, Nigeria hosts one of the fastest growing telecommunications markets, boasting more than 129 million subscribers in 2014 and a telecommunication density of 92.14% (NCC, 2014). Aided by a bolstered telecoms sector, it is conceivable that implementing mobile banking into its banking industry would be a feasible and worthwhile venture as benefits such as improved service delivery and increased customer base would be essential in providing banks with the competitive advantage that is imperative for success in the industry. Evidently, Nigeria's rapid telecommunications growth, the banking industry's competitive nature, individual banks' need for a competitive advantage and the emergence of mobile banking as a tool which provides competitive advantage, all stand as

motivators for the introduction and adoption of mobile banking. However, despite the presence of plausible reasons to implement mobile banking and the seemingly facilitative Nigerian banking environment, previous research has shown that the adoption of mobile banking by customers has experienced challenges (Agwu & Carter, 2014). Research into the factors affecting mobile banking implementation and adoption in developing countries have been carried out with Irwin et al (2003) identifying; trailability, lower perception of risk, customer needs and relative advantage as major factors affecting mobile banking adoption among South African customers. Nadim and Noorjahan (2008) also conducted research into the barriers facing mobile banking adoption and identified perceived usefulness, ease of use, security and privacy, and customer attitude as contributing factors to the success or failure of mobile banking adoption. Also, perceived risk and trustworthiness appear as important factors in the findings of Tanakinjal et al's (2010) study of mobile banking in Malaysia. Already, the issue of user perception, risk and trust emerge as common factors among these studies. In addition to the many challenges encountered in mobile banking implementation, the issue of trust continues to be a hurdle, which financial institutions must scale in order to improve the efficiency of service delivery and optimization of service usage because customers will not be willing to adopt mobile banking if they do not trust it. (Kim et al, 2009). The importance of consumer trust in mobile banking adoption demonstrates the significance of this intended research as it is identifying the factors, which affect Nigerian customer's adoption of mobile banking, and trust's major or minor impact, is essential. The findings of this research will provide important information to both consumers and financial institutions regarding mobile banking adoption.

## **1.2 CONTEXT OF MOBILE BANKING IN NIGERIA**

According to Ajayi and Ojo (2006), the economic growth and development of a nation is linked to its investment, and improvement, in information technology infrastructures, as well as establishing secure, convenient and reliable payments systems. Countries such as the United States of America, Canada, France, Japan and Germany have already experienced increased economic growth because of continued investment in their respective information technology infrastructures (Jorgenson, 2001). However, IT investment does not automatically result in economic development without proper execution (ibid), a fact Anie (2011) concurs with by adding that IT investment can only result in economic development if the nation's IT objectives and policies are effectively implemented and utilised. With advancement in

information technology standing as a factor in economic development, developed countries are experiencing trends where traditional systems, in various sections such as education, health and transport, are being improved or replaced with more secure automated information technology systems (Humphrey, 2004). The financial industry is also experiencing this change as online and cashless systems are currently implemented as alternatives to the traditional cash payment systems (Tunji, 2013). These changes have been beneficial in countries like the United States and United Kingdom where financial institutions reported cashless alternatives leading to benefits such as faster transactions, reduced queues at points of sales and improved hygiene on site due to the elimination of bacterial spread through handling notes and coins (Akhalumeh & Ohiokha, 2012). They have also led to increased transparency in user transactions as well as reduced operational costs and increased customer satisfaction (ibid). With these benefits in mind, the Central Bank of Nigeria (2013), Nigeria's financial system regulatory body, has stated that it is imperative for Nigeria to also make a transition from the traditional cash-heavy economy to a cashless economy because of these identified benefits as well as several disadvantages of the nation's current cash-heavy financial paradigm (Yaqub et al 2013). Some of the benefits, which CBN (2013) highlights as motivations for introducing the cashless policy are:

- Meet Vision 2020 Requirement: Vision 2020 is a policy introduced by the Nigerian government, and facilitated by CBN, which aims to increase economic development through an IT supported cashless society. The policy also aims to put Nigeria on par with global counterparts as one of the leading economies in the world by the year 2020.
- Drive Financial Inclusion: Ensuring that all Nigerians in the nation have access to financial services irrespective of constraints such as geographical location.
- Reduce the cost of cash on the Nigerian economy: Considering that the cost of handling cash transaction in the nation continues to have an increasingly sapping effect on its financial system, as shown in Figure 1:1 and Figure 1:2
- Foster transparency and curb corruptions: This is because transactions conducted through cashless systems are traceable and auditable as opposed to cash-heavy systems, which encourage bribery and corruption.

In addition to the potential benefits of a cashless economy, motivations to switch from the traditional methods also come from the current detriments Nigeria's current cash-heavy

economy is causing the nation. These detriments have continued to put a strain a financial strain on the Nigerian economy as well as everyday life of the Nigerian populace.

Firstly, in its current cash-heavy economic state, the high cost of cash continues to pose a major disadvantage to the Nigeria financial system and its stakeholders (Agwu & Carter, 2013). In 2012, CBN reported the cost of cash to have reached 192 billion naira (CBN, 2013). In table 1:1 below, CBN (2013) also provides an overview of Nigerian banking activities accounted for by cash channels such as automated teller machine withdrawals, over-the-counter-withdrawals and cheques, in 2010. It also shows the activities accounted for by cashless channels such as point-of-sale transactions and web transactions in the year 2010 as well. The reports reveal that 99% of customer activity in banks were cash related and further demonstrates how cash-heavy the Nigerian economy was before the launch of the cashless policy in 2011. In figure 1:1 (CBN, 2012), the graph shows a 5-year increase; from 2008 to 2012, in the cost of cash to the nation, showing how much of a financial strain the cash-heavy system was putting on the Nigerian economy. Lastly, figure 1:2 (CBN, 2012) shows the direct impact a cash-heavy economy has on the financial systems of Nigeria in 2009. From figure 1:1 (CBN, 2012), it is seen that in 2009 alone, cash transactions cost Nigeria’s financial system over 114 billion naira, a cost which was predicted to increase to over 200 billion in the years to come.

Table 1:1: Transaction activity of customers in banks for 2010 (CBN, 2013)

<b>Payment channel</b>	<b>Transaction volume</b>	<b>Method of transaction</b>
ATM withdrawals	109,592,646	<b>CASH</b>
Over-the-counter withdrawals	cash 72,499,812	
Cheques	29,159,960	
Point of sale (POS)	1,059,069	<b>CASHLESS</b>
Web	2,703,516	
Notes: ATM = Automated teller machines		

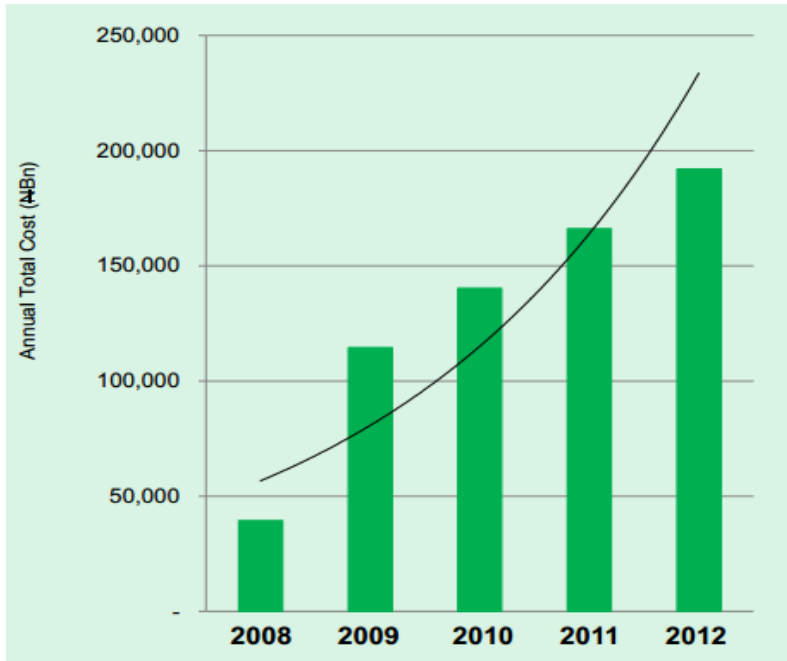


Figure 1:1: Cost of cash to the Nigerian financial system (CBN, 2012)

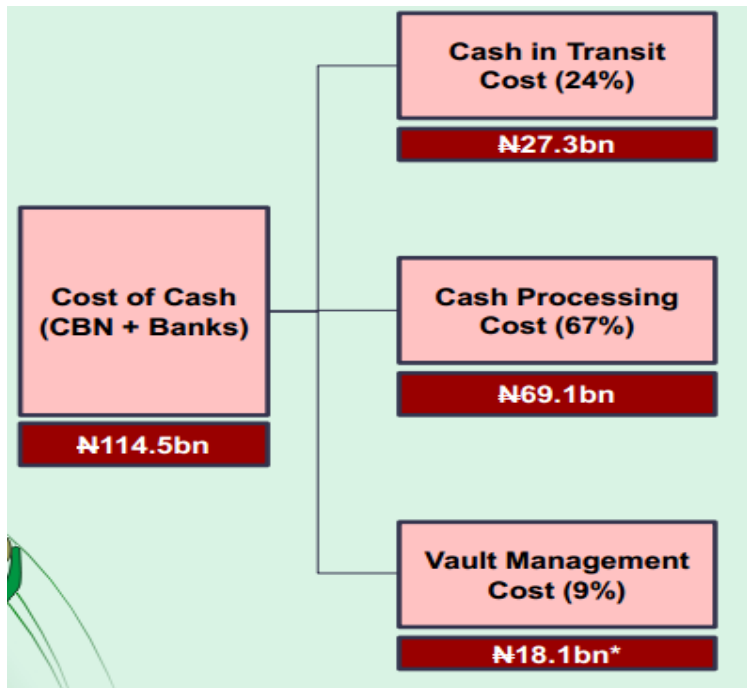


Figure 1:2: Direct cost of cash to the Nigerian economy in 2009 (CBN, 2012)



Secondly, Nigeria has an adult population of 84.7 million and 46.3% of this population has been identified to be financially excluded (EFINA, 2013). This means that over 39 million Nigerians do not have bank accounts and are not receiving any form of financial services. With such a large percentage of the nation's populace being financially excluded and described as "unbanked", it also results in a large percentage of funds and transactions being undocumented and unregulated because they exist outside the scope of a formal financial system (Odonmeru, 2013). Availability of services has been theoretically identified as one of the major issues which encourages financial exclusion as a large portion of the unbanked Nigerians reside in rural areas where banks are unable to establish branches due to geographical constraints (CBN, 2012). With 70% of Nigerians' adult population residing in these rural areas, it is deducible that a large percentage of the unbanked are physically inaccessible to financial institutions especially since, under a cash-heavy economy, these unbanked Nigerians require services such as bank account and fund management to be done through physical bank branches (Odonmeru, 2013). However, under a cashless paradigm, financial exclusion can be curbed as more unbanked Nigerians can opt for cashless channels like mobile banking. Mobile phones currently have over 80% penetration in Nigeria's rural areas (ibid) and can be used to include the unbanked in the formal financial system, provide them with financial services and bring the various benefits of the cashless economy to previously unreachable areas, through mobile banking, ultimately leading to economic growth and development (CBN, 2013).

Finally, the high usage of cash in the country is an enabling factor for corruption in the nation and is one of the main factors encouraging financial crimes such as bribery, money laundering and other fraudulent activities. It also encourages cash-related criminal offences such as robberies and kidnappings, which can be reduced if the economy was not reliant on cash-heavy payment systems (CBN, 2014). Considering the consequences of a continued cash-heavy economy, and the potential benefits of going cashless, all of which have been results of a sole reliance on cash-payment systems, the Nigerian economy was in need of a solution, which could alleviate the immense cost of cash on its financial system. Achieving this would require a reducing the amount of physical cash in the nation, ensuring the establishment of secure and reliable alternatives to these cash-payment systems while being beneficial for Nigeria and all stakeholders involved (CBN 2014). These requirements became the stimulating factors for CBN's cashless policy solution, launched in 2011. The cashless policy was created as a transition project which would lessen the negative effect cash was having in the economy by introducing new information technology channels which provided more advantageous payment

alternatives to customers, organisations and Nigeria as a whole (Odunmeru, 2013). The cashless society CBN aimed to achieve would be one where transactions are conducted through information technology channels such as mobile banking and debit or credit cards; thereby leading to a minimal amount of physical cash in the economy (Yaqub et al 2013). To achieve this goal, the mandate was to utilise appropriate policies and investment to encourage alternative payment methods and, to be more specific, CBN (2013) stated its aims and motives for the cashless policy as:

1. To drive development and modernization of Nigeria's payment system in line with Nigeria's vision 2020 goal of being amongst the top 20 economies by the year 2020. An efficient and modern payment system is positively correlated with economic development, and is a key enabler for economic growth.
2. To reduce the cost of banking services (including cost of credit) and drive financial inclusion by providing more efficient transaction options and greater reach.
3. To improve the effectiveness of monetary policy in managing inflation and driving economic growth

CBN also introduced certain policies and strategies, engineered to motivate the Nigerian populace to switch their preferred payment methods from the cumbersome and economy-debilitating cash system to the convenient and secure cashless payment systems. These strategies involved introducing financial constraints and creating awareness amongst Nigerians on the cashless policy and the cashless systems available to them. More detail on each strategy is provided below:

- **Transaction limits and charges:** From March 20th 2012, cash withdrawal limits and cash handling charges were implemented for both individuals and organisations (CBN, 2013). This policy aimed to steer customers away from using physical cash to conduct transactions by placing cash handling charges on individuals and organisations making withdrawals or deposits exceeding N500,000 and N3,000,000 respectively, as well as a N150,000 withdrawal limit for all third party cheques (Odunmeru, 2013). However, these withdrawal limits and cash handling charges could be circumvented if the individuals and organisations opted to utilise cashless channels, such as mobile banking, as their preferred method of payment and transaction. Although the cashless

policy was introduced in April 2011, this policy was put into effect in March 2012 in order to provide financial institutions with enough time to put appropriate cashless payment channels in place. In addition, it allowed banks to have enough time motivate their customers to see the benefits of using these new payment channels as opposed to dealing with the limits and charges that were now attached to their traditional cash-heavy channels (Yaqub et al, 2013).

- **Sensitisation and awareness:** The second strategy was designed to be used in conjunction with the financial constraints; involved a mass sensitization scheme aimed at creating awareness amongst Nigerians (CBN, 2013). This mass sensitisation scheme utilised media channels like newspapers, television adverts and social media to target groups and locations, such as markets, religious organisations, academic institutions, community leaders and organisations (ibid). These groups were identified by CBN as persons who would be most affected by the cashless policy, as well as avenues to reach a large cross-sections of Nigerians (ibid).

With the cashless policy and CBN's sustained dedication to achieving its cashless economy goals, financial institutions increased efforts to provide cashless payment channels to customers. The high penetration of mobile telecommunications in the country led to a large number of financial institutions introducing mobile banking applications aimed at taking advantage of Nigeria's large mobile telecommunication subscriber base to bring financial goods and services to both current and prospective customers through their mobile devices. By 2013, over 90% of the 21 banks in Nigeria offer mobile banking services as financial institutions, motivated by the high penetration of mobile phones in Nigeria and CBN's cashless policy, increasingly introduced the technology anticipating high adoption rates among customers (Odumeru, 2013). Though mobile banking is the most current cashless payment system introduced in Nigeria, its introduction was preceded by other technology solutions aimed at fostering cashless payment in Nigeria; consequently contributing to the trend and shift towards a cashless economy in Nigeria (Tunji, 2013).

### 1.2.1 CASHLESS BANKING TECHNOLOGIES IN NIGERIA

The early stages of mobile banking in Nigeria were characterised by SMS-based transactional notifications, which involved customers receiving SMS notifications on their phones when transactional operations were performed on their bank accounts (Ibikunle & Mayo, 2012). However, further technologies were adopted to provide mobile banking services to consumers and some of the additional features of mobile banking which customers could utilise included account and security alerts, transaction verifications and provision of account details and payment services (Ibikunle & Mayo, 2012). Some of the technologies, which helped bring these services to operation, are:

**TELEPHONE BANKING:** In the case of telephone banking, banks provided specific numbers for consumers to call and during these phone calls, security measures would ensure customer identity authentication followed by pre-specified menus listing various available banking services which users could choose from and utilise either via text or speech input (Ibikunle & Mayo, 2012). After the security measures were satisfied, customers could access their respective accounts and perform actions such as balance enquiries, money transfers and general customer enquiries. Although telephone banking gave customers the added convenience of being able to perform and receive financial services, through a phone, without having to be physically present in a bank, the technology did not experience the level of patronage that the institutions expected. This was due to inadequate awareness of technology amongst Nigerians and a lack of effort from the financial institutions in increasing customer sensitisation towards the service (Adewuyi, 2011).

**INTERNET BANKING:** The introduction of internet banking in Nigeria in 2001 has allowed customers to conduct transactions and received goods and services, not just from banks, but from other stakeholders, such as retailers, as well (Adewuyi, 2011). This has led to internet banking being a main facilitator of electronic commerce (e-commerce), not just in Nigeria, but worldwide (ibid). Much like mobile banking and telephone banking, internet banking adds convenience to customers by letting them have access to their accounts, and financial services such as funds transfer and balance enquires, without them having to be present within a bank. With this technology, customers use the internet to navigate to the websites of their respective banks and access their accounts after satisfying security measures such as provision of internet banking customer numbers, appropriate passwords and personal identification numbers (PIN).

Apart from accessing bank accounts and carrying out banking operations, customers can also navigate to merchant websites, purchase goods and services and pay for them using cashless payment infrastructures, such as debit or credit cards, which result in the account affiliated with the customer's cards being debited (ibid). Like most of the cashless payment infrastructures in Nigeria, internet banking has faced several challenges; hindering customers from experiencing its full potential. Inadequate investment and infrastructure, low awareness level and poor literacy levels have led to this technology facing low adoption as a preferred method for cashless payments (Yaquub et al, 2013). In subsequent sections, more detail will be provided on the challenges cashless payment channels like this, and specifically mobile banking, face in Nigeria.

**ELECTRONIC CARD TECHNOLOGY:** Preceding Nigeria's migration to chip and pin card use in 2010, card-related fraud had been prevalent in nation because of the predominant use of a less secure variant of card technology known as the magnetic stripe-card (CBN, 2014). These magnetic strip cards were designed based on a process called card fingerprinting where a magnetic stripe on a card was used to identify customers and customer bank accounts based on the unique pattern of particles or verification code on the magnetic stripe (Sullivan, 2013). Customers would hand these cards over to merchants at the point of transaction and merchants would swipe these cards, which also had the customer's bank details embossed on the opposite side of the magnetic stripe, on card reading machines (ibid). The card reader would then compare the pattern or code details on the magnetic stripe of the swiped card with the details associated with that card number on the globally accessible database (ibid). Transactions were successful if a match was established between the details on the card and the details on the database. If these criteria were not satisfied, the transaction was rejected (ibid). Despite the authentication measures of the magnetic stripe cards, vulnerabilities in the system led to migration towards more secure alternatives for card payments (ibid). These vulnerabilities exposed customers and financial institutions to card fraud instances where customers' cards were stolen, or duplicated, and used by criminals to access funds in the customer's account (ibid). In a bid to improve security measures and reduce card fraud, customers were later asked to sign the back of their cards as well as required to reproduce these signatures at the point of transaction in order to improve authentication measures (Bhatla et al, 2003). However, criminals later learned to duplicate the signatures of the card owner and because the signature and magnetic stripe were the only security measures that authenticated customer's identity,

criminals with stolen cards or cloned counterfeit cards could perform transactions successfully because they could now also reproduce the signatures of the customer (ibid).

According to statistics provided by the Financial Institutions Training Institute (2013), card fraud cost the Nigerian financial system N165 billion in 2000; N3.12 billion in 2001 and N8.20 billion in 2002. The losses declined to N5.13 billion in 2003 but moved up to N89.43 billion the following year. In 2005 and 2006, the losses dropped to N6.76 billion and N2.74 billion respectively but rose again to N8.51 billion in 2007. In 2008, the losses rose steeply to N34.50 billion and marked the turning point for CBN where the issue of card fraud had to be drastically addressed as customer confidence in card technology had dwindled (Tunji, 2013). Countries like the United Kingdom and the United States had already begun rapidly transitioning away from magnetic-stripe card payments to the chip and pin card system and in April 2009, CBN ordered financial institutions in Nigeria to discontinue the use of the vulnerable magnetic stripe card in favour of the more secure chip and pin system. With the chip and pin system, customers were issued with payment cards which had computer-chips embedded into them as well as well as a unique four digit personal identification number (PIN), which was assigned to that card and expected to only be known by the account owner who the card was issued to by the financial institution (Adewuyi, 2011). These PINs can also be changed by the customer when desired; thereby adding an improved layer of security to card payments (ibid). With these cards, access to the funds in the account associated with the chip and pin card was granted only after the user successfully provided the PIN number associated with the card on points of transaction such as point-of-sale terminals and ATMs (Sullivan, 2013). Using these cards required the customer to present their card at the point of transaction, insert the card into a card reader and enter the PIN associated with the card. The card reader would then transmit the details stored on the microchip and the PIN number to the card issuer's database where both details would be checked for concurrence with the details for that account on the database. If a match was established, the transaction completed successfully and if a match failed to be established, the transaction was rejected (ibid).

The successful switch from magnetic stripe cards to chip and pin cards has led to a drastic reduction in card fraud to the tune of N21.72 billion in 2009 and a further decline to N14.96 billion in the preceding year (FITC, 2013). Electronic cards are one of the most widely used cashless payment channels across the globe (Carow & Staten, 2000). These cards provide an added convenience to customers because they reduce the need for customers to carry and use physical cash by allowing customers to access their accounts through these cards. Therefore,

customers can conveniently use these debit and credit cards, which are secured by bank or customer-defined PIN numbers, to pay for goods and services online as well as complete transactions using point of sales terminals (ibid). Figure 1:3 (Richard Sullivan, 2013) is a depiction of the architecture of the electronic card technology infrastructure.

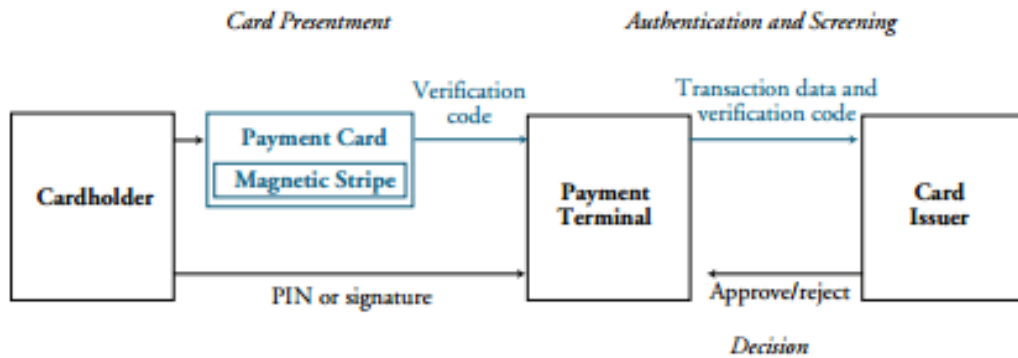


Figure 1:3: Architecture of electronic card infrastructure (Richard Sullivan, 2013)

The chip and pin card technology is currently the most widely used method of cashless payment with over 14 million banked Nigerians adopting the technology as at 2013 (EFINA, 2013) and, according to CBN (2014), has accounted for a 90% reduction in card fraud in the nation since its introduction. However, 46.3% of 84.7 million Nigerians are still financially excluded and are yet to adopt the technology, which is only available from financial institutions to Nigerians with active bank accounts. In addition, more than 50% of banked Nigerians are still not using electronic payment cards, resulting in the chip and pin card technology failing to reach the required penetration rate, among unbanked and banked Nigerians alike, which will indicate an economic transition to a cashless society (EFINA, 2013). In light of this, a cashless payment channel with a high potential to penetrate into the banked and unbanked demographic was required and this cashless solution had to be able to circumvent the physical barriers of geographical location to bring financial services to areas that had been previously unreachable. This is where Nigerian's high mobile telecommunication density and mobile phone penetration proved advantageous for its financial institutions and cashless policy

### **1.3 MOBILE PENETRATION IN NIGERIA**

In recent years, researchers have focused attention on online banking but specific and exhaustive research into the adoption of mobile banking in both developed and developing countries is lacking. Its adoption is evident in other countries like the United States where, with a population of 318 million people, 87% of the population own mobile phones and 33% of them have used mobile banking in 2014, an increase of 5% from 2013 (Federal Reserve, 2014). In November 2013, research conducted by GFT Technologies investigated mobile banking usage in Spain, Brazil, Germany and the United Kingdom. The results showed a 63% and 62% usage in Spain and Brazil while Germany and the United Kingdom showed the least amount of usage at 26% and 38% respectively (GFT Technologies, 2013). These statistics, specifically the low adoption rate in Germany, the United Kingdom, the United States as well as Nigeria's reported 5% adoption rate, once again highlight the low uptake of the technology in different countries. In Nigeria, understanding the mobile teledensity premise behind mobile banking's introduction into the financial system will provide better insight into the reason why the low adoption of the technology in the country requires investigation.

According to publications made by the Nigerian Communications Commission in 2014, the nation has experienced a yearly increase in mobile subscribers and teledensity since 1999. Specifically, the total number of mobile subscribers at the end of February 2012 was 178.18 million with the country having a teledensity of 69.01%. By January 2013, the number of subscribers had increased to 226.61 million with a teledensity of 81.78% and by the end of January 2014, the nation had 247.23 million registered subscribers and a teledensity of 91.40%. Table 1:2 (NCC, 2014) gives an overview of the country's mobile subscriber and teledensity data from 1998 till date.



Table 1:2: Nigerian mobile subscriber data and teledensity. (NCC, 2014)

<b>Year</b>	<b>Subscribers (millions)</b>	<b>Teledensity (%)</b>
1998	0.02	0.02
1999	0.03	0.02
2000	0.04	0.03
2001	0.35	0.28
2002	1.46	1.15
2003	3.35	2.49
2004	9.39	6.85
2005	18.4	13.2
2006	29.1	20
2007	41.6	29
2008	44.4	31
2009	47.01	34
2010	50.92	37.51
2011	53.78	42.08
2012	178.18	69.01
2013	226.61	81.74
2014	247.23	91.4

Table 1:2 shows that mobile telecommunication usage in Nigeria has experienced yearly growth as the technology continues to have an increased penetration across the nation. Specifically, mobile phone penetration exhibited a high rate of penetration in 84.9% in urban as well as a substantial penetration of 55.6% in rural areas where a large percentage of unbanked Nigerians reside (EFINA, 2014). In light of Nigeria’s growth in the mobile telecommunications sector and the increased mobile phone penetration in both urban and rural parts of nation, mobile banking was expected to experience a swift uptake among Nigerians as the country’s teledensity would provide a fertile environment for mobile banking adoption among the banked and unbanked alike (Agwu & Carter, 2014). In the next section, the definitions of mobile banking are discussed in order to understand the concept of the technology as well its evolution.

#### **1.4 DEFINITION AND EVOLUTION OF MOBILE BANKING**

In a global context, the banking industry has undergone several transformations over the years and, in addition to the introduction of new technologies, services and products, the use of information technology in bank operations has changed the way several bank processes are executed. It has also provided financial institutions, and its customers, with new utilities, such as automated teller machines (ATM), point of sale terminals (POS) and electronic banking, which help improve customer convenience, service delivery and banking operations (Tiwari & Buse, 2007). These cashless payment systems helped reduce traditional costs as manual banking operations were now being handled by computational technology systems that ensured process efficiency and data accuracy. Consumers also benefitted from the adoption of E-banking as they no longer had to be physically present within a bank, queuing up for extended periods of time to perform certain banking transactions such as cash withdrawals and bill payments (Mattila et al., 2003). Financial institutions' willingness to innovate would continue to merge with further technological advancements and the mutually beneficial results of this merger, to both consumers and financial institutions, would give rise to the emergence of mobile banking thereafter.

Mobile banking refers to the feature provided by financial institutions, which gives customers the ability to execute and experience fundamental banking services, through telecommunications devices, without them being physically present within a bank (Suoranta, 2003). Segun (2011) provides another definition, stating that mobile banking occurs when customers use mobile devices and similar devices to access a bank's network through the mobile phone's wireless telecommunication network. According to Akpan (2009), mobile banking can be viewed as a dimension of mobile commerce where customers can perform banking operations virtually through mobile phones without the constraints of time or physical location. In addition, Gu et al (2009), Medhi, et al (2009), Quick (2009) as well as Laukkanen,(2007) also provide definitions which are very similar to the ones detailed above and this consensus between definitions is a product of a lack discrepancies in studies regarding the meaning of mobile banking, functionalities involved and the benefits it provides users and vendors. Concerning the functionalities of mobile banking, the worldwide evolution of the technology has seen it transition from simply being a one-way bank-to-customer medium of information delivery to a robust banking tool which provides a host of services to users (Infosys, 2009). This service transition has been a direct result of growing business needs in

the financial industry as well as advancements in technology, all of which will be discussed in sections below.

#### 1.4.1 BUSINESS NEED EVOLUTION

The business needs of financial institutions which contributed to the introduction and evolution of mobile banking came in two dimensions (Infosys, 2009; Safeena et al, 2011):

- **The need to increase and maintain customer satisfaction:** Firstly, financial institutions identified characteristics of the new generation customer as being constantly on the move as well as accustomed to having access to information whenever and wherever they desired (Infosys, 2009). This new dimension to customer behaviour had been manifesting in several industries and the financial sector was no different as customers increasingly demanded constant access to their financial accounts as well as the ability to carry out various financial activities such as viewing bank statements, transferring funds, paying bills and applying for loans and overdrafts without being inconvenienced by factors such as bank branch location or closing times (Ankrah, 2012; Rahmani, 2012). The ability of banks to address these convenience and mobility needs of the new generation customer would later result in higher customer attraction and retention, so achieving higher levels of customer satisfaction was one of the significant business needs which triggered the introduction and evolution of mobile banking (Safeena et al, 2011). Attempts to address these needs initially led to the introduction of services like the ATM and internet banking which for the most part, addressed the demands of the customer but did not fully achieve the customer satisfaction levels required by financial institutions (Rahmani, 2012). This was due to the issues such as customers only being able to use ATMs at specific locations as well as ATMs providing only a limited set of financial services to the ATM user such as balance enquiry, mini-bank statement printing and fund withdrawal. In the case of internet banking, the lack of mobility became a major issue for users as internet banking users had to have access to the internet via LAN or WI-FI connection as well as be present in front of a desktop or laptop to use the service (ibid). These solutions made caused mobility and convenience issues for the new generation customer as these services were impossible or impractical to use whenever and wherever they desired. The advent of mobile banking addressed these issues as customers could simply be on the move and use their mobile devices to carry out whatever financial activity they desired without the

previous constraints they experienced with traditional banking methods or solutions such as internet banking (Anyasi & Otubu, 2009). This led to increased customer satisfaction levels for financial institutions and customers as well as banking had now evolved from the limiting branch-banking methods, where customers had to be present in a bank to carry out financial activities, to “on the move” banking which gave customers more freedom and convenience (Infosys, 2009 2009; Rahmani, 2012). The evolution of services provided by mobile banking also contributed to customer satisfaction as technological advancements enabled financial institutions to use mobile banking as a channel to provide a combination of basic services, such as text message alerts on account activity, as well as more elaborate services such as bill payment services and loan requests. Figure 1:4 provides an overview of the transition of service delivery from basic SMS alerts to more intricate features such as loan requests.

- **The need to reduce cost of operations:** The second factor which led to the introduction and evolution of mobile banking was financial institution’s need to reduce the operational costs of traditional banking methods. Banks had come to the realisation that a large volume of customers were using channels such as bank branches and ATM machines to carry out simple enquiries such as requesting bank statement and validating their account balance (Infosys, 2009: Yaqub et al, 2013). This led to negative impact on operational costs as financial institutions continued to record overhead costs for staff and ATM infrastructure because of banking activities which could be addressed using information technology solutions (ibid). This consequently led to the introduction of one of the earliest forms of mobile banking technology which was mobile banking via SMS texts. Figure 1:4 (Infosys, 2009) provides an overview of the evolution of services financial institutions provided customers through mobile banking.

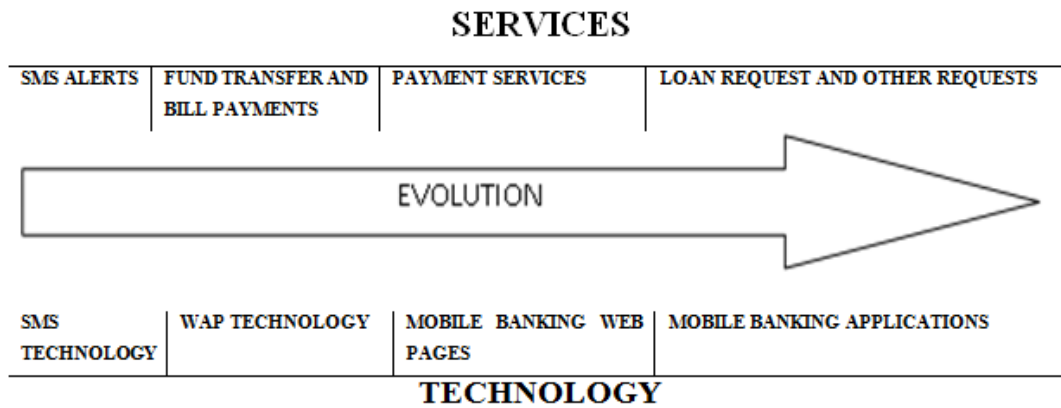


Figure 1:4: Service and technology evolution of mobile banking (Infosys, 2009)

### 1.4.2 EVOLUTION OF MOBILE BANKING SERVICES AND TECHNOLOGY

Mobile banking services evolved as technology advancements allowed financial institutions to meet more of their customers traditional banking demands through mobile banking. This section will discuss the evolution of these services from the initial basic SMS alerts to the more elaborate services such as loan requests.

**SMS ALERTS AND ACCOUNT ENQUIRIES:** The introduction of this service addressed the customer's need to perform simple tasks such as balance enquiries and account validation by sending short real-time messages to the user on their mobile phone with information such as recent account debit or credit activity (Dube et al, 2011; Rotimi et al, 2007). This was all made possible through the utilisation of Short Messages System technology which allowed mobile banking devices to send and receive short text messages in a push and pull mode respectively (Dube et al, 2011). In push mode, customers could request account information, such as account balance, by sending text messages to the financial institutions including a keyword and identification information. These request would then be responded to in pull mode where the customer receives replies to their requests from the financial institutions after the mobile number and identification information were validated against their registered bank account (ibid). SMS technology was widely accepted by banking customers as it provided a cost effective way to provide convenient banking to customers and was ubiquitous as it worked on almost every model of mobile phone (Rotimi et al, 2007). These benefits led to increased patronage by user as more customers began using the SMS banking services to carry out their simple enquiries; consequently reducing operation costs in branches and on ATMs (ibid).

However, limitations of this technology such as security vulnerabilities to hackers, 140 character limits on text messages and lack of a dedicated user interface to facilitate more complex financial services led to the adoption of new service delivery technologies such as WAP and USSD which enabled the introduction of more elaborate banking services through mobile banking (ibid)

**FUND TRANSFER AND BILL PAYMENT:** After the introduction of SMS alerts and account enquiries, financial institutions began realising and taking advantage of the potential in mobile devices as channels for increasing customer satisfaction and reducing operational costs as well as increasing competitive advantage by offering more traditional services through the mobile banking channel (infosys, 2009). This led to the addition of fund transfer and bill payments as added features in the mobile banking service, allowing customers to move funds between their own multiple bank accounts, send funds to other customer's account, as well as send funds in the form of bill payments to organisations like utility companies (ibid). To bring these mobile banking services to fruition, vendors utilised WAP technology which harnessed mobile phones ability to access the internet to allow customer have secure real-time access to their financial institution's dedicated web pages to perform banking operations (Mallat et al, 2004). WAP technology on mobile phone enabled users to perform activities similar to internet banking on a computer and the addition of these features further reduced operational costs as customers no longer had to visit branches and use cheques to pay their bills or manage the funds in their accounts because they could now do all these with their mobile phones (ibid). Though WAP technology allowed customer to perform more complex operations than the basic SMS alerts provided by SMS technology, the technology experienced usability issues as mobile phone screens were characteristically small and viewing web pages on mobile phones proved visually uncomfortable for users (Infosys, 2009). Also, websites accessed through WAP technology required numerous amounts of scrolling and clicking to accomplish tasks which later discouraged users from utilising the technology and the services it enabled (ibid). Consequently, this led financial institutions to consider other technologies and services they could introduce to customers through mobile banking which would provide more convenience to the user, increase customer satisfaction and reduce bank costs while avoiding the discomforts experienced by WAP technology.

**PAYMENT SERVICES:** With the mobile phone becoming an increasingly important tool in the life of the everyday user, financial institutions became increasingly convinced to take advantage on the mobile phone's increased penetration across both current and potential customer base. This led to the introduction of payment service features which came in two forms, namely proximity payments and non-proximity payments (Krugel, 2007; Infosys, 2009).

With non-proximity payments, mobile banking users could complete transactions using mobile phone communication channels such as GPRS, SMS, 3G and 4G (ibid). This service formed the basis for securely completely e-commerce transactions as customers could complete business transactions with merchants who were not in physical proximity to them. In addition to using mobile phone communication channels, this service was made possible by WAP technology and mobile banking web pages as well (ibid). Financial institutions were able to create elaborate websites on the internet; provided users with secure real-time access to their accounts as well as improved usability. This was due to advancements in mobile phone technology leading to smart phones with screens which were easier to navigate and more suitable to display webpages without being visually discomfoting for users (Infosys, 2009; Krugel, 2007).

In the case of proximity payments, the mobile phone was converted into a physical payment device using a relatively new technological introduction into the cashless payment systems known as Near-Field Communication (NFC). NFC technology is currently an introductory infrastructure in the mobile banking setup in Nigeria and is currently only provided by one vendor, Teasy Mobile Money, at the moment. With NFC, the mobile phone was converted into a physical payment instrument as an NFC chip encrypted with the customer's payment details was attached to the mobile phone (Infosys, 2009). With this chip attached, all the user had to do was tap the chip on an NFC-enabled payment terminal and a link between the mobile phone and terminal would be established, sending payment information from the chip, through the terminal, to the financial institutions servers which would then verify the details of the transaction and either accept or reject the transaction (ibid). This brought an added convenience to users as it greatly reduced the need to carry cash and has even been considered a substitute for debit and credit cards as well (Crowe, 2012).

**LOAN AND SERVICE REQUESTS:** The evolution of mobile phones to more smarter, faster, efficient devices known as smart phones, also led to an evolution in the sort of services offered by financial institutions through mobile banking (Infosys, 2009). Using bespoke mobile

banking applications which utilised the smart phones increased processing power, financial institutions were able to introduce more complex features where customers could apply for loans, overdrafts or mortgages and also receive instant decisions on their requests (ibid). Even though technology infrastructures such as mobile banking websites allowed these services to be provided to users, the advent of mobile banking applications led to even more user friendly channels of service delivery. Customers could download and install their respective financial institutions mobile banking applications on their phones which meant they had a dedicated user application on their phones which provided them with real time mobile banking services as well as improved response times, enhance communication security between user and bank, richer user interfaces and access to a comprehensive set of financial services (Infosys, 2009). This added features ultimately led to enhance customer experiences with mobile banking and increased customer satisfaction as well as immense decrease in financial institutions operation costs.

## **1.5 MOBILE BANKING ADOPTION IN NIGERIA**

The growth of the telecommunications industry, as well as the advancement of mobile technologies, set in motion the emergence of mobile banking as one of the fastest growing technology trends in recent years (Sulaiman et al, 2007). The facility for consumers to use their mobile devices to access their bank accounts, carry out banking operations such as bill payments, money transfers and viewing bank statements has provided consumers with a convenience which serves as one of the benefits and motivators for mobile banking adoption (Cheah et al, 2011). In addition, accessibility of services and interactivity are also responsible for the continuous adoption of mobile banking across the globe which has proven to be mutually beneficial for consumers and banking institutions, consequently motivating both financial institutions and consumers to adopt the technology as a preferred method of banking to traditional methods (Zhou et al 2010; Cheah et al, 2014). From the bank's perspective, the adoption of mobile banking has proven to be advantageous as a parallel operation to both traditional banking methods and electronic alternatives, which has led to cost reduction and increased customer satisfaction (Rose and Hudgins, 2005). The increased competitive advantage experienced by financial institutions in comparison to market counterparts who do not offer the mobile banking service has also given these financial institutions the motivation to promote customer adoption of the technology (Daniel, 1999). With the benefits of mobile banking acting as incentives for consumers to adopt the technology, CBN as well as the



financial institutions anticipated a swift transition to this cashless payment system. However, the uptake of mobile banking in Nigeria has been relatively slow and has struggled to reach a satisfactory level of adoption among Nigerians since its introduction in 2011. According to a report released by EFINA (2013), which surveyed 1500 adult customers in Nigeria, conducting transactions through mobile phones and mobile banking applications was the least preferred channel of banking to the adult Nigerian. Specifically, transactions through a physical bank branch had a preference of 57.9% in comparison to mobile banking's 0.4%. Nigeria has a total population of 168.8 million and these reports also showed that despite the country's 81% mobile phone penetration across these 16.8 million people, mobile banking had only achieved a 5% usage in the country in 2012 (EFINA, 2013). By 2013, the penetration rate had only increased to 13% (NOI, 2013) leading to the conclusion that the nation's high penetration of mobile telecommunications do not necessarily equate to a high rate of mobile banking usage that CBN and financial institutions had expected.

Within the same period, a survey conducted by ACI Worldwide and Aite Group (2012) reported the mobile banking adoption rate in the India, China, South African, the United States and United Kingdom as 76%, 70%, 61%, 38% and 31% respectively. In addition to these statistics, 60% of Nigeria's population were reported to be unaware of the existence of the technology in the nation (ibid). It was also reported that of the 40% who are actually aware of mobile banking, only 13% of them utilise the service. These statistics display the struggle mobile banking adoption faces in Nigeria and highlights the problem stakeholders such as the Central Bank of Nigeria faces in achieving its cashless economy aims and objectives (Tunji, 2013). With CBN's cashless economy objective dependant on Nigerian's adoption of banking alternatives such as mobile banking, the low rate of adoption consequently stifles the achievement of the proposed cashless society. The general adoption trend is evidently low and understanding the specific adoption tendencies of Nigerians, as well as the challenges facing the technology's adoption, will shed more light on the motives behind the low adoption of mobile banking as well as the provide a research foundation for the investigation of the factors influence these adoption trends.

## **1.6 DEMOGRAPHICS AND ADOPTION TRENDS**

Considering that CBN launched the cashless policy in 2011, the projected nation-wide adoption of cashless payment channels such as mobile banking is currently at an infancy stage (Hamza & Shah, 2014). With the technology being in an early phase stage of adoption in Nigeria, three

general demographics of adopters and non-adopters have been identified by CBN in a report released in 2013. These classifications also fall under categories identified in Roger's (1995) theory of innovation diffusion and the details of this theory, and its theoretical contributions to this study will be discussed in later chapters of this thesis. These three types of Nigerian adopters are:

1. Those who clearly oppose the cashless policy and its associated technologies
2. Those who aren't sure and view the policy, and technologies, with an amount of scepticism
3. Those who believe in the benefits of the policy and are ready utilise the technologies supporting the policy

Though extensive statistical research is lacking regarding the demographic profiles of mobile banking users and non-users in Nigeria, a survey conducted by EFINA (2013) among 1535 customers provides statistical evidence about certain mobile banking demographics in Nigeria. Research from EFINA currently stands as the most extensive investigation into the demographic profiles of mobile banking adopters and non-adopters in Nigeria. However, there exist other smaller scale studies, which supplement or contradict the findings revealed by EFINA in 2013. Gender is the first demographic characteristic considered

### **1.6.1 GENDER**

Research by Izogo et al (2012) investigated the cashless policy adoption trend among 150 customers and revealed that 55.7% of the total male demographic had used mobile banking while 43.3% had not adopted the technology. In comparison, the female demographic were less open to the new technology as 31.7% had used mobile banking while 68.3% had not adopted the technology. Odunemru's (2013) research also reveals similar trends with a survey of 59 men and 32 women revealing 52% of the men had already adopted mobile banking while only 41% of the women had not done the same. The findings of Izogo et al (2012) and Odunmeru (2013) reveals a disparity between both demographics where women are more likely to be non-adopters of mobile banking than men and this is further evidenced in EFINA's (2013) report which showed that 43.5% of Nigerian females were financially excluded in comparison to 36.1% of the male demographic. The shows that the low adoption rate of mobile banking inevitably has a direct impact on the rate of financial exclusion as mobile banking was

introduced as cashless payment channel aimed at providing financial services to the unbanked and increased financial inclusion. In summary, not only were the Nigerian female demographic lagging behind in mobile adoption rate in Nigeria, they were also exhibiting a lesser patronage to other financial services such as owning and operating bank accounts. An explanation for this phenomenon may lie in Nigeria's culture as, traditionally, the female demographic have been more concentrated in lower-paying informal jobs while the male demographic are more dominant in higher-paying formal jobs (Onyia & Tagg, 2011). Olatokun (2007), who suggested that the female demographic in Nigeria are traditionally more concentrated on staying home taking care of the family while the male demographic go out to work, also discussed this job distribution between the male and female gender. Despite the increased presence of women in more formal occupations over the years, the National Bureau of Statistics of Nigeria also reports that only 30% of formal jobs are occupied by women in Nigeria with the female demographic showing 86% visibility in informal jobs like agriculture, farming and petty trading. This has led to a higher visibility of men in formal, high paying jobs and lower visibility in informal jobs (Onyia & Tagg, 2011).

With women, occupying more lower-income jobs than men, the low-income earners' perception of financial services such as mobile banking must also be considered as it is expected to be prevalent amongst women in the nation. According Izogo et al (2012) and Odunmeru (2013), the low-income earners perception of the usefulness of mobile banking suggests that services like mobile banking are privileges reserved for higher income earners and only useful to individuals with formal occupations. This demographic also believe that mobile banking is more suitable for those who can afford to pay for such services, earn enough money to need a bank account and have enough funds to pay for the charges associated with cashless payment systems such as credit cards and mobile banking (Adogamhe, 2010). Therefore, it is deducible that women in Nigeria are less likely to adopt mobile banking because of their dominance in low income jobs, consequently leading to a negative perception of the usefulness of the technology, a lower adoption rate of mobile banking and a higher percentage of financial exclusion in comparison to men in Nigeria (Onyia & Tagg, 2011). This has led to "gender" and "perceived usefulness" emerging as factors with theoretically impact on mobile banking adoption in Nigeria, and this study aims to investigate the direct or indirect impact these factors by validating theoretical hypothesis with statistical evidence. The influence of high and low income earning jobs has also led to "occupation" also being revealed to play a

role and considering the demographic distribution of mobile banking across various occupations in Nigeria will provide more insight into the adoption trends in Nigeria

### **1.6.2 OCCUPATION AND EMPLOYMENT STATUS**

The adoption trends of various occupations, with respect to income levels, was investigated by Izogo et al (2012), Odunmeru (2013) and Onyia and Tagg (2011) with all of these studies revealing that adoption of mobile banking is higher amongst individuals in high-paying formal jobs and considerably low in unemployed and low-income earners. Specifically, Izogo et al's (2012) study, low income earners showed a 40.19% adoption rate of mobile banking in comparison to a 68.42 adoption rate among high income earners. Odunmeru's (2013) investigations showed a 55% adoption rate by high-income earners, considerably higher than the 14% adoption rate among low-income earners. Further evidence of this demographic distribution is seen in EFINA's (2013) report, which specifically identified low-income jobs such as farming, trading and unemployment as well as high-income jobs as occupations that provide the individual with a regular salary and wage. EFINA's report also showed low adoption rate amongst the low-income jobs with farmers having a 14.9% adoption, traders showing 35.7 % and dependants showing 29.6%, all of which are significantly lower than the 76.8% adoption rate amongst high-paying occupations. Gillwald et al (2010) provide theoretical explanations for this adoption trend by stating that high-income earners are more likely to use cashless payment channels, because they can afford the services and have a steady source of income that permits them to pay for services such as data plans, which allow access to mobile banking applications and networks. This confirms Onyia and Tagg's (2011) assertions on adoption trends of the female demographic because statistics have shown that low income jobs in Nigeria, who are mostly women, are less likely to adopt mobile banking than men who are dominant in high-income jobs Onyia and Tagg (2011).

### **1.6.3 AGE**

Research suggests that there is a strong relationship between age and the acceptance of new technologies (Bigne et al., 2005; Morris & Venkatesh, 2000; Venkatesh & Davis, 2000; Venkatesh et al., 2003). Based on existing literature, older customers have a negative attitude towards adoption of technology, resulting in lower adoption rates in comparison to younger adults (Venkatesh and Morris, 2000). Younger customers are reportedly more receptive to new technology with more positive perceptions and attitudes towards technological innovations

(Venkatesh and Morris, 2000). In a study conducted by Barret (1997), younger customers of banks were reported to be more willing to adopt non-branch banking systems, such as telephone banking and internet banking, while older customers were less likely to transition away from traditional banking methods. Regarding mobile banking, several studies have investigated customer adoption trends across various age groups; leading to results showing a correlation between age groups and mobile banking adoption. In America, a survey conducted by the Federal Reserve (2012) revealed that mobile banking usage amongst 18-29 year olds was at 39%, usage across 30-44 year olds was 34%, 45-59 year olds had a usage of 19% and 60 years and older had the least usage rate was 9%. These statistics show that usage of mobile banking in America is higher between the ages of 18-44 as the rate of adoption within this age group is collectively higher than in the older age brackets.

This is also true in other countries, a similar study in Nigeria in 2013 by Odunmeru (2013) showed that mobile banking adoption had an adoption rate of 85% amongst the 21-40 year old demographic and the least adoption rate among the 40-60 age bracket and over 60s at 16% and 15% respectively. In a study into the impact of socio-demographic factors on technology adoption, Mutengezanwa and Mauchi (2013) provide an explanation for this adoption phenomenon by positing that, the older generation are less likely to adopt cashless systems and non-branch banking methods because they have a general preference for face-to-face interactions and social environments. This leads them to have a negative attitude and towards the impersonal banking environments created by systems like internet and mobile banking which require them to carry out their financial operations without minimal social contact and face-to-face interaction with banking staff. This mirrors the suggestions put forward by Lemaitre (1997) and Guerrero et al (n.d), who also suggest that the younger adults between the age of 18 and 35 will be more open to newer technology than older adults and technology vendors would achieve a higher rate of adoption if they focused more of the younger generation of users. Concerning the role trust plays in this adoption trend there exists a lack of knowledge on the possibility that an individual's age might play a part in their willingness to trust the technology and ultimately influence their decision to adopt cashless technologies like mobile banking. This adds an additional scope to the context of this study as, in addition to gender, occupation, marital status and education level, characteristics like age group, as well as bank account ownership and technology competence, will be included in this study's investigations into mobile banking adoption in Nigeria.

#### **1.6.4 EDUCATION LEVEL**

Considering, mobile banking adoption in Nigeria is currently at an early stage (Hamza & Shah, 2014), extensive research is currently lacking concerning the adoption trends of Nigerian customers based on additional demographic information such as education level, age and marital status. However, with sufficient reliable documentation being unavailable, this research area can be addressed by considering the theoretical propositions provided in existing literature regarding the adoption trends of these demographics as well as discussing existing studies which have investigated these adoption trends in other countries.

Concerning education level, developed countries have experienced a higher adoption of cashless payment systems like mobile amongst the educated demographic than the non-educated demographic (Meuter et al., 2005). Education level affects technology adoption, as highly educated customers such as university graduates are more comfortable in using technology, like mobile phones and mobile banking (Burke, 2002). This is because individuals that are more educated are more likely to understand technological concepts and operations better and have a higher affinity towards these technology concepts and devices than individual who are less educated (ibid). Evidence of this can be seen in the 2013 reports published by the United States of America's Federal Reserve, which revealed that educated individuals exhibited the highest adoption rate of mobile banking in the country. Individuals with some full or incomplete college education showed 35% adoption and individuals with a bachelor's degree or higher showed 37.1%, as opposed to uneducated individuals who showed an adoption rate of 5.6% (Federal Reserve, 2013). Although, comprehensive studies in this area are lacking in Nigeria, Odunmeru (2013) investigated the adoption rate in Nigeria and results showed that the highest adoption rates was exhibited by Bachelor's degree holders at 40%, Master's degree holders at 58%, and Doctorate degree holders at 51%, with the lowest adopters being those with secondary school level education and below at 23%. These results show the disparities existing between the adoption rates of the educated and uneducated demographics; reconfirming that higher the levels of education result in higher likelihoods of adoption of mobile banking and any other financial service (Mattila et al, 2003). This results in higher financial inclusion among the educated and low rates of inclusion among the less uneducated (Karjaluo et al, 2002). As state earlier, the specific impact this demographic characteristic on intention to use mobile banking in Nigeria is yet to be extensively investigated. This is a gap in knowledge, which this study intends to address by providing empirical evidence, which

reveals the specific significant or non-significant impact individuals' education level has on mobile banking adoption and its relationship with other factors.

### **1.6.5 MARITAL STATUS, TECHNOLOGY COMPETENCE**

Concerning the context of this study, characteristics such as gender, education level and occupation may have already been investigated in previous studies for demographic distribution and adoption trends; but the level of impact each of these demographic characteristics exerts on the intention and actual use of mobile banking technology still lacks extensive investigation and documentation. Researchers have focused on the statistical distributions and level mobile banking adoption in relation to these demographics; but there exists a gap in knowledge regarding the level of significance and impact these variables have on mobile banking usage. This study will also address this gap in knowledge by taking into account various demographic characteristics and individually measuring the degree of significant influence each one has in the adoption of mobile banking in Nigeria. Additional demographic factors to be considered are marital status, technology competence and bank account ownership, all of which have been theoretically considered by other researchers such as Odunmeru (2013) and Izogo et al (2011) but their specific impact on mobile banking adoption has not been specifically investigated.

### **1.7 CHALLENGES OF MOBILE BANKING IN NIGERIA**

In light of all these adoption trends and customer behaviour towards mobile banking in Nigeria, as well as overall low adoption rate of the technology in Nigeria, mobile banking is evidently facing penetration challenges amongst Nigerians (Agwu & Carter, 2013). Several researchers have highlighted the barriers mobile banking faces in Nigeria and the reasons why mobile banking, amongst other cashless payment channels, is experiencing such a low adoption rate in the nation. Specifically discussing these challenges will aid the researcher in providing valuable and relatable recommendations strategies and policies which can help improve the adoption rate of mobile banking in Nigeria. Some of the main barriers, which have been identified as the major challenges facing the cashless policy and mobile banking in Nigeria, are:

- **Education and literacy level:** The low level of literacy and education in Nigeria has proven to be a major barrier in the accessibility and adoption of cashless payment systems, such as mobile banking, to illiterate and uneducated demographics in Nigeria

(Agwu and Carter, 2014). Yaqud et al (2013) also provide further insight by revealing that the cash-based payment systems are preferred by the illiterate populace of Nigeria because of a psychological and physical satisfaction these individuals feel when holding and touching cash as well as a tendency to be content with existing payment structures and resist change. Considering that Nigeria was already a cash-heavy economy, the culture of conducting transactions in cash continues to be enabled by the state of the economy and the prevailing culture (CBN, 2013). There is also a conception that if the cashless policy continues to take hold in Nigeria without appropriate measures being taken to address the low literacy in the country, the illiterate populace who will be forced to adopt this new payment system and become vulnerable to the literate populace who may exploit them (Okoye & Ezejiofor, 2013). This fear of vulnerability and exploitation leads the illiterate populace to be adamant towards adoption and mistrusting of the cashless policy.

- **Lack of required skills:** Research has provided evidence, which shows that over 60% of Nigerians lack the skills and knowledge required to operate information technology infrastructures such as mobile banking (Adesina and Ayo 2010). This evident computer illiteracy is also a problem which has been identified in the Nigerian education system where information technology systems are either completely absent in curriculum and framework of nursery, primary, secondary and tertiary institutions or present but inefficient. Consequently a lack of required skills to utilise mobile banking leads to individuals having either a negative perception of their ability to use these cashless payment systems or negative perception of the difficulty required to operate the service and in both cases, the individual is ultimately inclined to refuse adopting mobile banking as that (Agwu and Carter, 2014). Later on in this study, specific frameworks and theories will lead to perceived ease of use role in mobile banking adoption in Nigeria being identified and investigated with empirical evidence.
- **Occupation and unbanked Nigerians:** One of the aims of the cashless policy is to increase financial inclusion in the nation, bringing financial services to areas, which had previously not had access to the services due to constraints such as geographical location (CBN, 2013). This is because the cash-based economy has led to 66% of funds



in the country residing outside the structured financial system, resulting in a larger percentage of the Nigerian population being unbanked. With such a high percentage of funds existing outside the nation's structured banking system, it becomes difficult for institutions like CBN to regulate the financial system, manage inflation and ensure economic growth (Princewell & Anuforo, 2013). With a population of over 165 million, over 30% of Nigerians, approximately 57 million, do not own bank accounts (Odonmeru, 2013). Agwu and Carter (2013) provide more insight into the nature of these unbanked Nigerians with their research revealing that most of them are low-income earners such as anglers, petty traders and mechanics. It was also revealed that these unbanked, despite not owning bank accounts, own mobile phones but are still unaware of the mobile banking services offered by financial institutions (ibid). Adogamhe (2010) emphasises this barrier by stating that low-income earners do not consider a bank account a necessity because they do not earn enough money to deposit in bank accounts, consequently leading to a perception among the unbanked populace that financial services like bank accounts and mobile banking are not useful to them and do not suit their needs. In light of the challenge this factor poses to CBN's cashless policy, it is unfortunate to see that appropriate efforts have yet to be made to address the lack of awareness, which is prevalent among the unbanked in Nigeria (Agwu & Carter, 2013).

In addition to these major barriers facing mobile banking in Nigeria, there are several additional challenges facing the technology and the cashless policy in general. Some of these, which are highlighted by CBN (2013), Odonmeru (2013) and Agwu and Carter (2013) are:

- **Online crimes and security:** A prevalence of e-fraud, identity theft and unauthorised account access in Nigeria poses a major problem for the cashless policy and mobile banking as these security concerns affect core aspects of cashless payment systems which are confidentiality, access control and data integrity. Inefficient security controls will continue to lead to a lack of confidence in mobile banking and low adoption rates.
- **Frequent power interruption:** Nigeria has experienced the nagging problem of inconsistent power supply for years and the lack of this fundamental amenity, which is vital to the operation of information technology infrastructure, gives rise to availability

issues for cashless payment systems, which continue to hinder the adoption and efficient usage of mobile banking in Nigeria.

- **Complaint resolution:** Adoption of electronic payments is being inhibited by poor dispute resolution and lax consumer protection regime (CBN, 2013). In a report produced by EFINA in 2013, poor complaint resolution emerged as one of the most predominant challenges facing the use of cashless payment systems in Nigeria. Users complained that when complaints and enquiries about problems they had faced with these cashless payment channels had not been handled in a professional and friendly manner by staff of financial institutions and this poor business practice had consequently deterred them from further patronage of the technologies such as mobile banking.

**Lack of confidence and trust:** The current lack of trust and confidence in mobile banking in Nigeria is a consequence of the culmination of the impact all the afore-mentioned challenges on the Nigerian customer (Agwu & Carter, 2013; Odunmeru, 2013). Payment systems are facing persistent issues such as less than acceptable levels issues of security, integrity, availability and best business practices there is a level of mistrust in mobile banking technology amongst Nigerians as which hinders the populace from adopting the technology (ibid). In a survey conducted by EFINA in 2013, Nigerians were asked to categorically state the reason why they had not adopted the technology and the results published are summarised in the Figure 1:5 (EFINA, 2013)

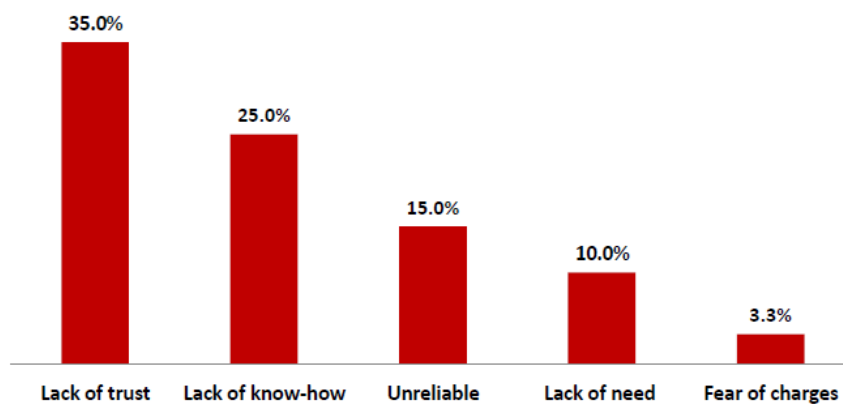


Figure 1:5: Reasons for not adopting mobile banking in Nigeria (EFINA, 2013)

Figure 1:5 shows that, in comparison to issues discussed by researchers such as Agwu and Carter (2013), a variety of other issues were identified from the sample group; with lack of trust emerging as the factor with the highest impact on customer's resistance to mobile banking adoption. This creates the basis of this study as the research aims to use appropriate theories and research frameworks to identify the factors which contributing to user trust in mobile banking technology as well as the level of impact trust, and any other factors, have on mobile banking adoption in Nigeria. In previous sections of this document, a better understanding of mobile banking in Nigeria was achieved by stating the motivations for its introduction in Nigeria, defining the concept of mobile banking, understanding its business and technological evolution, identifying customer adoption trends as well as discussing the policies and challenges the technology faces in Nigeria. All these have provided with a focused outlook on the problem environment and the issues this study aims to address in Nigeria.

## **1.8 RESEARCH QUESTIONS**

The research questions that this study aims to resolve are a result of the mobile banking adoption challenges in Nigeria. Similar questions formed the basis for investigations by Kabir (2013) into the factors influencing the usage of mobile banking in Bangladesh, Crabbe et al's (2009) study of the mobile banking adoption in Ghana and Iddris's (2013) study of the adoption of Mobile banking in Ghana as well. Similar to these existing studies, the research questions will form the basis for the hypotheses in this study and empirical data will prove or disprove each hypothesis. In the end, resolving each hypothesis will in turn resolve the research questions

- What are the significant contributing factors to technology trust in Nigeria and what level of impact do these factors have on technology trust in Nigeria?
- Are there any other contributing factors to mobile banking adoption in Nigeria and how significant is the impact these factors?
- What degree of impact does technology trust have on Nigerians' intention to use mobile banking?
- Does technology trust influence these other factors related to consumer adoption of mobile banking in Nigeria?

In order to consider this research a success, the researcher will use empirical methods to resolve these questions.

## **1.9 STATEMENT OF PROBLEM**

Clearly defining the problem this research will investigate will help in providing scope to the project. In this case, a lack of trust has been highlighted by previous research as a major contributor to the lack of adoption of mobile banking in Nigeria.

In 2011, the Central Bank of Nigeria, introduced the cashless policy to the nation in a bid to foster economic development and financial inclusion (Tunji, 2013). The success of the project would result in beneficial implications for the nation including an expansion of Nigeria's credit creation process, financial inclusion of the rural areas and a reduction of cash handling costs (ibid). Nigerian's low mobile banking adoption rate and the factors contributing to this, stand as the problem this research intends to address. Understanding and providing solutions to this problem can increase mobile banking adoption in Nigeria, leading to a successful completion of CBN's cashless project and economic growth in Nigeria.

Extensive research already exists regarding the impact of trust on technology adoption, specifically mobile banking. However, there is a noticeable gap in knowledge regarding the impact technology trust has on mobile banking adoption in Nigeria. Researchers such as Tunji (2013) have identified several factors affecting the adoption of mobile banking in Nigeria such as: investment in infrastructure, lack of consumer trust, power supply issues and literacy level. Agwu and Carter (2014) also highlight literacy levels as a factor affecting mobile banking adoption in addition to economic and technological factors, age, poverty and occupation. Odumeru (2013) also highlights age and education level and despite these researchers highlighting similar factors as contributors to mobile banking in adoption, technology trust remains a concept lacking detailed empirical investigation in relation to Nigeria.

With financial institutions considering the adoption of mobile banking's as a factor, which will help bring its nationwide cashless policy into fruition, the non-adoption of this technology stands as the fundamental problem this research aims to investigate. In addition to this, this research aims to investigate the existence and impact of other theoretical factors, such as trust, affecting the adoption of mobile banking in Nigeria. These additional factors will be identified from appropriate frameworks and theories in related technology adoption studies. Subsequently, the factors and their interrelationships will be statistically evaluated, based on

data collected from a suitable sample group in Nigeria, to reveal the level of significant or non-significant impact they have on the adoption of the technology in Nigeria.

### **1.10 OPERATIONALISATION OF RESEARCH CONSTRUCTS**

Conceptual definitions for the constructs used in this study are presented in subsequent chapters of this study. However, in order to facilitate an empirical investigation of these constructs, it is necessary to provide their operational definitions. The operational definitions for constructs in this study is presented below:

**CONFIDENTIALITY:** Represented by the variable “CONF”. Measured on a five point Likert scale with “1” = “Strongly disagree and “5” = “Strongly agree” based on responses to three items namely:

- CONF11: I would feel totally safe providing personal privacy information over mobile banking
- CONF12: I am convinced that mobile banking respects the confidentiality of the transactions
- CONF13: I feel safe about the privacy control of mobile banking from me

**INTEGRITY:** Represented by the variable “INT”. Measured on a five point Likert scale with “1” = “Strongly disagree and “5” = “Strongly agree” based on responses to three items namely:

- INT14: I think mobile banking performs reliably and securely
- INT15: I think the operation of mobile banking is dependable
- INT16: I think mobile banking takes steps to make sure that the information in transit is accurate

**AUTHENTICATION:** Represented by the variable “AUTH”. Measured on a five point Likert scale with “1” = “Strongly disagree and “5” = “Strongly agree” based on responses to two items namely:

- AUTH 24: I believe that mobile banking is able to confirm the identity of the account holder before allowing me access
- AUTH25: I think mobile banking ascertains my identify before sending any messages to me

**NON-REPUDIATION:** Represented by the variable “NONR”. Measured on a five point Likert scale with “1” = “Strongly disagree and “5” = “Strongly agree” based on responses to three items namely:

- NON17: I think mobile banking provides me with some evidence to protect against its denial of having received a transaction from me
- NON18: I think mobile banking will not deny having sent me a message
- NON19: I believe mobile banking will not deny having participated in a transaction after processing it

**ACCESS CONTROL:** Represented by the variable “ACC”. Measured on a five point Likert scale with “1” = “Strongly disagree and “5” = “Strongly agree” based on responses to three items namely:

- ACC26: I’m worried about using mobile banking because other people may be able to access my account
- ACC27: Mobile banking database that contain my personal information are protected from unauthorized access
- ACC28: Mobile banking devotes time and effort to preventing unauthorized access to my personal information

**AVAILABILITY:** Represented by the variable “AVAIL”. Measured on a five point Likert scale with “1” = “Strongly disagree and “5” = “Strongly agree” based on responses to two items namely:

- AVAIL29: Mobile banking services may not complete transactions because of network problems
- AVAIL30: Mobile banking allows information to be readily accessible to me

**BEST BUSINESS PRACTICES:** Represented by the variable “BBP”. Measured on a five point Likert scale with “1” = “Strongly disagree and “5” = “Strongly agree” based on responses to four items namely:

- BBB27: I think mobile banking provider is fair in customer service policies following a transaction
- BBB36: Overall, I have confidence in legal framework that governs my interaction with mobile banking system
- BBB55: Mobile banking service providers have the skills and expertise to perform transactions in an expected manner
- BBB60: I think mobile banking provider makes good-faith efforts to address most customer concerns

**PERCEIVED USEFULNESS:** Represented by the variable “PU”. Measured on a five point Likert scale with “1” = “Strongly disagree and “5” = “Strongly agree” based on responses to two items namely:

- PU35: Overall, I think mobile banking is useful
- PU34: I think mobile banking would enable me to accomplish my tasks more quickly

**PERCEIVED EASE OF USE:** Represented by the variable “PEOU”. Measured on a five point Likert scale with “1” = “Strongly disagree and “5” = “Strongly agree” based on responses to three items namely:

- PEOU33: I think learning to use mobile banking is easy
- PEOU32: I think that it is easy to use mobile banking to accomplish my banking tasks
- PEOU31: I think that interaction with mobile banking does not require a lot of mental effort

**INTENDED USE:** Represented by the variable “IU” .Measured on a five point Likert scale with “1” = “Strongly disagree and “5” = “Strongly agree” based on responses to two items namely:

- IU36: I intend to use mobile banking for my routine banking transactions
- IU37: I intend to use mobile banking in the future

**ACTUAL USE:** Represented by the variable “AU”. Measured on an ascending frequency scale with “Less than 1 hour”, “1-3 hours”, “4-6 hours”, “7-9 hours” and “greater than 10 hours” based on responses to one item namely:

- AU38: How many hours do you spend using mobile banking every month

Also measured on an ascending frequency scale of 1 to 5 with “Less than 1 time”; “1-3 times”, “4-6 times”, “7-9 times” and “greater than 10 times” based on responses to one item namely:

- AU39: How many times do you use mobile banking in a week?

Additionally measured based on an ascending descriptive scale with “No use”; “Not very frequent”, frequent”, “Slightly frequent” and “Very frequent” based on responses to one item namely:

- AU40 How frequent is your use of mobile banking.

**TECHNOLOGY TRUST:** Represented by the variable “TechTrust” .A construct based on the combined function of confidentiality, integrity, authentication, access control, non-repudiation, availability and best business practices.

**PERCEPTION AND INTENTION:** Represented by the variable “Percep\_Int”. A construct based on the combined function of perceived usefulness, perceived ease of use and intention to use.



**GENDER:** Represented by the variable “gender”. Measured based on user selection of either “Male” or “Female”

**AGE:** Represented by the variable “age”, Measured on descriptive scale with “18-24”, “25-34”, “35-44”, “45-54”, “55-64”, “65-74” “75 or older”

**MARITAL STATUS:** Represented by the variable “Marital” on a descriptive scale with “single”, “In a relationship”, “Married” and “Divorced”.

**EMPLOYMENT STATUS:** Represented by the variable “Employment” on a descriptive scale with “Self-employed”, “Employed”, “Military”, “A student”, “A homemaker”, “Unemployed” and “Retired”.

**EDUCATION LEVEL:** Represented by the variable “Education” on a descriptive scale with “No schooling completed, Nursery school”, “Primary school”, “Secondary school”, “Undergraduate”, “Masters”, “Doctorate”, “Trade/Technical/Vocational training”, “Professional degree” and “Associate degree”

**ETHNICITY:** Represented by the variable “Ethnicity” on a descriptive scale with “Ibo”, “Hausa”, “Yoruba” and “Other”.

**TECHNOLOGY COMPETENCE:** Represented by the variable “Technology” on a descriptive scale with “Not competent”, “Novice”, “Competent” “Advanced” and “Expert”.

**MOBILE PHONE OWNERSHIP:** Represented by the variable “Mobile” on a descriptive scale with “Yes I own a mobile phone” and “No I do not own a mobile phone”.

**BANKING STATUS:** Represented by the variable “Bank” on a descriptive scale with “Yes I own a bank account” and “No I do not own a bank account”

**MOBILE BANKNG STATUS:** Represented by the variable “Mbanking” on a descriptive scale with “Yes I use mobile banking” and “No I do not use mobile banking”

### **1.11 RESEARCH AIM**

Previous research has investigated customer trends in mobile banking adoption with researchers using frameworks such as the technology acceptance model to evaluate customer’s intention to use information technology services such as mobile banking (Pavlou, 2003; Khraim et al, 2011; Lee, 2007). Trust has also been a concept investigated in previous research, in relation to technology adoption, and it has been modelled into the technology acceptance model in these investigations as well (Chiravuri et al, 2001; Wang & Tseng, 2011). This research aims to investigate customer adoption of mobile banking in Nigeria focusing on customer trust in mobile banking technology and the relationship between customer trust in mobile banking technology and their intention to use this technology.

### **1.12 RESEARCH OBJECTIVES**

The research objectives serve as clear steps stipulated to meet the aims of the study. The following are the pre-set objectives of this research:

- Identify the factors that significantly contribute to customer trust in mobile banking technology in Nigeria by considering relevant existing research on technology and trust
- Design a model for investigating the influence of technology trust and additional contributing factors on user adoption of mobile banking
- Validate the designed model using structural equation modelling in order to identify an optimal selection

- Validate the factors theoretically influencing technology trust using confirmatory factor analysis
- Identify theoretical factors which influence customer trust in mobile banking technology and the adoption of the technology in Nigeria
- Include additional theoretical factors in proposed model and investigate validity of these factors using confirmatory factor analysis and structural equation modelling
- Validate the role technology trust plays in customer adoption of mobile banking adoption in Nigeria using confirmatory factor analysis and structural equation modelling
- Investigate the possibility of demographic factors, such as age and gender, influencing user trust in mobile banking technology and its effect on the adoption of the technology in Nigeria

### **1.13 SIGNIFICANCE OF STUDY**

With the aims and objectives of this research in mind, the findings will contribute to the existing knowledge regarding mobile banking adoption among customers with an emphasis on Nigerian banking customers. In addition, these results will be relevant to financial institutions and mobile banking service providers because identifying and evaluating the factors, which affect customers trust in mobile banking technology, and their intention to use it, provides a better understanding of customer technology adoption trends. Financial institutions will also benefit from this research if they intend to provide mobile banking services or enhance current services to cater to customer needs. The researcher also intends to use the results of this study to provide elaborate and appropriate strategies to mobile banking stakeholders in Nigeria; aimed at improving the service adoption rate amongst Nigerians. While doing this, this study will also be contributing new information to the existing knowledge gap regarding technology adoption

in developing countries and the lack of academic literature with statistical evidence validating the impact of relevant factors on customer adoption trends in Nigeria.

Considering the significance of this research as well as its aims and objectives, this study is subject to certain assumptions and delimitations, which define the scope of the research. These are detailed in the subsequent sections.

#### **1.14 ASSUMPTIONS**

Research assumptions are a fundamental part of studies and considering the nature of this study, there are certain assumptions, which must be made about mobile banking and mobile banking users in Nigeria. These assumptions are considered accurate and integral to the execution of this study but also outside the control of the researcher.

The first assumption is that the sample group in this study is a cross-sectional representation of the Nigerian population. Several demographics, such as age, gender and ethnicity will be taken into account and the sample group, data collected and results will serve references for generalization based on this assumption.

The second assumption is that respondents will be honest when partaking in the study and the answers they will provide will be truthful. Additionally, it is assumed that participants will be encouraged to be honest and truthful due to the confidentiality of the study because participation in the study will be voluntary and anonymous. Individuals who do not wish to participate will not be forced to do so or penalized for their refusal to participate.

The final assumption is that the content of instrument being used in data collection as well as the frameworks and tools being used for data analysis are all reliable based on their application in previous literature. Frameworks such as the technology acceptance model, software packages such as SPSS, AMOS and statistical analysis methods such as confirmatory factor analysis are examples of tools and frameworks which have been used in previous research and will also be utilised in this research. It is assumed that they are reliable and will provide accurate results. A statistical test of the reliability of this study and its findings is provided in section 4.7

## 1.15 DELIMITATIONS

Delimitations refer to boundaries, which the research has set on the study in order to enhance the focus of the research (Isaac and Michael 1990). For this study, certain delimitations were put into place to define the scope explicitly.

Firstly, the scope of trust being measured had to be defined. Trust as a concept has many facets with definitions and applications existing in several schools of thought (Hosmer, 1995). For this research, the research focuses on technology trust as the scope of the study because this particular type of trust is related to the researcher's academic affiliations and also provides a clear scope with variables which can be defined, hypothesised, measured and analysed statistically. A detailed clarification of technology trust will be given in the literature review.

The next delimitation regards generalization. The focus of this study is on user technology trust in mobile banking and its adoption in Nigeria. Therefore, the results are generalizable to the population of users and non-users of mobile banking within the nation subject to statistical validity and a representative sample being collected. The demographic profiles investigated in this study also increase the generalizability of the findings as a large cross-section of demographics, such as genders, ages, marital statuses, education levels and ethnic groups, are considered.

Ethnic group delimitations have also been added to this study. Nigeria consists of over 250 different ethnic groups with three groups considered the major ethnic groups of the nation. There are the Igbo who comprise 18% of the total population, the Hausa who make up 29% and the Yoruba who are 21% (CIA, 2014). Although this research intends to measure the impact of different demographic segmentations on technology trust and mobile banking adoption, not every ethnic group within the nation can be considered due to geographical restrictions as each demographic is characterised by inhabiting different areas of the nation. Therefore, the researcher has limited the measurement scope of the ethnic group demographic to these three ethnic groups with a lessened focus on the other ethnic groups, as they are not as predominant in the populace as the Igbo, Hausa or Yoruba.

The final delimitation on this study is regarding the literature, which will be reviewed. As mentioned earlier, the nature of trust is diverse in both definition and application. As a result, this study focuses on technology trust in particular and its impact on mobile banking acceptance. With this in mind, the literature reviewed in later sections and chapters will be

relevant to the nature of study and the concepts involved, namely technology trust and technology acceptance, with previous work from other researchers in this area being the focus of the critical analysis.

## **1.16 CONCLUSION AND SUMMARY OF CHAPTERS**

This thesis is divided into five chapters, each consisting of multiple sections. This first chapter serves as an introduction to the body of research and highlights the state of telecommunications mobile banking in Nigeria as well as the purpose, significance, aims and objectives of this research. The chapters hereafter will be structured in the following manner:

- Chapter 2 will review existing literature on mobile banking, trust and technology acceptance
- Chapter 3 will discuss the methodology used in conducting the research and achieving the findings
- Chapter 4 will detail the results and analysis of the research and address the research questions
- Chapter 5 will discuss the findings of the research and its implications

## **2 LITERATURE REVIEW**

### **2.1 INTRODUCTION**

This chapter will discuss the concept of trust, the various dimensions of trust, its role in technology adoption trends and the importance of technology trust on technology adoption. The aim is to provide clear understanding of its effects on customer perception and their behaviour towards technology based on existing literature and studies. In addition, this chapter aims to provide justification for investigating technology trust, a specific dimension of trust, in relation to mobile banking adoption. Finally, this chapter aims to show the importance of trust in technology adoption and the relation between trust and technology adoption trends across various demographics; ultimately explaining the motives for considering the concept, as well as the specified demographics, in this study.

### **2.2 DEFINING TRUST**

The concept of trust has been investigated in several disciplines such as economics, organizational behaviour, psychology, and sociology. This is because trust is considered a complex, multi-dimensional construct that can be studied from numerous points of view and applied in various unique contexts (Gefen et al, 2003). With multiple disciplines and fields studying a specific concept, such as trust, there is often a threat of disparity between these fields regarding the fundamental definition of the concept. However, in the case of trust, researchers have attempted to come to a shared understanding of trust and a consensus on specific attributes of the concept (Lee & Ahn, 2013). According to Mayer et al (1995), trust is “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trust or, irrespective of the ability to control that other party.” Rousseau (1998) provides another definition stating that trust is “a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of another.” Evidently, a common factor in these definitions is “vulnerability” as it describes the risk involved when a customer exercises trust (Cho et al, 2007). When an individual ascertains the existence of risk in an environment, trust is the factor which influences the individual to participate in that environment with the expectation of certain benefits despite the possible vulnerabilities the individual might be exposed to in that environment (McKnight et al., 2002). Therefore, trust becomes a significant factor, which should be established in the user to encourage participation and technology

adoption (ibid). As highlighted above, trust is a context-sensitive concept with definitions applicable in various fields of study. In this study, the focus is on trust's role in information technology adoption and consequently requires the research to consider trust from an IT perspective. Therefore, definitions of trust in relation to the mobile banking environment will be considered specifically to provide a distinct understanding of how the concept relates to user behaviour and technology adoption in the mobile banking environment (Li and Yeh, 2010).

Although a variety of disciplines have dealt with the concept of trust, trust in mobile banking requires defining in a manner specifically based on the information technology (Lee & Ahn, 2013). With this in mind, Donny and Cannon (1997) defined trust as an online vendor-customer relationship based on the perception and prospective buyer of credibility and benevolence in the vendor". In a study by Kim et al (2009) into the effect of initial trust in mobile banking user adoption, trust was defined as an expectation that a trusted party will not behave opportunistically and exploit the vulnerability of the trusting party. Furthermore, Jarvenpaa and Tractinsky (1999) defined trust as a consumer's willingness to rely on the vendor in an online environment and take action in circumstances where such action makes the consumer vulnerable". The concept of vulnerability crops up again amongst other concepts like customer perception and customer expectation. Due to the nature and scope of this research, the definition of trust adopted must encompass the fundamental concept of trust and relate this to its role in customers' adoption of information technology while also considering user perception and potential vulnerability. Therefore, the researcher adopts Koo and Wati's (2010) definition that describes it as "an individual's willingness to experience vulnerability to financial institutions and their technology based on their perception of the institution and information technology infrastructure". This definition was chosen as the most appropriate for this study because, in comparison to the other afore-listed definitions, Koo and Wati's (2010) definition views trust from a technological point of view and this view is in-line with the purpose of this research, which is to investigate the impact of trust on mobile banking technology adoption. This selection does not discredit the definitions of Mayer et al (1995), Donny and Cannon (1997) Jarvenpaa and Tractinsky (1999) and Rousseau (1998). However, these definitions did not specifically highlight the relationship between trust and information technology and institutions, which this study aims to investigate.



Similar to definitions of trust, a lack of consensus exists among the factors, which determine a customer's propensity to trust. Table 2:1 summarises work conducted by previous researchers, the research area and the antecedents of trust, which were identified and investigated.

Table 2:1: Previous researcher's identified technology trust antecedents

<b>RESEARCHERS</b>	<b>RESEARCH AREA</b>	<b>TRUST ANTECEDENTS IDENTIFIED</b>
Lui and Jamieson (2003)	Integrating trust and risk perceptions in business-to-consumer electronic commerce with the Technology acceptance model	Legal framework, third party trust, retailer ability trust, retailer integrity trust, technology trust
Connolly, and Bannister (2007)	Consumer Trust in Electronic Commerce: Social & Technical Antecedents	Trustworthiness of internet vendor, perceived security control, perceived privacy control, perceived integrity, perceived competence, third party recognition, legal framework
Söllner et al (2010)	Towards a formative measurement model for trust	Integrity, ability, benevolence
Balmaceda Phillips-Wren (2004)	Effect of trust on the Success of it reform in Chile	Legal framework, quality of service, government reputation, education
McCord and Ratnasingam (2004)	The impact of trust on the Technology acceptance model in Business to consumer e-commerce	Technology trust, relational trust

As seen in table 2:1, several factors influencing trust were identified and used in previous research leading to a lack of a specific framework regarding the concept. In order to measure trust effectively, an appropriate type of trust as well as a set of contributing factors was identified. The chosen type of trust and its contributing factors must also be in line with the purpose of this study, which is the investigation of trust's impact on mobile banking technology. In light of this, the type of trust investigated in this study will be chosen based on its appropriateness in measuring consumer adoption behaviour of technology. To make this decision, the next section will discuss the different types of trust and their respective determining components. This will help in selecting a specific type of trust, which provides an appropriate and specific focus for this research.

### **2.3 TYPES OF TRUST**

McKnight et al (1998) identified three categories of trust namely institutional, personal and cognitive-based. These categories were refined by Kim et al (2009) who included external variables, such as system quality, in an attempt to give the classifications a more wholesome scope. Soderstrom (2009) was also able to categorise trust into three distinct types and these mirror the three classifications made by Misiolek et al. (2002), which were adopted by Lippert & Swiercz (2005). The three categories are organisational, person and technology trust. Defining these three dimensions of trust individually will reveal which one is most appropriately in-line with the aims and objectives of this study

**ORGANISATIONAL TRUST:** This dimension of trust is defined as an institutional-dependant trust, which describes an individual's willingness to trust, based on a reliance on established institutions or third parties (Gefen et al., 2003). Researchers have further classified organisational trust as a sociological-based trust where individuals consider the presence or absence of appropriate structural assurances such as legal frameworks, security measures and best business practices as conditions, which determine they can trust a particular information technology infrastructure (Mcknight et al, 1998; Keen et al. 1999). In the mobile banking environment, organisational trust is established when the user considers the mobile banking vendor to have created an environment where assurances are put in place to protect the user from harm such as hacking and loss of funds. In addition, the user's organisational trust would be established when there is a presence of assurances, which make the vendor liable for recompense in a situation where the user as experienced any form of harm or loss while using

the mobile banking service (Popoola, 2013). It is possible to investigate this sociological dimension of trust and its influence on user acceptance of mobile banking in Nigeria. However, it is not appropriate for this study as its primary focus is on the institution rather than the technology (Keen et al. 1999). In addition, in later sections of this document, it is revealed factors, which determine the presence of organisational trust, namely best business practices, are also considered in the dimension of trust, which this research focuses on, namely technology trust. Therefore, focusing on organisational trust and technology trust would be redundant.

**PERSON TRUST:** Person trust, or personality-based trust, focuses on the psychological aspect of trust and considers personality-based factors as determinants of users' propensity to trust and adopt technology (Mayer et al., 1995). It stems from the fundamental understanding that each user has a unique personality formed from inherent traits, behaviours and experiences resulting in the individual's overall character, as well as defining the individual's degree of willingness to trust (Dibb et al., 1994; Sharif et al., 2014). Psychological factors such as past-experiences, personality types, agreeableness, neuroticism and cultural backgrounds all contribute to an individual's level of personal trust and results in varying degrees of personal trust levels (Kim et al, 2001). Person trust, in contrast to organisational trust, considers the individual when focusing on user adoption behaviour and bases its assumptions, theories and conclusions on the psychological uniqueness between various users (Lui & Jameison, 2003). This is a worthwhile approach to understanding user adoption behaviour but does not consider the technological variables involved in technology adoption. In addition, undertaking a study on person trust requires extensive psychological analysis and qualitative research, which examines each specific user to uncover the specific traits, which define the individual's propensity to trust. This research intends to focus on the technological aspect of user adoption behaviour, as opposed to the solely psychological aspect, with the aim of quantitatively understanding the adoption behaviour of across a wide breath of users as opposed to the depth of individual behaviour. With this in mind, technology trust, the third dimension of trust will be discussed as it most appropriate for this research

### **2.3.1 TECHNOLOGY TRUST**

In comparison to organisational trust and person trust, technology trust considers the relationship between the user and the information technology in question. McKnight et al., (2011) defined technology trust as an individual's willingness to depend on technology based on the positive characteristics of the technology and its ability to perform its intended tasks. McCord and Ratnasingam (2004) also identified and analysed technology trust in an investigation into the impact of trust on the technology acceptance model and provided a similar explanation by defining it as the user subjectively believing that a specific information technology infrastructure and its control measures are capable of carrying out tasks, which fulfil the user's expectations. These two definitions highlight the relationship between user and technology as well as the user's willingness to trust and utilise the technology based on positive perception of the technology. This is also in-line with Muir & Moray's (1996) definition, which posited that trust in technology is primarily based on user perceptions of capabilities of the technology. Therefore, in the context of mobile banking, customers will be more likely to use the technology if they consider the services reliable, useful and trustworthy. This also reiterates the definition from Koo & Wati (2010) whose study into trust and mobile banking adoption was based on the premise that technology trust is a belief that allows individuals to willingly become vulnerable either to the bank or banking technology after having taken the bank's characteristic embedded in its technology artefact. These technology-based definitions for trust have formed the basis of various studies into user adoption of technology with factors such as predictability, reliability and utility being considered as the major factors, which affect an individual's propensity to trust technology (Lippert & Davis, 2006).

Considering these classifications of trust, technology trust was chosen as the appropriate type of trust, which this research will investigate. In comparison to the other classifications such as organisational trust, which is more focused on an individual's institutional perception, and person trust, which addresses trust based on an individual's personality, technology trust focuses on the relationship between information technology and user behaviour. This coincides with this study's investigation of mobile banking technology trust and adoption by allowing the study to determine individual's trust based on user perception as well as attributes of mobile banking technology itself (Koo & Wati, 2010). Investigating technology trust will also address a gap in knowledge regarding its specific role in mobile banking adoption and this is highlighted in the literature review. Previous research has also highlighted the importance of

technology trust on technology adoption with publications by Kim et al (2001) and Kini and Choobineh (1998) providing academic evidence justifying its investigating in this study. Technology trust was also used in previous research such as the works of McKnight et al (2011), McCrod and Ratnasingam (2004) and Masrek et al (2012). In these instances, the researchers investigated the impact of technology trust on information technology adoption and consequently proved the validity of investigating technology trust's effect on customers' propensity to use IT infrastructures. With technology trust being the focus of this study, identifying its appropriate contributing factors is necessary (McKnight et al, 2011). Using a set of factors to measure technology trust is an approach, which has been used by previous researchers, detailed in the section hereafter, and identifying appropriate contributing factors provides a comprehensive understanding of technology trust and its role in mobile banking adoption.

### **2.3.2 IMPORTANCE OF TECHNOLOGY TRUST IN MOBILE BANKING TECHNOLOGY ADOPTION**

The introduction of cashless payment systems, like mobile banking, has created a unique mobile environment for customers and financial institutions where trust in these technologies is considered a major contributing factor in users' adoption decisions (Yousafzai et al, 2009). The reason why trust has become an important factor in mobile banking technology adoption is that mobile banking creates a mobile commerce structure with no need for physical exchange of cash for services, bank branches and face-to-face interaction between merchants, customers and banks (ibid). With an absence of these components, which are all fundamental constituents of the traditional cash-heavy financial environment, users who are expected to adopt mobile banking must carry out various financial activities through their mobile devices and mobile communication networks; thereby creating a dependence on these mobile infrastructures and their vendors to perform reliably and securely (Lee & Ahn, 2013). This dependence also creates vulnerability in the users adopting this technology and before a user can adopt the technology, the individual must be willing to expose themselves to this vulnerability with minimal fear of penalties (Rousseau, 1998). In the mobile banking environment, adopters experience a wide range of benefits, such as convenience, increased satisfaction and real-time access to funds anywhere and at any time, but also expose themselves to the risk such as security vulnerabilities, network unavailability and privacy issues (Lee & Ahn, 2013). This is where trust in the technology comes into focus, as users are less willing to expose themselves to these

vulnerabilities and be dependent on mobile banking if they do not trust the technology to perform reliably and securely. Trust allows users to put themselves in situations they cannot totally control with the expectation of receiving benefits while also permitting themselves to face the risk of disappointment and harm (Jarvenppa et al, 2000). It is therefore essential in mobile banking technology implementation and adoption because when trust in the technology is established, users are more likely to allow themselves experience these benefits in light of the risk involved as well (Koo & Wati, 2010). Sathye (1999) agrees with this suggestion by adding that the most significant barriers to internet and mobile banking adoption is establishing trust in the technology despite in light of customers' perceived security risk in the technology. Lowering the perceived risks associated with online transaction as well as maintaining transaction trust are vital keys to attracting consumers and retain customers (Tan and Thoen, 2000, 2002). The success of IT implementation projects, like mobile banking, is dependent on the adoption levels the technologies generate amongst users (Lee & Ahn, 2013). With trust in these technologies acting as a significant factor in user adoption decisions, a relationship emerges between trust, user adoption and project success where the presence of technology trust leads to a willingness to adopt, higher adoption rates and implementation success. Inversely, a lack of trust will result in less willingness to adopt, lower adopting rates and the consequent failure of the project (ibid). Evidence of this can already be seen in the adoption statistics provided by EFINA (2013), and discussed in earlier sections of this document, where a lack of trust emerged as a major contributing to users' reluctance to use the technology. This has further highlighted the significance of trust as an important factor in mobile banking adoption as well as the significance of this study; which ultimately aims to use the results of this study to provide both academic and real-world recommendations targeted at addressing the lack of trust in Nigerian mobile banking.

Understanding technology adoption in mobile banking has led to an identification of the various adoption demographics in Nigeria, the trends exhibited by some of them in relation to acceptance of this new technology and the emergence of technology trust as a factor influencing customers' willingness to adopt the technology. In relation to technology trust, further efforts to understand these adoption trends, leads to a discussion of existing adoption theories and studies that investigate the role trust plays in the adoption trends of various demographics.

## **2.4 TECHNOLOGY ADOPTION, TRUST AND DEMOGRAPHIC RELATIONSHIPS**

In previous sections, the adoption trends of various demographics was discussed with existing literature providing evidence to support related theories. This provided insight into the unique adoption behaviours of users in various demographics. Following the identification of trust as a significant factor which contributes to technology adoption, this section aims to provide further insight towards these adoption behaviours by considering the specific role technology trust plays in these various demographics' adoption behaviour towards information technology infrastructures like mobile banking. This section will show how related existing research has investigated and discussed the relation between technology trust and various demographics as well as its overall influence on adoption behaviour. The aim is to provide context for further consideration of trust and demographic factors in this study in relation to mobile banking adoption in Nigeria.

Previous research has shown specific adoption trends among different demographics such as gender, age, education level and occupation as well as the important role technology trust plays in the adoption behaviour of users. Unfortunately, there exists a lack of substantial and reliable literature on the specific adoption trends of demographics and the role technology trust plays in technology acceptance among Nigerians. However, to compensate for this lack of literature, this study will consider previous existing literature related to demographic adoption trends and the influence of trust on these trends. The first demographic to be considered is gender.

### **2.4.1 TECHNOLOGY TRUST AND GENDER**

Previously discussed studies have established that a lower level of technology trust amongst users ultimately results in lower levels of technology adoption. In addition, literature regarding the adoption trends across the male and female gender has shown that males have a higher technology adoption rate than the female gender. With trust evidently playing a role in the degree of technology adoption, several studies have theorised and proven that the male gender are more likely to adopt new technology because they are more trusting of technology than the female gender. Some studies, such as the work of Schuber et al., (1999) suggest that these findings are context sensitive and the trust trends across these demographics will vary based on the context in question.

In a general context of individual's willingness to trust, research by Croson and Gneezy (2009) revealed that women are more averse to risk-taking than men, meaning men are more likely to

exhibit trust and take risks than their female counterparts. Brody (1993) also reports that when placed in situations, which may result in negative outcomes, women exhibit more nervousness and fear in comparison men, making them less likely to interact or participate in those situations. These assertions have also been supported by findings from Niederle and Vesterlund (2007) and Soll and Klayman (2004) whose research reveals that men are more overconfident than women and have a higher tendency to expect a positive outcome out of situations than women, making them more likely to engage in these situations considered as gambles or risky. To shed more light on this phenomenon, Selim et al (2012) cites work by Eagly and Wood (1999), Meier-Pesti, and Penz's (2008) suggesting that the socialization theory explains this difference in gender behaviour based on social and cultural practices. They affirm that men and women are assigned various social roles in society and are psychologically adjusted to fit into these roles. Furthermore, regardless of differences in social roles, higher degrees of femininity in an individual, determined through sex role tests and gender identification, results in lower willingness to trust. This theory and its associated findings by previous research bring to mind the previously discussed work done by Onyia & Tagg, (2011) and Olatokun (2007) concerning gender roles in Nigeria as well as the studies on mobile banking adoption trends revealed by Izogo et al (2012) Odunemru's (2013). It is also worth mentioning that several other researchers such as Alesina and La Ferrara (2002), Buchan et al. (2008), Glaeser et al. (2000), Snijders and Keren (1999), Terrell and Barrett (1979) have provided evidence supporting the notion that men are more trusting than women. These findings provide a backdrop for understanding the adoption trend across the male and female demographic and considering that trust has been suggested to be context sensitive, studies into the demographics' behaviour concerning technology trust and technology adoption must be conducted. In summary, based on the reviewed literature, this study also aims to investigate the possibility that the disparity between both genders' general willingness to trust also extends towards their adoption of technology, thereby leading to a theoretical explanation for the disparity in gender adoption of mobile banking in Nigeria. To do this, relevant literature on this subject will be reviewed.

In the context of technology adoption, extensive investigation revealed a lack of literature specifically studying gender differences in mobile banking trust, indicating a gap in knowledge and an opportunity for potential research. However, there exist studies addressing the relationship between trust and gender with respect to the adoption of other cashless technology systems like internet banking and shopping. With mobile banking being an information technology infrastructure which shares certain traits with these IT infrastructures, such as



cashless payment and a dependence on the internet availability, it is viable to use these existing studies as cumulative guides towards research into gender trust and mobile banking. Research by Venkatesh and Davis, (2000) and Seybert (2007) adds to the numerous existing studies, which show that males utilise computers and engage in online transactions, such as internet shopping, more than females. Furthermore, research by Van Slyke et al. (2002) suggests that this higher utilisation rate amongst the male gender is a result of men being more trusting of the technology than women are. In an investigation into the perceived risk of buying online, Garbarino and Strahilevitz (2004) revealed that women are less likely to trust and utilise internet shopping because of their significantly higher perception of negative outcomes in comparison to men. This study also revealed that the female gender not only exhibited a higher perception of negative outcomes but also expected the consequences of the negative outcomes to be more severe in comparison to their male counterparts. Research by Janda (2008) sheds further light on this trend with the results from conducted on online purchase behaviour in US revealing that online information credibility and privacy concern were factors, which influenced the purchase likelihood of only female consumers. This ultimately led to the female being less trusting of internet transactions and being more cautious about online risks such as fraudulent sites, credit card misuse, and privacy loss.

In light of these studies, which have emphasised the different technology adoption trends and technology trust trends between the male and female demographic, this study will include a gender variable in its research model which will be tested to reveal the significance of relationship between gender and technology trust as well as gender and mobile banking adoption in Nigeria. This will also address the lack of literary and empirical evidence investigating the relationship between trust and gender in mobile banking adoption,

#### **2.4.2 TECHNOLOGY TRUST AND AGE**

As discussed in the previous chapter, several research have affirmed, with empirical evidence, a strong direct relationship between technology adoption and age. (Bigne et al., 2005; Venkatesh et al., 2003). In comparison to older users of customers, younger adults especially those under the age of 25 are more willing to adopt new banking technologies such as mobile banking (Wood, 2002). Specifically Alkhunaizan and Love (2012) examined a cross-tabulation between usage of mobile internet technologies and five age groups, in Saudi Arabia. The data revealed a daily usage percentage of 94% for 15-18 year olds, 87% for 19-25, 89% for 26-35 year olds. These were higher than the usage percentage of 74% and 67% for individuals within

the 36-45 bracket and 45 years and older, respectively. Results from research by the U.S Federal Reserve (2012) and Odunmeru (2013) provide further evidence, from the United States and Nigeria respectively, towards the assertion that young adults adopt new mobile banking technology more willingly than older adults do. Despite the extensive literature displaying the relationship between age and technology usage, there is a gap in knowledge with respect to the relationship between age, technology trust and technology adoption. Trust has been identified as a significant factor, which influences users' decision to adopt technology (Alafef et al., 2011), and research into the possibility that age may influence the relationship between trust and adoption intention. In light of this research opportunity, this study will also include age in its research model.

### **2.4.3 TECHNOLOGY TRUST AND OCCUPATION AND INCOME LEVEL**

Similar to the investigations into the relationship between technology trust, technology adoption and demographic factors such as age and gender, there is a significant lack of credible literature which focuses on the influence of user occupation and income level may has on user's trust in mobile banking technology. However, research does exist which highlights the influence of occupation on mobile banking adoption, excluding the consideration of technology trust. Prior to reviewing this literature, it is necessary to bear in mind that technology adoption has been proven to influenced by user trust in the technology, confirmed by Lu et al., (2008); Siau and Shen, (2003) and additional researchers discussed in previous sections. In the previous chapter, reviewed studies by Izogo et al (2012), Odunmeru (2013), Onyia, and Tagg (2011) revealed a higher adoption rate of mobile banking amongst high-income earners than in low-income earners. Furthermore Hong et al., (2008) explains this trend by stating that users consider the cost of innovation adoption and will not adopt a technology they cannot afford. Research into internet banking adoption in Australia and Singapore by Sathye, (1999) also supports this notion by revealing that low income-levels and high cost of adoption are factors non-adopters of the technology. Results from Alafef et al., (2011) study in Jordan also show that if customers consider a new technology to be costly to adopt based on their income level, there is higher probability that the customer will not adopt the technology. Considering these reviewed literature have established links between technology trust and technology adoption as well as occupation and technology adoption, it is feasible to also consider the theoretical probability of a relationship between all these components, namely technology trust, occupation and technology adoption. Therefore, this study aims to conduct an empirical

investigation into the influence of occupation on the relationship between technology trust and technology adoption in order to address the existing gap in knowledge in this area.

#### **2.4.4 TECHNOLOGY TRUST AND EDUCATION LEVEL**

Based on previously reviewed literature, customers' education level is directly linked to the adoption of new technologies like mobile banking (Matila, 2003; Matila et al., 2003; Meuter et al., 2005; Burke 2002) and evidence from Odumeru's (2013) survey in Nigeria provides statistical evidence supporting the assertions of these studies. With respect to the role educational level plays in users' willingness to trust technology, Dutton and Sheperd's (2003) research of the population of Great Britain aged 14 and upwards showed that users with higher levels of education exhibited more confidence and trust in technology than those of lower education levels. The research also revealed that despite individuals with more formal education being more sceptical of the information and people accessible through internet-related technology, they are significantly less concerned about the risk of using internet-related technology than individuals with less formal education; resulting in more educated individuals being more trusting on internet technologies. In conjunction with these findings, research into internet banking usage in Tunisia by Wadie (2011) revealed that amongst 253 respondents, education levels were significantly linked to internet banking usage. Wadie (2011) explained that individuals with more formal education are more trusting of technology because they possess higher skill levels and technology knowledge than individuals with lower level education, resulting in higher adoption rates amongst the higher educated. Stavins (2001) also agrees with this explanation by affirming that consumers with more years of education are more likely to use cashless banking channels. These investigations into the relationship between education levels and technology trust provide additional theoretical background for the inclusion of demographic variables, specifically education levels, into the research model for this study. Through this inclusion, this study will be able to assess the existence of a significant relationship between education levels and Nigerian mobile banking users' trust in the technology as well as their adoption of the technology.

#### **2.4.5 TECHNOLOGY TRUST AND TECHNOLOGY COMPETENCE**

Technology competence is the ability to understand and operate wide range of technology innovations such as the computers, internet applications, mobile phones and mobile phone applications with minimal difficulty (Van Braak et al., 2004). Concerning users' technology competence and their propensity to trust technology, several researchers have investigated the existence of a relationship between these two concepts. As stated earlier, Wadie (2011) proposed that individuals with higher technology competence are more likely to trust and adopt technology than individuals with lower technology skills. In research into the factors influencing user adoption of technology in Kenya, Nganga and Mwachofi (2013) cite the BECTA report (2003) which states that, in addition to resource-related factors and cultural factors, challenges associated with lack of training, skills, knowledge and computer experience are factors influencing the non-adoption of technologies such as mobile banking in the country. In conjunction with the statements in the BECTA (2003) report, further comparative studies conducted by Nganga and Mwachofi (2013) obtained data from SMEs and bank agents in Karatina and Likuyani, and revealed that assertions in the BECTA (2003) report were true in Kenya and lack of technology knowledge and competence negatively impacted technology adoption. Research by Ayana (2014) amongst Ethiopian banking customers also investigated the factors influencing the adoption of technology banking services such as internet banking and mobile banking. The results revealed that in addition to a lack of trust, an unfamiliarity with services provided through ATM, internet banking, and mobile banking led to a lack of technical skills in the use of these technological innovations, ultimately resulting in a lack of adoption as well. From these existing studies, it is theoretically deducible that a lack of technology competence leads to a lack of trust in technology and lower rates of technology adoption. According to Venkatesh et al., (2012), users with more familiarity with technology are more willing to trust and adopt new technologies as well as requiring need less supporting structures to utilise the new technologies in comparison to individuals with less competence and familiarity. In a study conducted on the factors influencing internet usage, Cheshire et al, (2010) present further explanation for this adoption trend by studying the theoretical relationship between technology competence, trust and the usage of websites. Cheshire et al (2010) obtained data from a sample group of 1213 internet users and the results revealed that an individuals' own knowledge and competence with the internet is critical in developing trust in websites and facilitating adoption. Cheshire et al (2010) summarise their findings in this area by stating that increased technology competence leads users to believe they can assess the

trustworthiness of technologies such as the internet websites and increases the probability of them using these technologies. In light of these findings from various studies, the researcher suggests the possibility of a relationship between technology competence and users trust in mobile banking technology in Nigeria. This suggestion consequently leads to the inclusion of a technology competence variable in the research model, which will study the existence, or non-existence of this relationship amongst Nigerian customers. The next area to be considered is an assessment of the factors, which act as antecedents of technology trust. Identifying these specific factors will provide a more detailed approach to understanding user trust in technology.

#### **2.4.6 FACTORS OF TECHNOLOGY TRUST**

Regarding factors contributing to technology trust, seven specific antecedents have emerged as the most implemented measures among researchers. These factors, identified and adopted by Jamieson (1996), Bhimani (1996), Marcella et al (1998) and Parker (1995) are confidentiality, integrity, authentication, non-repudiation, access control, availability and best business practices (Ratnasingam et al, 2002). Ratnasingam et al (2002) were able to adopt these seven factors while investigating technology trust's role in business-to-business electronic commerce and Hwang et al (2007) implemented these classifications on technology trust's antecedents while researching the factors, which determine online trust and participation in e-commerce. Based on their adoption in existing literature as well as their individual definitions, these seven factors will be used to investigate technology trust in this study. Confidentiality refers to privacy issues and determines customer trust based on the mobile banking information technology being able to protect transactions and personal data from unauthorised access, disclosure and manipulation. Integrity refers to mobile banking transaction accuracy, as customers are more likely to exercise trust if all transaction operations are consistently carried out without being distorted. Authentication determines a customer's propensity to trust as it refers to the legitimacy of mobile banking transactions and the perception that all the elements involved in the transaction are genuine. Non-repudiation refers to systems that ensure that the parties involved in a transaction cannot deny having participated in the transaction after participating in the transaction. Access control defines the infrastructures set up to ensure transactions are carried out without intrusions and disruptions.

Best business practices focuses on the institutional aspects of mobile banking and leads customers to have more confidence in mobile banking based on regulatory infrastructures and operations, which govern mobile banking (Ratnasingam et al, 2002). Availability refers to customer's willingness to trust based on the regular presence of mobile banking infrastructure as issues such as a weak or absent signal, faulty devices and outright absence of mobile banking service will lead to diminished customer confidence in mobile banking

With this in mind, these seven factors will be adopted in this research as some of determinants which will be investigated and measured as the researcher intends to also determine if demographic factors might also be contributing to customer's adoption of mobile banking in Nigeria. Figure 2:1 (Hwang et al, 2007) provides a summary of the major antecedents, which will be investigated in addition to any other determining factors that may be uncovered during the course of this research.

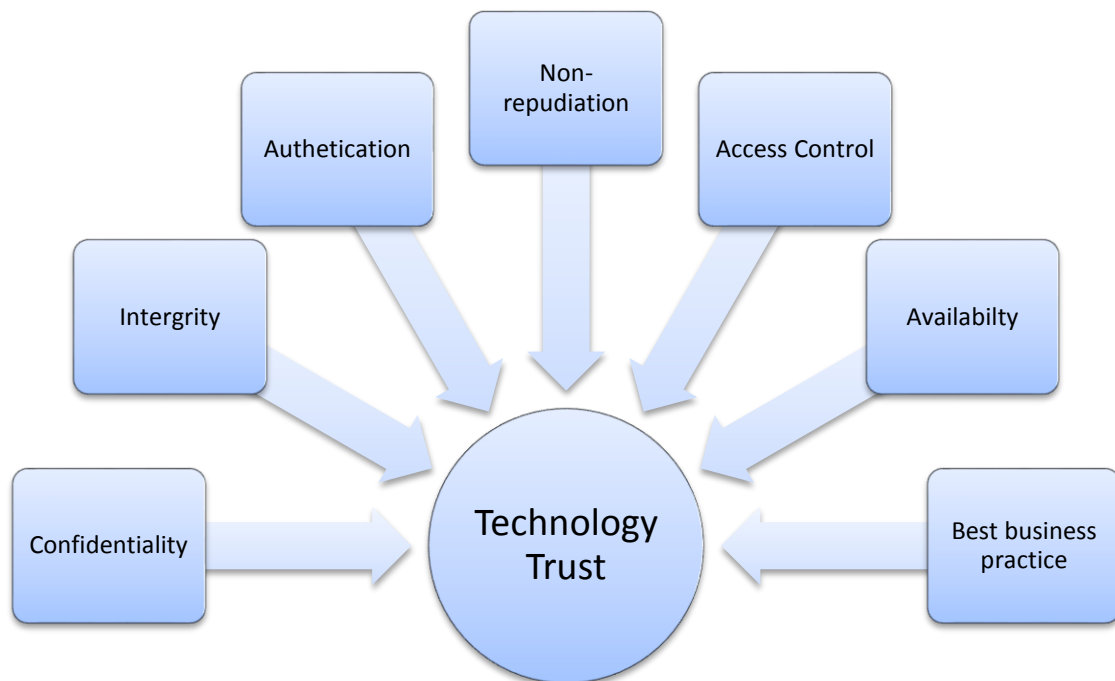


Figure 2:1: Factors of technology trust (Hwang et al, 2007)

As the factors affecting technology trust have been identified, the next step is to introduce a framework, which can be used to investigate technology adoption by incorporating technology trust as well as other technology acceptance factors.

## **2.5 USER ADOPTION AND TECHNOLOGY ACCEPTANCE**

Concerning investigating technology adoption, several theoretical frameworks have been used by researchers to analyse and understand the factors influencing user acceptance of technology. Some of these frameworks, cited by Shroff et al (2011), include:

- The Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980).
- The Theory of Planned Behaviour (TPB) (Ajzen, 1991)
- The Technology Acceptance Model (TAM) (Davis, 1989; Davis et al, 1989),
- The Diffusion of Innovation Theory (DOI) (Rogers, 1995).

Each of these frameworks have proven to be appropriate in investigating user adoption behaviour and illustrating each of them will reveal the justification for using TAM in this study.

### **2.5.1 THE THEORY OF REASONED ACTION (TRA)**

The TRA is a framework developed from a social psychology setting by Martin Fishbein and Icek Ajzen (1980) as a model for predicting user behaviour intention and understanding user behaviour and attitude. In this model, user behaviour is defined by three components which are behavioural intention, (BI), individual attitude about the behaviour, (A), and subjective norm in the individual's social environment, (SN). Using the TRA, Fishbein & Ajzen (1980) suggest that an individual's actual behaviour is a result of their intention to exhibit that behaviour and this intention is a product of the individual's attitude and subjective norms. They defined behavioural intention as an individual's level of willingness to exhibit behaviour. Attitude considers the individual's perception of the consequences of exhibiting this behaviour multiplied by the individual's personal appraisal of the consequences. Subjective Norm is defined as an individual's perception of what other people of relevance expect as well as the individual's willingness to meet these expectations (Fishbein & Ajzen, 1980). Figure 2:2 (Fishbein & Ajzen, 1980) is a representation of the TRA model

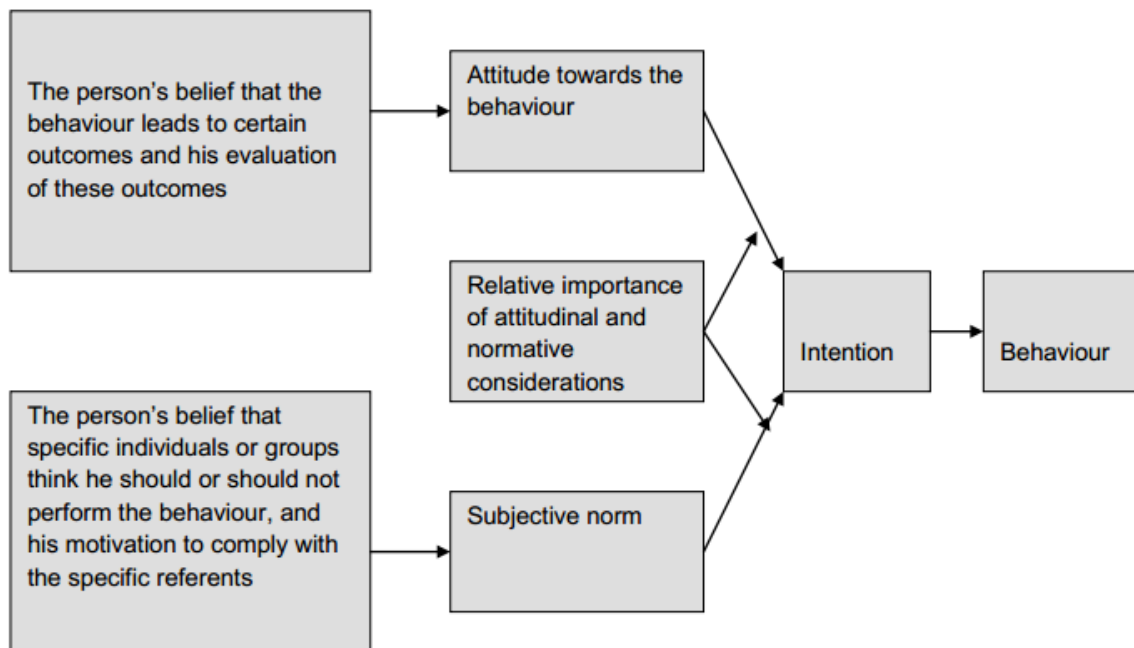


Figure 2:2: Theory of Reasoned Action. (Fishbein & Ajzen, 1980)

As pictured in Figure 2:2, the TRA model specifies actual behaviour to be a direct result of an intention to exhibit that behaviour. In turn, the intention to exhibit that behaviour is jointly influenced by the individual's attitudes towards that behaviour and the individual's perception of what relevant people in their life expect from them in terms of behaviour (Selim, 2002). The primary goals of this framework are to understand and predict the social behaviour of individuals and to accomplish this; the behaviour in question is specifically defined, completely under the control of the individual and performed in a specified context or situation (Godin, 1994). In addition, this framework assumes that the behaviour in question is solely based on the individual's intention to either perform or not perform that behaviour (ibid). Fishbein and Ajzen's (1980) TRA model has been used by researchers to successfully investigate user behaviour by assuming that individual's actual behaviour is governed by their rational analysis of people's expectations, behavioural consequences and their own attitude (Yousafzai et al, 2010). However, criticisms of this model arose based on indistinguishable relationships between subjective norm and attitude as well as the model's assumption that behavioural intention directly resulted in actual behaviour without limitations (Truong, 2009). These criticisms exposed limitations of this model and evaluating these strengths and limitations of



this model is essential towards developing this study's framework for investigating the role of technology trust on mobile banking adoption in Nigeria.

As a framework, the TRA has been able to identify various casual factors proven to have an impact on an individual's intention to perform a behaviour (Bobbitt & Dabholkar 2001; Davis et al 1989; Venkatesh & Davis 2003). This stands as an asset of this framework because recognising behavioural intention and the factors, which directly influence it, allows researchers to use this model in understanding the cognitive aspect of human behaviour and identify the areas of human behaviour, which can be targeted in order to influence volitional behaviour. This has led to researchers such as Sheppard et al (1998) praising the models prediction capabilities and concluding that it can applied in investigations and studies outside its intended sociological field. Previous studies have successfully used this framework in understanding and predicting behaviour with Olsen et al. (1993) employing the model in a study into customer purchasing behaviour and stating that the model's evaluation of behavioural intention is an almost perfect determinant of actual behaviour. However, several weakness have led to this this model being reviewed and modified to address limitations identified from research criticism.

One weakness of this model is in its assumption that individual behaviour is totally under the control of the individual and intentional (Hale et al., 2003). Its explanatory scope excludes behaviours which are not considered as volitional such as spontaneous or impulsive behaviour and focuses solely on behaviour which is well-thought out and evaluated by the individual (Langer, 1989). The theory suggests that once an individual has attained an adequate evaluation of attitude and subjective norm, the intention to a behaviour undoubtedly leads to the execution of that behaviour without constraints (Hale et al., 2003). The suggestion that intention to exhibit a behaviour remains constant over time is impractical, because of the possibility that intentions to carry out a behaviour can change over time (Olsen et al., 1993). This lead to counter-arguments against the framework's direct high relationship between behavioural intention and actual behaviour as variables, such as time, trust and other circumstantial constraints, can influence behavioural intentions and not lead to actual behaviour.

The influence of other variables on behavioural intention leads to another limitation of this framework's theory that behavioural intention is solely influenced by only two factors (Godin, 1994), The TRA fails to consider other factors which can influence behaviour such as behaviours which require special skills, resources, availability and lack of opportunity. (Liska,

1984). The framework also excludes variables such as social, technological or demographic factors, which studies have revealed to play roles as determinants of individual behaviour (Grandon & Peter P. Mykytyn 2004; Werner 2004). When considering the conceptualisation of technology trust in this study, as well as the relationship between technology adoption and various factors reviewed in previous sections, the limitations of this framework make it inadequate for a total application in this investigation in Nigeria. With mobile banking technology adoption being the desired behaviour, this framework suggests that the intention to adoption mobile banking undoubtedly leads to the adoption of the technology. However, literature has revealed that mobile banking usage is not totally under the control of the customer's intentions and demographic factors such as income level, education level and age play a role in the intention to adopt the technology. These factors, including technology trust, must be considered, and included in the research framework, which aims to investigate their influence amongst mobile banking customers in Nigeria. The TRA theory is considered very useful when predicting behaviour (Abbas & Nik, 2010) and its separation of behaviour intention and actual behaviour into different concepts can be adopted into the model, which will be used in this study. However, rather than conclude that behaviour intention directly results in actual behaviour, this study will investigate both components separately to uncover a possible relationship between both variables and the significance of the relationship, thereby circumventing the predictive limitations found in the TRA model. The next research model to be considered is an extended version of the TRA called the Theory of Planned Behaviour.

### **2.5.2 THE THEORY OF PLANNED BEHAVIOUR (TPB)**

The Theory of Planned Behaviour was developed by Ajzen (1991) as an extension of the TRA in order to address the limitations of the model and was designed to predict pre-meditated deliberate behaviour by introducing a fourth construct into the existing model (Truong, 2009). In addition to subjective norm, attitude and behaviour intention, perceived behavioural control was added into the model and this fourth construct was defined as the individual's evaluation of existing or non-existing factors, which will facilitate or hinder their execution of behaviour (Ajzen 1991). The theory behind this model was that an individual's actual behaviour is a product of these four factors and below is a representation of the model. Figure 2:3 (Icek Ajzen, 1991) is a representation of the TPB

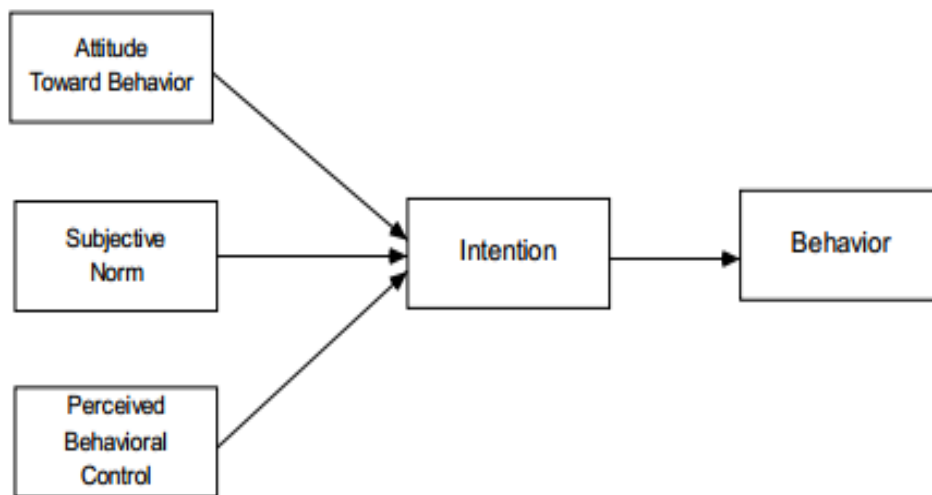


Figure 2:3: Theory of Planned behaviour (Icek Ajzen, 1991).

Similar to the TRA, TPB's primary objective is to predict and understand human behaviour based on an evaluation of the influences of four factors (Armitage & Christian, 2003). However, unlike the TRA, TPB extends the predictability of its framework past the sole understanding of intentional behaviour to also consider behaviour not under the complete volitional control of the individual, by introducing a fourth construct, Perceived behavioural control (Bilic, 2005). The concept of this fourth factor is based on the premise that individuals will exhibit a certain behaviour based on the ease or difficulty of execution associated with the behaviour and the presence of facilitating external factors (Ajzen, 1991). Much like the TRA, the TPB also posits that once intention is constant, the execution of a certain behaviour is almost inevitable (ibid). This assumption therefore causes the TPB to both experience some success in research application but also suffer similar limitations with the TRA.

The TPB has seen successful implementation in research in the field of health, technology and social behaviour (Brown and Venkatesh, 2005; Chau and Hu, 2002; Venkatesh and Brown, 2001; Pedersen, 2005). Researchers such as Armitage and Conner (2001), Godin and Kok (1996) and Trafimow et al., (2002) have stated that all three determinant constructs can explain 39-42% of variance in the intention to exhibit behaviour and perceived behavioural control, in conjunction with behavioural intention, can explain 24-39% of variance in actual behaviour. These findings have led these researchers, including, Elliot et al., (2003) and Sheeran et al., (2001) to deem this framework to a complete model which can be used to investigate and understanding individual behaviour. However, despite being an extensive of the TRA and

addressing the predictability drawback of its predecessor, the TPB still preserves the assumption that intention to exhibit a behaviour will almost always result in the actual exhibition of that behaviour. This assumption has led to criticisms of the model stemming from research results where actual behaviour failed to be a direct result of behavioural intention (Mathieson, 1991; Taylor & Todd, 2001). Despite researchers revealing that the constructs of the TPB explained a large variance in behavioural intention and actual behaviour, there remains a large portion of variance, which the constructs of the TPB failed to explain. According to Sharma et al (2007), Ogden (2003) and Werner, (2004), inconsistencies still exist regarding the relationship between subjective norm and attitude and the TPB, similar to the TRA, does not consider the influence of external factors in determining an individual's behaviour. This lack of consideration of external factors limits the TPB's predictability to four factors, which is insufficient in research contexts, which require an individual's behaviour to be predicted with a more robust set of constructs (ibid). Considering these limitations, the TPB could not be used to study the role of technology trust in mobile banking adoption in Nigeria because it does not consider the influence other external variables, such as technology trust or demographic variables in its framework (Knabe, 2012). Reviewed research has already reported the influence of these variables on technology adoption behaviour and this model's failure to consider these factors makes it unsuitable for this study. Taylor and Todd (2001) highlights another feature of this model, which makes it unsuitable for application in this study into technology trust and mobile banking in Nigeria. The idiosyncratic nature of constructs such as attitude towards behaviour makes it difficult to investigate the construct empirically as it is a construct, which is accurately studied qualitatively. Considering that this study is an empirical investigation aimed at explaining the role of technology trust on mobile banking adoption in Nigeria using statistical methods, the TPB is further seen as a less than satisfactory model for implementation. Therefore, this study will develop a model, which considers the influence of these variables as well as adopts some of the benefits of existing models, such as the TRA and TPB's separation of behaviour intention and actual behaviour into separate constructs. Ultimately, this will lead to the development of a holistic model, which can empirically investigate the subject in question. With the TRA and TPB being unsatisfactory frameworks for this study, the next theoretical framework to be considered is the technology acceptance model, which has been reported by Matheison (1991) to have a better predicating capability of behaviour intention than the TRA and TPB.

### 2.5.3 TECHNOLOGY ACCEPTANCE MODEL

The technology acceptance model, (TAM), is a framework designed based on the theory of reasoned action, (TRA), and has been applied by researchers as a tool in determining the acceptance of information technology (Davis, 1989; Venkatesh & Davis, 2000). Various studies have applied TAM in information technology acceptance related research (Davis, 1989; Davis, et al., 1989; Bagozzi, et al., 1992; Taylor and Todd, 1995; Moon and Kim, 2001) and researchers agree that the model is an appropriate framework for investigating user adoption behaviour because of its comprehensive structure and its consistently successful implementation. In addition, the framework's versatility also makes it applicable in various areas of user adoption studies because researchers can modify it to relate to the desired research area in question (O'Cass and Fenech 2003). Another major appeal of TAM to researchers are the components of the framework, and the links between these components (Davis et al. 1989; Szanja 1996). These components are perceived usefulness; which refers to how helpful the individual thinks the technology will be in aiding him/her in achieving their aim and perceived ease of use; which refers the individual's assumptions of the level of difficulty, which will be experienced when trying to use the information technology (Wang & Tseng, 2011). Both perceived usefulness and perceived ease of use have been proven to directly influence an individual's intention to use and ultimately their actual use of an information system (Davis, et al., 1989). This is evident in the successful implementation of TAM in Li and Huang's (2009) research into customer intentions regarding online shopping, Wang and Tseng's (2011) research into the impact of trust on customer's adoption of online shopping and the work of McCord and Ratnasingam (2004) on the impact of trust on the technology Acceptance model in business to consumer e-commerce. Figure 2:4 (Venkatesh & Davis, 1996) is a description of the Technology Acceptance Model.

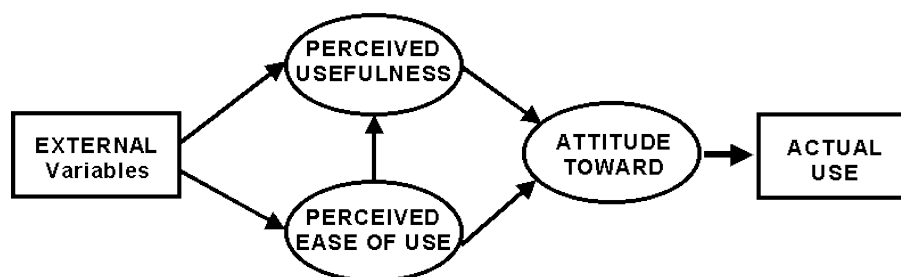


Figure 2:4: Technology acceptance model (Venkatesh & Davis, 1996)

Figure 2:4 shows that in addition to perceived ease of use and perceived usefulness, the TAM framework provides an opportunity to introduce and investigate the influence of external variables in technology adoption. These three constructs are theorised by Davis' (1989) to directly impact intention to use with external variables also capable of influencing intention to use technology through their influence on perceived usefulness and perceived ease of use.

As an adaption of the TRA, The TAM's design shares some similarities with its predecessor as well as incorporating distinguishable traits in comparison to the TRA (Davis, 1989). In addition to perceived usefulness and perceived ease of use, the TAM introduces the "intention to use" construct into its framework, a variable also present in the TRA model (Davis et al., 1989). Similar to the TRA, the TAM also considers intention to use and actual use as separate entities with intention to use being a direct determinant of actual use (ibid). The inclusion of this construct in the model allows researchers to investigate both constructs, with respect to user adoption behaviour, with the aim of uncovering a possible significant relation between both constructs; rather than theorising that intention to use directly results in actual use, such as with the TRA model (Taylor & Todd, 2001). This addresses the limitation exhibited in the TRA model, which theorised that behaviour intention ultimately led to actual behaviour without constraints. The TAM model also differs from the TRA regarding factors directly affecting intention to use. In the TAM, the model depicts a direct relationship between perceived usefulness and intention to use, replacing the direct relationship between intention to use and attitude towards behaviour, depicted in the TRA model. Davis, (1989) provides an explanation for this by stating that in IT adoption environments, user's intention to adopt a particular technology is based on the users' perception of the usefulness of the technology and its consequences on their ability to perform a task, irrespective of their attitude towards the technology. For example, an employee might not like a newly introduced technology innovation at work but still use it because it is beneficial to the completion of tasks. An additional noticeable difference between the TAM and its predecessor is the exclusion of the subjective norm construct, present in the TRA and TPB models. Davies (1989) explains that based on the context-sensitive nature of that subjective norm construct, as well as a lack of evidence showing significant relationship between the construct and intention to use, subjective norm was inappropriate for empirical investigations. Davis (1989) also argued that the exclusion of subjective norm did not suggest that social factors did not influence adoption intentions and these factors could still be introduced as external variables into the TAM

framework, and investigated for influence on other constructs in the model. Davis et al., (1989) explains that the inclusion of external variables as an additional determining factor in user intention to adopt technology allows investigations into technology adoption behaviour to also consider the influence of other influential variables not explicitly included in the TAM, such as demographic factors, personal factors and social factors. This highlights the defining flexibility feature of the TAM model, standing as a beneficial attribute that differentiates it from the TRA and TPB (Taylor & Todd, 2001). Taylor and Todd (2001) agree with Davis et al.'s, (1989) assertions and also describe it as a pragmatic advantage of the model, making it adaptable in its application and increasing its capabilities to predict user adoption intentions. The versatility of the TAM has resulted in it being considered an influential and comprehensive tool by several researchers in understanding user adoption of information technology (Hartwick & Barki, 1994; Mathieson et al., 2001; Taylor & Todd, 1995). Researchers have been able to introduce external variables and constructs such as system characteristics, personality traits trust and demographic segmentations, such as gender and age, into the model (Gefen & Straub, 1997; Venkatesh, 2000) and successfully investigate the influence of these factors on user adoption trends. The afore discussed strengths and benefits of the TAM model are features which the research deems appropriate to adopt in the development of a model for investigating trust and mobile banking adoption in Nigeria. However, this research also considers some of the limitations of the TAM as the researcher aims to address these limitations in this study and circumvent the drawbacks faced in previous TAM-related investigations.

Despite its widespread acceptance and use in technology adoption studies, the TAM model has undergone scrutiny by researchers in order to validate its strengths and evaluate any limitations the model might have. Lee et al., (2003) argues that despite several studies confirming the prediction validity of the TAM, a wide variety of studies were conducted in controlled environments with sample groups that may not have provided accurate data for analysis and generalization. Legri et al., (2003) also supports this argument by explaining that based on extensive meta-analysis of TAM-related studies, several of these studies have used controlled sample groups such as students or company employees, such as the work by Davis et al., (1989), who may have subjective motivations for providing data for research, for instance good grades or organisational rewards. This leads to a limitation of these studies, and the TAM model, because the results of these studies cannot be generalised to the real world.

Yousafzai et al., (2007) highlights another limitation of the TAM, revealing that its application has been largely concentrated on studies of voluntary technology use, resulting in a lack of

literature on its application in environments where technology use is semi-mandatory or mandatory. This also diminishes the TAM's real-world application because organisations and governing bodies, such as schools, companies and countries, usually require individuals under their jurisdiction to use the newly implemented technologies with no alternatives (Lee et al., 2003).

Since the intended research aims are to investigate the impact of trust, specifically technology trust, on customer acceptance of mobile banking in Nigeria with TAM as a contributing framework of study, understanding trust's role in the TAM framework is essential.

### 2.5.3.1 TRUST IN THE TECHNOLOGY ACCEPTANCE MODEL FRAMEWORK.

Several researchers have focused on customer trust in information technology. Several researchers have included the construct in the TAM model. Evidence can be found in Gefen et al.'s (2003) research into trust and TAM in Online Shopping, Wang and Tseng's (2011) research into the impact of trust on customer's adoption of online shopping and Balmaceda and Phillips-Wren's (2004) study on the effect of trust on the success of IT reform in Chile. In these studies, the TAM was extending to including trust as an external variable with investigated influences on perceived usefulness, perceived ease of use and intention to use. Figure 2:5 (Wend & Tseng, 2011) is the TAM model with trust integrated into the TAM model as an external variable.

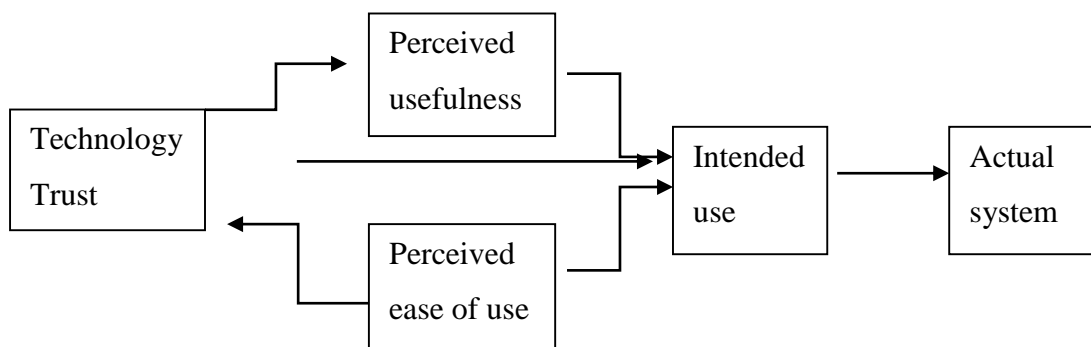


Figure 2:5: Technology acceptance model with integrated trust (Wend & Tseng, 2011)



### **2.5.3.2 RELATIONSHIP BETWEEN TRUST AND TAM COMPONENTS**

Bearing in mind the definitions of trust and the TAM's components, understanding the relationship between these concepts will ultimately explain their role in consumer's intention to use mobile banking.

**Relationship between Trust and Perceived Usefulness:** Existing literature, such as the work of Gefen et al. (2003) and McCord (2004), has shown that a perceived usefulness depends on specific task-related measures, meaning customers will consider information technology trustworthy and useful if it aids and enhances their ability to complete a specific task. (Eriksson et al., 2005; Laforet & Li, 2005; Polatoglu & Ekin, 2001; Cheung, 2002). The relationship between perceived usefulness and technology adoption is also present in other information systems research models such as Goodhue and Thompson's (1995) task technology fit, (TTF), which theorises that information technology will have a higher probability of effectiveness if the features and capabilities of the information technology are in-line with the tasks the user intends to execute. Considering the previous related work of Pavlou (2003), and the theory that a customer's trust in information technology is positively affected by the perceived usefulness, the researcher has hypothesised that trust in mobile banking will be positively affected by the customer's perceived usefulness of mobile banking.

**Relationship between Trust and Perceived ease of Use:** Considering the arguments of Kamalruzaman (2007) and Koufaris and Hampton-Sosa (2004), the relationship between trust and perceived ease of use exists in an increased willingness to trust information technology if it can be accessed and utilised with minimum difficulty. Previous studies by Koufaris and Hampton-Sosa (2003) have shown that perceived ease of use exhibits a positive effect on customer trust and ultimately customer intention to use information technology and this leads to another of the researcher's hypothesis, which states that perceived ease of use of mobile banking will positively affect technology trust. Support for this relationship can be found in the technology adoption studies of Kazemi et al (2013) and Jaradat & Twaissi (2010) in Zhenhua & Shaobo's (2009)

**Relationship between Trust and Intention to use:** One of the characteristics of mobile banking is that there is no physical interaction between the customer and the financial institution and this exposes the customer to the risk of unauthorised access to their personal details and transaction data (Flavian & Guinaliu, 2006; Monsuwe et al., 2004). This risk also tends to deter customers from using information technology services such as mobile banking

as the perceived uncertainty of mobile banking operations appears to be too much of a gamble for them (Lee and Turban, 2001). With this in mind, the theory that trust relates to intention to use, because customers who trust the technology will be more likely to use it than customers who have a lack of trust in the technology (Line et al, 2011), has been identified and will be tested in this research. Jaradat & Twaissi (2010) and Zhenhua & Shaobo's (2009) investigations into technology adoption also provide empirical support for this relationship.

### **2.5.3.3 SUMMARY**

The inclusion of a trust construct in the TAM as well as empirical investigations regarding its influence on other constructs in the model has been researched and identified by previous researchers resulting in an extended TAM framework designed to measure trust-related technology acceptance. Therefore, TAM provides applicable theoretical features which the researcher intends to adopt in this study.

Firstly, consider the variables and constructs to be investigated in this research: technology trust, its seven contributing determinants, demographic characteristics of users, the mobile banking adoption behaviour of users and the possible relationships existing between all these variables. A framework, which is designed to understand and predict user adoption behaviour, must consider all these variables in theory and allow the investigations to validate any possible relationship between them with empirical data. The TAM provides an appropriate theoretical backdrop in its framework, catering to all these requirements. The framework of the TAM allows this study to adopt its theoretical structure and modify it to suit the purpose of this study by introducing constructs such as technology trust and demographic factors into its structure. Existing literature, discussed in previous sections, has already proven that introducing trust as an external variable into the TAM leads to successful investigations of technology adoption. Previously considered frameworks such as the TPB and TRA did not facilitate this adaptability and research, such as Lules et al's (2012) investigation into m-banking adoption in Kenya, provides additional justification for adopting the TAM as theoretical backdrop and modifying it towards investigating technology adoption behaviour in different environments. Furthermore, Jaradat and Twaissi's (2010) assessment of the introduction of mobile banking in Jordan and Park et al.'s (2007) research into mobile banking adoption among Chinese customers, all illustrate the feasibility and validity of using TAM as a theoretical framework in this research area.

Secondly, considering the limitations discussed about the TAM framework. This study's intended model would be developed based on certain measures aimed at avoiding the shortcomings experienced by the TAM. Regarding, a lack of literature and studies of mandatory technology adoption. As discussed in chapter 1, Nigeria's mobile banking environment is being driven by its overall financial governing body, CBN. CBN has currently sanctioned additional charges and penalties on cash-heavy transactions, in an attempt to motivate a nation-wide transition towards cashless payment systems like mobile banking. Adopting TAM's theoretical structure into this research's model and applying it in the investigation into mobile banking adoption in Nigeria will address the lack of literature on mandatory technology adoption, cited as a limitation of TAM studies. Also, to address the issue of TAM studies focuses mostly on controlled sample groups and environments such as students and company employs, this study aims to use its TAM-related model to investigate the adoption behaviour across a large cross-section of demographics who will comprise of various educational levels, occupations, age groups and ethnicities. This will increase the generalizability of the results, which will be obtained from this study. In light of these measures, this research aims to produce both a holistic model for measuring the influence of external factors, such as technology trust and demographic variables, on mobile banking adoption and provide empirical data to support the designed model, ultimately resulting in a framework and results, which can be generalised for real-world application.

Before the intended model for this study is developed, a final technology adoption theory is considered. This theory is the diffusion of innovation theory and it also holds theoretical assertions appropriate for inclusion in the intended model for this study as well as considerations which are significant to the results achieved at the end of this study

#### **2.5.4 THE DIFFUSION OF INNOVATION THEORY (DOI)**

Technology adoption and innovation diffusion has been an area of extensive research for more than three decades and the DOI is a theoretical framework popularised by Rogers (1995). Rogers (1995) uses the terms "innovation" and "technology" interchangeably and defines the DOI as "the process by which an innovation, or technology, is communicated through certain channels over time among the members of a social system". The DOI is considered a very useful tool in understanding the process of adopting new technologies with Sahin (2006), Dooley (1999) and Stuart (2000) citing its application a variety of fields such as economics, education, public health, technology and communications. As expressed in its definition,

Rogers' (1995) framework comprises of key components, which are important to the framework and the diffusion of technology (Sahin, 2006). These are innovations, communication channels, time and social systems.

#### **2.5.4.1 CONCEPTS OF THE DOI**

**INNOVATION:** Rogers (2003) defines an innovation as an idea, practice or project perceived as new by an individual or other unit of adoption. Rogers further explains that regarding human behaviour towards an innovation, an individual will always perceive an innovation as being new regardless of the actual objective newness of the idea. This means that whether a technology was recently discovered, or a large amount of time has elapsed since its discovery, the technology will always be seen as an innovation to an individual if he perceives it as being new (Sahin, 2006). However, the newness of an innovation is not solely dependent on the individual's recent knowledge or acquaintance with the technology. Rogers (2003) explains that an individual might already have had prior knowledge of a specific innovation but not formed a favourable or unfavourable attitude towards it, not adopted or rejected it.

**COMMUNICATION CHANNEL:** This is the second element in the diffusion of innovation process and Rogers (2003) defines communication as a process in which participants create and share information with one another in order to reach a mutual understanding. The diffusion of innovation theory considers adoption of innovations as a form of communication between and across sources through various channels, with "sources" described as individuals or organisations who originate a message and "channels" defined as means by which a message is communicated from a source to a receiver (Sahin, 2006). Rogers continues by stating that the process of diffusion or adoption requires specific elements to occur, namely, an innovation, two individuals or other units of adoption, and a communication channel. He also describes diffusion as a very social process involving interpersonal communication relationships (Rogers 2003). In summary, the diffusion of innovation theory's perspective on innovation adoption is based on the notion that user adoption of technology and user attitude towards the adoption of technology, is majorly influenced by the individuals communication with other individuals through social and interpersonal channels (Sahin, 2006)

**TIME:** The aspect of time is an element ignored in various existing studies into innovation adoption but stands as a beneficial feature of the DOI because of its inclusion as a key

component in its framework (Rogers, 2003). Time also factors in the DOI framework such as the diffusion process, the types of innovation adopter and the rate of innovation adoption. Further discussions on the impact of time on this study in Nigeria are presented in section 5.2.6.

**SOCIAL SYSTEM:** This is the final element of the DOI definition and refers to a set of interrelated units jointly engaged in problem solving towards a similar goal (Sahin, 2006). Since the DOI is based on the theory that innovation definition occurs within a social system, Rogers (2003) also states that the diffusion of the innovation in question is influenced by the social structure and arrangement of units within that system

The DOI framework also provides further elaboration on the process of innovation adoption and the stages involved in individual decision making process regarding adopting or rejecting an innovation.

#### **2.5.4.2 THE INNOVATION DECISION PROCESS**

In the DOI theory, Rogers' (2003) refers to the decision-making procedure of individuals as the innovation decision process. He defines it as an information-acquiring and information-processing process, where an individual aims to learn about the innovation in an attempt to reduce uncertainty about the advantages and disadvantages of the innovation (ibid). This process consist of five stages which an individual, or group of individuals which are systematically worked through when an innovation is to be adopted or rejected. These stages are the knowledge stage, the persuasion stage, the decision stage, implementation stage, implementation stage and the confirmation stage (Toledo, 2005).

**KNOWLEDGE STAGE:** In the DOI theory, Roger notes that knowledge is an essential part of innovation decision and adoption process because increasing the chances of innovation adoption depends on the individual having sufficient knowledge on the innovation. The knowledge stage is the first stage in the innovation decision process and is characterised by the individual finding out about the existence of the innovation and acquiring more knowledge about it (Roger, 2003). During this stage, the individual seeks to understand the nature of the technology how it works and “What?” “Why?” and “How?” are the critical and prevalent questions asked in this stage (ibid). According to Rogers (2003), these questions form three categories of knowledge in stage, namely:

- A. **Awareness knowledge:** Referring to the knowledge of the innovations existence. This knowledge usually motivates the individual to seek more knowledge about the innovation, leading to an acquisition of the other two types of knowledge and ultimately an adoption of the innovation
- B. **How-to knowledge:** This refers to knowledge on the appropriate use of the innovation. How-to knowledge becomes increasingly vital with an increase in the complexity of the innovation and is considered a significant aspect on the innovation decision process.
- C. **Principles knowledge:** This refers to knowledge of the underlying mechanisms and operational principles surrounding the “how” and “why” an innovation operates. Rogers (2003) states that an individual can adopt an innovation without this knowledge being present but a continued lack of this knowledge after adoption may lead to the misuse of the innovation and a rejection of the innovation afterwards.

**PERSUASION STAGE:** The persuasion stage occurs after the knowledge stage and this is the phase where the individual has formed a favourable or unfavourable opinion about the innovation (Rogers, 2003). In this stage, the individual has acquired knowledge about the innovation and it leads to either a positive or a negative outlook on the innovation. However, these positive or negative outlooks do not guarantee an acceptance or rejection of the technology (Sahin, 2006). Rogers emphasises that though the knowledge stage is based on the individuals cognitive input, the persuasion stage is based on the individual’s feelings and attitude towards innovation. As a result, the factors which play a role in the individuals perception of the innovation are the amount of uncertainty still existing about how the innovation operates and the degree of social encouragement or discouragement received from the individuals social peers.

**DECISION PHASE:** According to Rogers (2003), the adoption of an innovation is defined as a full use of an innovation as the best course of action available. In addition, he defines rejection as an individual not adopting an innovation. With this in mind, the decision phase is characterised by the individual concluding on whether to adopt or reject an innovation (Sahin, 2006). According to Rogers, an innovation is less likely to be rejected if it is offered to the individual on a trial basis because most users will be willing to adopt an innovation after testing

in in their own subjective situations (ibid). Rogers (2003) also categorises rejection into two dimensions: active and passive.

- A. **Active rejection:** This is a situation where an individual tries an innovation, considered adopting it but decides to reject it instead. A situation where an individual actually adopts the innovation but rejects it later on is also considered as an active rejection
- B. **Passive rejection:** This is a situation where an individual rejects the innovation without trying it at all

In light of these first three stages in the adoption decision process, Rogers notes that even though the stipulated transition between stages is knowledge-persuasion-decision, transition can also occur in a knowledge-decision-persuasion based on if the knowledge the individual acquires on the innovation leads to a passive rejection (Sahin, 2006). In either case, the next stage is the implementation stage.

**IMPLEMENTATION STAGE:** Prior to this phase, the individual will have decided to adopt the technology and the implementation stage is where the innovation is put into use. Considering that the innovation may still hold some degree of unfamiliarity with the adopter, certain aspects of the innovation may lead to unforeseen outcomes for the adopter (Sahin, 2006). Rogers (2003) notes that in this stage, adopters may require technical assistance in implementing the innovation in order to reduce the amount of unfamiliarity the adopter has with the innovation. Rogers also notes that users may also reinvent and find new ways to implement the innovation in this stage, which means adopters can modify or change the innovation during the process of adoption. This is advantageous for innovation adoption because a higher frequency of reinvention leads to a higher degree of adoption across a social system (ibid).

**CONFIRMATION STAGE:** This is the final stage of the adoption decision process and at this point, the adoption decision process has ended (Sahin, 2006). Here, the individual as adopted and implemented the innovation and is seeking support for the decision (Rogers, 2003). The individual's adoption may come under threat from messages criticising or reproofing the adoption of this decision but the individual may not be exposed to these messages because the individual will tend to stay away from such messages and seek out assurances for the adoption decision (ibid). However, despite the adoption and implementation

of the innovation, the innovation may be rejected based on two reasons: replacement discontinuance and disenchantment discontinuance.

A. **Replacement discontinuance:** This is a situation where the individual decides to reject the innovation by replacing it with a better substitute

B. **Disenchantment discontinuance:** This is a situation where the individual decides to reject the innovation because of a lack of satisfaction with its performance

Fig 2:6 (Sahin Ismail, 2006) provides an overview of the adoption decision process

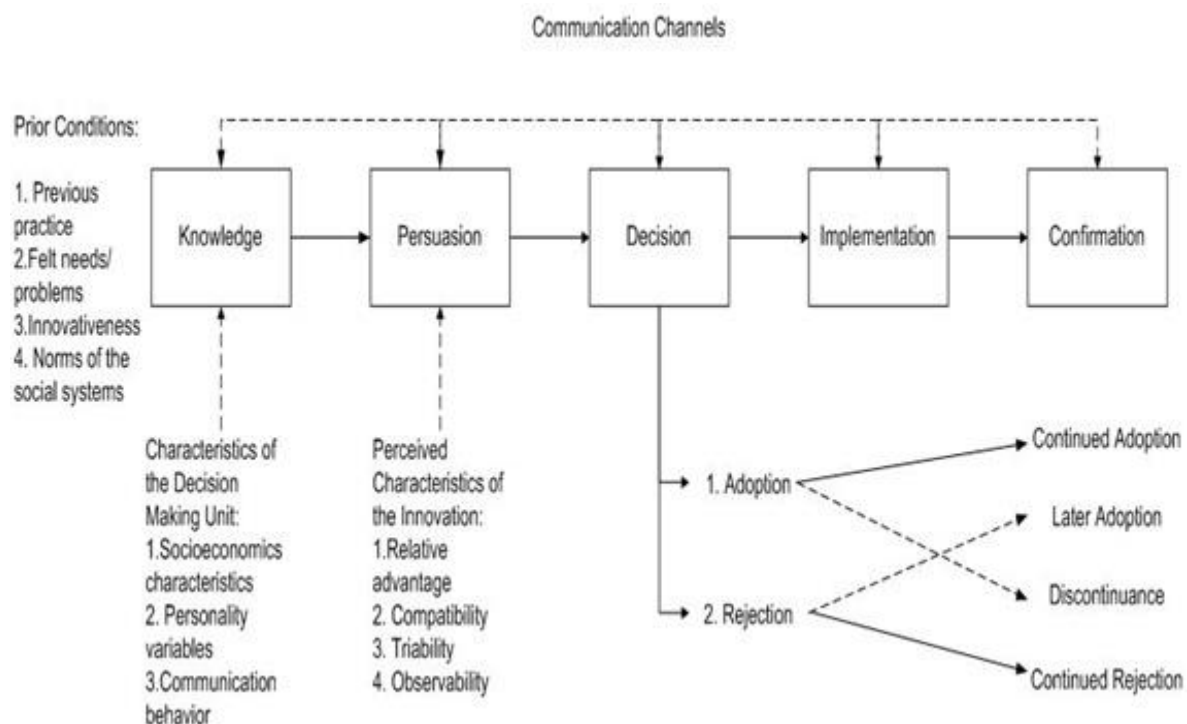


Figure 2:6: The adoption decision process (Sahin Ismail, 2006)

In the DOI, there are a set of factors which Rogers (2003) proposes influence the adoption of innovations. Rogers suggests that these factors help reduce the amount of uncertainty perceived by an individual in an innovation and addressing these factors will aid in increasing the rate of innovation adoption. These factors are relative advantage, complexity, compatibility, trailability and observability.

- **Relative advantage:** Also referred to as perceived usefulness, refers to the individual's perception of the advantages the technology has over its predecessor. To increase the



rate of adoption and the effectiveness of relative advantage, Rogers (2005) suggests that incentives be offered to individuals to motivate them to adopt an innovation

- **Complexity:** Also referred to as perceived ease of use, refers the individual's perception of the difficulty involved in using the technology. As Rogers (2003) stated, opposite to the other attributes, complexity is negatively correlated with the rate of adoption. This means that the higher the complexity of an innovation, the less likely individuals will adopt it.
- **Trailability:** the level of experimentation, which can be carried out on the technology on a limited basis. As discussed in the implementation stage, reinvention is a property which increases the rate of adoption of an innovation, therefore making trailability positively correlated with rate of adoption (Sahin, 2006)
- **Compatibility:** the individual's perception of the technology's adherence to existing values and the individual needs of potential users. A lack of compatibility in IT with individual needs may negatively affect the individual's IT use (McKenzie, 2001; Sherry, 1997).
- **Observability:** the degree to which the results of the technology are visible to other individuals Similar to relative advantage, compatibility, and trialability, observability also is positively correlated with the rate of adoption of an innovation.

In summary, Rogers (2003) argued that innovations offering less complexity, more relative advantage, compatibility, trialability, and observability will be adopted faster than other innovations. (Anderson et al., 1998; Bennett, & Bennett, 2003; Parisot, 1997; Slyke, 1998; Surendra, 2001). The next aspect in the DOI theory is Rogers' classification of adopters.

### **2.5.4.3 ADOPTER CATEGORIES OF THE DOI THEORY**

Prior to discussing Rogers's classification of adopters, it is necessary to outline the DOI's theoretical view on rates of adoption. According to Rogers (1962), the "rate of adoption" is the relative speed with which members of a social system adopt an innovation. This is measured by the length of time each category of adopters takes to adopt the innovation. Rogers (1962) also notes that there is a variation in the rates of adoption of the various adoption categories and some members of the social system will adopt an innovation faster than others. This is why considering time as a key component of innovation adoption is important because some categories of adopters will take less time to adopt, exhibiting a high rate of adoption while a later group will adopt innovations slower, longer adoption process and sluggish rate of adoption. Elaboration on these adoption categories and their rates of adoption is given hereafter

In the DOI, Rogers (2003) defined the adopter categories as the classifications of members of a social system based on innovativeness. Rogers provides further explanation by defining "innovativeness" as the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a system (ibid). Braak (2001) also provides a definition by describing it as a relatively-stable, socially-constructed, innovation-dependent characteristic that indicates an individual's willingness to change his or her familiar practices". Therefore, the DOI categorises adopters based on individual's propensity to adopt new technology (Sahin, 2006). The theory identifies five categories of adopters namely: innovators, early adopters, early majority, late majority and laggards. Figure 2:7 (Everett Rogers, 2003) is a representation of the five categories and their associated percentages of adoption. Figure 2:8 (Les Robinson, 2009) also shows the five categories as well as an illustration of adopter categories propensity to trust. Upon further elaboration of the characteristics of these categories, similarities are identifiable between them and the cashless policy adopter categories revealed by CBN (2013).

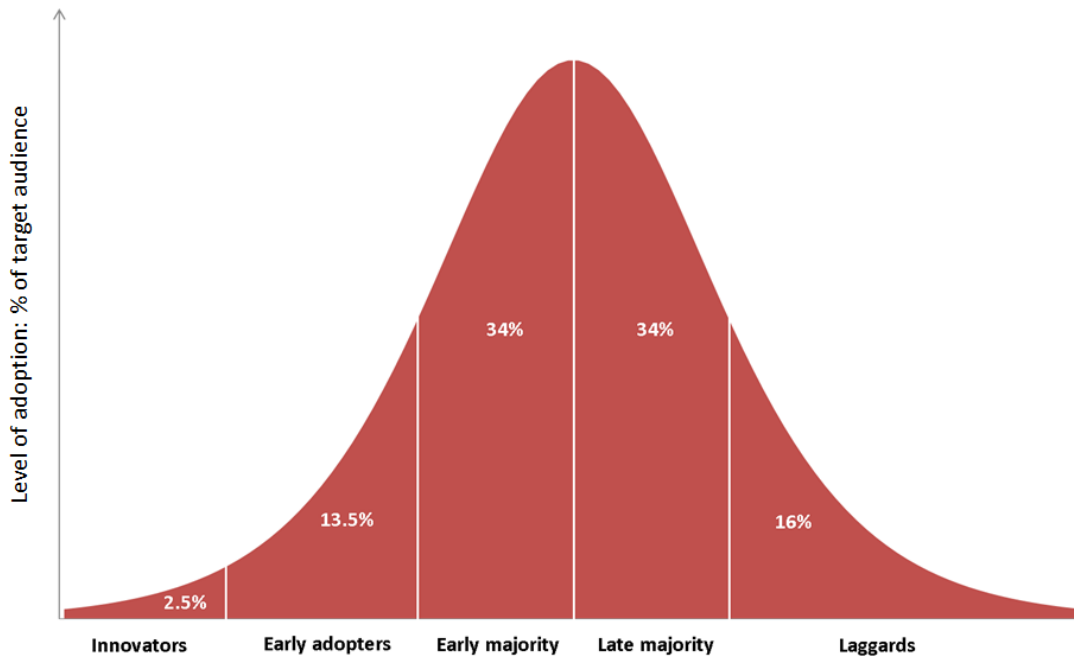


Figure 2:7: Adopter Categorization on the Basis of Innovativeness (Everett Rogers, 2003)

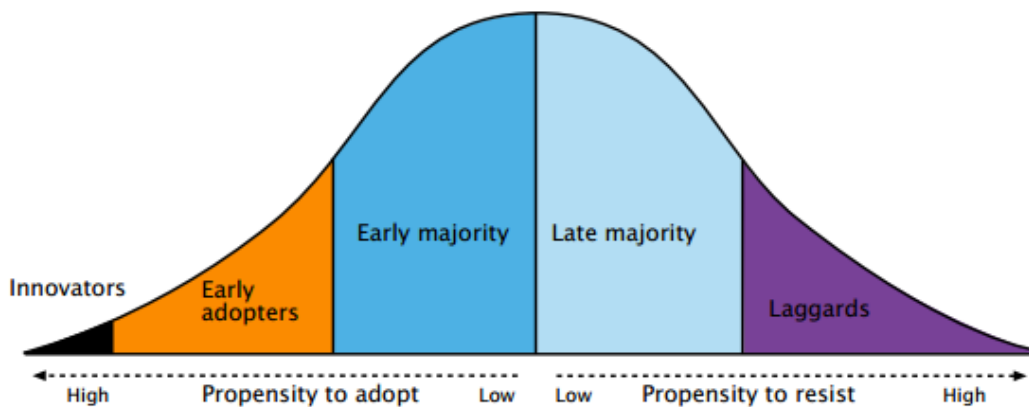


Figure 2:8: Adopter Categorization showing propensity to adopt (Les Robinson, 2009)

Rogers (2003) also the adopter classification is based on successful adoption of an innovation and the curve generated in this distribution occurs with no consideration given to incomplete adoption and non-adoption. Therefore, in the normal distribution shown in figures 2:7 and 2:8, each category is defined using a standardized percentage of respondents. Rogers (2003) also provides detailed descriptions for each category, beginning with innovators.

**Innovators:** According to the DOI's adoption categorization, the adoption process begins with a small set of individuals known as the innovators. In the social system, these innovators are the first-line of innovation introduction by either creating the innovation or importing it from outside the social system (Sahin, 2006). Consequently, they are among the first 2.5% of individuals in a social system to adopt innovations (ibid). Rogers (2003) characterises innovators as risk-takers who are willing to experience new ideas as well as exhibiting the highest propensity to adopt innovations in comparison to members of other adopter categories in the system. In addition, Rogers (2003) emphasises that not all innovations are destined to succeed and innovators should complement their enterprising attitude towards adoption with a willingness to experience uncertainties and consequences of the adopted innovation. Kaminski (2011) and Rogers (1962) provide further details on profile of innovators, describing them as:

- Youngest in age, in comparison to other categories in the social system
- Require shortest adoption time due to their high willingness to adopt innovation
- Possess knowledge of complex technology which helps them understand and apply innovations efficiently
- Highest propensity to trust innovations
- High financial lucidity to cope with the possible failure of an adopted innovation

**Early Adopters:** Early adopters are the second fastest group to adopt innovations and make up an additional 13.5% of adopters within the social system (Rogers, 2003). They are less adventurous towards technology than innovators but still show a significantly higher propensity to adopt technology than the early majority, late majority and laggards (Sahin, 2006). Rogers (2003) describes this category of adopters as having the highest degree of opinion-leadership in comparison to the other adopter categories and show higher integration into the social system than their adopter counterparts. Due to their influence on other members in the social system, early adopters are perceived as visionaries and role models to potential adopters who consistently seek their advice regarding innovation advice. This makes them a crucial factor in every stage of the adoption process as the subjective review of an innovation from an early adopter diffuses across various channels of communication towards other members of the social system, influencing their opinion of the innovation (Light, 1998). Kaminski (2011) provides additional attributes of the early adopter:

- Younger in age in comparison to the early majority, late majority and laggards.
- Advanced education, helping them understand complex innovations
- Higher social status than other adopter categories and significantly interested in increasing social prestige
- More financial lucidity to cope with failures in adopted innovation
- Trend setters, wanting to have a competitive edge over counterparts
- Slower adoption time than innovators but faster than other categories of adopters

**Early Majority:** Much like the early adopters, the early majority have a good interaction with members of their social system, especially their peers, but rarely occupy opinion-leadership positions and account for an additional 34% of adoption in a social system (Rogers, 1962). As explained by Rogers (2003), the early majority tend to be slower in the adoption process than the early adopters and innovators. This slow adoption is because the early adopters are pragmatic in their adoption decision-making, causing them to spend a considerable amount of time deliberating in their adoption decision process and seeking guarantees and assurances about the innovations reliability from role models such as the early adopters (Sahin, 2006). However, they are neither the first nor the last to adopt an innovation as they have a lower propensity to adopt than the early majority and innovators but higher propensity than the late majority and laggards (ibid). Despite their slow adoption rate, the early majority generally become opinion opinion-leaders later on in the adoption process after they have adopted the innovation. Kaminski (2011) provides additional attributes of the early

- Above average social status, not significantly concerned with trend setter or increasing competitive advantage
- Prudent and not as financially buoyant as the early adopters or innovators, making them less adventurous towards technology adoption due to the probability that they may not be able to cope or recover from the failure of an adopted innovation
- Do not like complexity, causing them to be less likely to adopt an innovation which is considered to be difficult to use
- Less trusting of innovations, more adoption-inspiration than the early adopters and innovators but less than the late majority and laggards.

**Late majority:** According to Rogers (2003) classification of adopters, the late majority are similar to the early majority in the sense that they each represent one-third of the total adopters, respectively accounting for 34% of the innovation adopters in a social system. However, unlike the early majority, the late majority are more conservative towards innovation adoption, less likely to occupy positions of opinion-leadership and approach innovations with a significantly higher degree of scepticism than the early majority (Rogers, 1971). This category of adopters are also less likely to adopt innovations in comparison to early majority, early adopters and innovators while also being more likely to adopt in comparison to laggards (Sahin, 2006). Rogers (2003) also noted that despite the late majority having a below average social status, they share interpersonal communication channels with the early majority and laggards. The late majority are also susceptible to peer pressure and are less likely to adopt an innovation if members of their social group have not adopted it or provided them with assurances of its reliability (Rogers, 2003). Some additional characteristics of late majority, identified by Kaminiski (2011) are:

- Little financial liquidity, making them very cost sensitive when considering innovation adoption
- Older in age than the early majority, early adopters and innovativeness  
Adopt innovations based on a need conform with members of their social group
- Cautious and less willing to trust unless given adequate information about the pros and cons of an innovation
- Easily influenced by laggards

**Laggards:** Laggards represent the last category of innovation adoption and the final 16% innovation adopters in the social system. Rogers (2003) states that due to their strong traditional views and experiences, laggards are traditionalists who possess little or no opinion leadership and are more sceptical about innovations than any other adopter category, making them highly resistant to change and change agents. In addition, laggards are the most localized group of the social system and their interpersonal networks mainly consist of other members of the social system from the same category (Rogers, 1971). Because of their high resistance to change and significant scepticism towards innovations, laggards have the longest adoption-decision process of the five categories, resulting in the slowest rate of adoption as well. Consequently,

by the time laggards adopt an innovation, it is either outdated or remodelled. Further characteristics of this category, provided by Kaminiski (2011), are:

- Most advanced in age in comparison to the late majority, early majority, early adopters and innovators.
- Isolated from opinion-leaders and their innovation decision-process is not affected by the opinions of
- Highly suspicious of technology and less willing to trust innovations, resulting in the slowest adoption rate of all the five categories.
- Tendency to feel isolated from rapidly changing society
- Only invest in innovations if all other alternatives are

With these five categories in mind, Rogers (2003) further summarised these categories into two distinctive groups: earlier adopters and later adopters. The earlier adopters group consist of the innovators, early adopters and early majority, while the late majority and the laggards make up the later adopters

Several studies have proven that the DOI is a suitable framework for examining social and technical change (Al-Jabri & Sohail, 2012; Sahin, 2006). This has led to its implementation in various fields of study such as information technology, sociology, anthropology health and educations system (Dingfelder & Mandell, 2011; Sahin, 2006; Bishop et al., 2010; Katz et al., 1963). Regarding information technology, various existing research have shown that the five factors in the DOI framework, specifically relative advantage, ease of use and compatibility, play frequent roles in the adoption of internet and mobile innovations (Koenig-Lewis et al. 2010; Liu & Li 2010; Papiés & Clement 2008; Park & Chen 2007; Vijayasarathy, 2004; Bradford & Florin, 2003; Taylor, & Todd, 1995). Al-Jabri and Sohail (2012) used the DOI to investigate mobile banking adoption behaviour in Saudi Arabia. During this study, the researchers investigated the impact of the five factors stated by Rogers as the determinants of innovation adoption, as well as an addition “perceived risk” factor. Data and results obtained from 330 actual mobile banking users revealed that relative advantage, compatibility, and observability have positive impact on adoption. In addition, trialability and complexity had no significant effect on adoption while perceived risk had a negative impact on mobile banking adoption in Saudi Arabia. This meant that though three out of five of the DOI’s factors influenced user adoption, adoption behaviour in Saudi Arabia was not influenced by the

amount of experimentation adopters could carry out on the mobile banking technology, neither was it influenced by the perceived difficulty required to utilise the innovation. The inclusion of perceived risk, a factor not included in the DOI model, further highlights the importance of trust in mobile banking adoption. In their study, Al-Jabri and Sohail (2012) justify their inclusion of this factor by providing research evidence from Chen (2008), Koenig-Lewis (2010) and Lee et al. 2007 regarding the importance of establishing trust in innovations amongst users. The evidence states that due to the threat of privacy violation and security breaches, innovations like mobile banking may fail to satisfy the requirements of users leading to increased doubt and less trust in the technology and an increased perception of risk amongst adopters (Gewald et al. 2006; Ndubisi & Sinti 2006).

Odunmeru (2013) also implemented the DOI in an investigation into mobile banking adoption trends in Nigeria. This study also considered the impact of the DOI's five factors but also considered the possible influence of two demographic segmentations; age and education background. Similar to Al-Jabri and Sohail's (2012) study in Saudi Arabia, relative advantage, compatibility and observability were revealed that have significant impact on mobile banking adoption in the nation. However, contrary to the results from the Saudi Arabian study, complexity and trailability also influenced mobile banking adoption in Nigeria. Odunmeru (2013) also discovered that age and education played an additional role in adoption of the innovation in Nigeria, with users between the 21-40 age group showing an 85% adoption rate in comparison to an average of 15.5% and 16% between for users aged 41 and above. This reiterates the discussions in Chapter 1 regarding the influence of age on technology adoption as well as Kaminiski's (2011) comments on the adopter categories in the DOI framework, stating that adopters and non-adopters are younger in age and older in age respectively.

One study which adopted Rogers' adoption categories is Less' (2003) study of faculty adoption behaviour towards computer technology for instruction in the North Carolina Community College System. This study also included demographic variables of age, gender, race/ethnicity, teaching experience, and highest degree attained in its investigations results showed a significant relationship between Rogers' adopter categories and their years of teaching experience and highest degree attained. However, no significant relationship emerged between the investigated demographic variables and the adopter categories. These varying results in studies indicates that a variety of variable combinations influence adoption behaviour in different environments and factors which play a significant role in innovation adoption in one environment may not necessarily be significant in another.



Despite Rogers (1995) reporting that 49-87% of the variance in the rate of adoption of innovations is explained by the five attributes in the DOI framework, as well as additional studies by Agarwal and Prasad (1998), Karahanna et al. (1999) and Plouffe et al., (2001) all proving that this theory can predict user adoption behaviour of various forms of technology. Criticisms of this model highlight weaknesses, which require assessment prior to the theory's possible absolute or partial adoption in this study. By considering the contributions this theory makes to adoption research as well as the limitations with the framework, this study can go beyond existing models and introduce an integrative approach to understanding adoption trends without experiencing the drawbacks of previous research.

The first criticism of Rogers (2003) DOI theory is that it suffers from a pro-innovation bias (Botha & Atkins, 2005). The pro-innovation bias implies that innovations be rapidly diffused and adopted by all members of a social system without rejection or modification to the innovation (Fenech & Longford, 2014). In later publications, Rogers (2010) acknowledges this criticism in the DOI theory and states that it is a significant limitation, which diffusion researchers also incur when adopting the theory and its framework in their studies. Kole (2000) elaborates further on this pro-innovation bias by asserting that the DOI theory associates the latest innovations as tools towards progress, thereby leading innovation vendors to ignore all alternatives in an attempt to motivate a rapid adoption of the innovation in question. The bias also leads vendors into ignoring the possibility that the non-adoption of an innovation may be due the innovation not satisfying the intended requirements for its introduction into the system. Wolfe (1994) contributes to this criticism by adding that the pro-innovation bias of the DOI theory fails to consider the characteristics of innovations and the affect they may have on the diffusion of the innovation in question. Further explaining that innovations may possess certain characteristics, which may or may not favour adopters. Despite the numerous benefits innovations may bring to adopters and the society, there are also consequences shadowing the adoption of the innovation as well (Spicer, 1967). Take the case of mobile banking in this study, it has already been revealed that although offering a variety of advantages such as increased convenience to users and reduced operational costs to financial institutions (Ankrah, 2012; Rahmani, 2012), customers are yet to fully adopt the innovation because of a lack of trust in the technology (EFINA, 2012). This lack of trust is a result of concerns about aspects of the technology including confidentiality and data integrity issues (Rousseau, 1998). In an attempt to gain an in-depth understanding of this adoption trend, researchers must produce and adopt frameworks that consider the characteristics of the technology and how they affect user

behaviour (Rogers, 2003). In addition to Rogers (2003) acknowledging this pro-innovation bias limitation, he also suggests that adoption and diffusion studies should not overlook non-adoption of innovations and possible re-invention of the innovation. By this doing this, innovation diffusion studies will be able to understand more about the characteristics of the innovation and its relationship with user adoption or non-adoption trend, as well as provide insight into possible ways to improve the innovation or discontinue it entirely

Another criticism the DOI theory suffers is an individual blame bias. The individual blame bias implies that the individual is at fault for the non-adoption of an innovation. Rogers (2003) notes that diffusion innovation research is occasionally limited by a tendency to support change agencies and promote the diffusion of an innovation in question. This biased standpoint is sometimes due to innovation diffusion research being funded by the change agents implementing the innovation, consequently leading the research to demonstrate a significantly lesser degree of system-blame and higher individual blame (Rogers, 1983). Havens, (1975) also recognises this limitation and adds that variables used in diffusion models to predict innovativeness are conceptualized to indicate the success or failure of the individual within the system rather than as indications of success or failure of the system. Such variables include individual's age, gender, employment status and education level. Waterman (2004), in conjunction with affirmations from Hader & Kreps (2004), further highlights this bias, stating that the framework does not take into account the possibility of technology rejection by individuals who have a good understanding of the technology. The theory's generalisation of laggards as an adopter category, which lacks technical knowledge and understanding, is especially inaccurate as some individuals simply reject an innovation because they realise it is not good idea or prefer a more advantageous alternative (Kole, 2000). Rogers (2003) acknowledges this criticism and highlights that despite some diffusion research including system-blame variables, studies in diffusion of innovation scarcely result in non-adoption being blamed on the change agent or innovation rather than the user. The individual-blame bias and pro-innovation bias both result in a lack of open minded by researchers adopting the diffusion of innovation model which Rogers (2003) suggests must be addressed to facilitate a better understanding of diffusion trends sand user behaviour

The third criticism to befall the DOI theory is the recall problem. Time is one of the four main components of the DOI theory and a fundamental constituent of diffusion research because, by definition, the diffusion of innovation within a system occurs over a period of time (Rogers, 2003). Considering time in its research theory is also one of the main strengths of the DOI

framework (*ibid*). However, Hader and Kreps (2004) reveal that the recall problem associated with the DOI theory, and its related studies, arises from researchers relying on recall data from adopters; requiring them to remember past experiences with the innovation and provide data based on their memory. This reliance on adopter memory sometimes leads to highly subjective and inaccurate data especially when external factors can negatively affect the quality of data gathered such as length of time passed since adoption and the quality of the adopters' memory. In light of this limitation, Rogers (1995) states that diffusion research is dependent on recall data and suggests a few alternatives to counter the recall limitation that studies inherit when using this theory. Rogers (1995), as well as Hader and Kreps (2004), propose gathering data from adopters at several points during the diffusion period rather than at the end of the diffusion process. Both researchers agree that this longitudinal approach will significantly reduce recall bias and provide more in-depth and dynamic insight into the diffusion process than a static point of view of the phenomenon. This suggestion is taken into consideration in this research and further elaboration on its influence on this study into mobile banking adoption in Nigeria will be presented in later chapters of this publication after the data has been gathered and analysed.

The fourth criticism of the DOI theory is the issue of inequality. The issue of inequality refers to the resulting gap in socioeconomic levels between the higher-class members of a system and the lower-class segments in the system (Rogers, 2003). The issue of equality, or lack thereof, is also linked to the diffusion of innovation as Hader and Kreps (2004) affirm that the distribution of the benefits of innovations is unequal across various socioeconomic groups with the greatest disparity existing between the elite and the lesser class members. Spicer (1967) explains that members of the higher-class in a social system are willing to support innovations elevate their social standing and do this through various means such as availability of resources to both fund and acquire innovations before other lower-class members of society and influence on innovation vendors and decision-making process through elite communication channels. Rogers (2003) notes that though this inequality can occur in any social system, it is more evident in developing countries such as Latin American and Africa. Hader & Kreps (2004) also state that the equality issues of DOI studies is dissimilar to the other three criticisms because the researcher can neither control nor resolve it singlehandedly. However, both Hader & Kreps (2004) and Rogers (2003) suggests that acknowledging this issue during DOI research as well as innovation implementation and diffusion, illustrates an awareness of the issue, resulting in increased efforts to reduce the socioeconomic gap caused by diffusion of

innovation. These suggestions are also taken into consideration in this study and will contribute to the in-depth recommendations the researcher will present at the end of the study.

#### **2.5.4.4 SUMMARY AND CONTRIBUTIONS TO STUDY**

Despite the researchers such as Lyytinen, & Damsgaard, (2001), Prescott & Conger (1995) and Wolfe, (1994) all suggesting a revision to Rogers (2003) framework, the DOI theory affords important contributions to studies regarding innovation adoption. These contributions will be considered for adoption in this investigation into trust and mobile banking in Nigeria in conjunction with considerations to the limitations of the DOI theory that this study aims to address.

Concerning the DOI's contributions, the DOI theory offers several significant contributions to this study. The aspect of user perception is an important component of the DOI theory and is consequently a significant element to include in this study's intended integrative model. Rogers (2003) notes that user perception of the attributes of an innovation can influence their decision process and adoption intentions. This is taken into consideration while conceptualising the integrative research model that will be used in this study. Similar to the perceived ease of use and perceived usefulness variables in the technology acceptance model, the DOI also includes relative advantage and complexity in its model, further highlighting the importance of user perception in the adoption decision process. Despite trailability, and observability not also being present in the TAM model, previous research discussed in previous sections have revealed relationships between user technology trust and their perception of the ease of use and usefulness of technology. These existing literatures provide the premise for including perceived usefulness and perceived ease of use as variables, which are validated for a relationship with technology trust as well as a relationship with intention to use mobile banking in Nigeria.

The next contribution the DOI makes to this study is introducing the element of time. As stated by Rogers (2003), the aspect of time should always be included in diffusion research and consideration must be given to rates of adoption at various points in the diffusion process. This study aims to consider the aspect of time by serving as a focal point for observing the technology trust trend and adoption behaviour of the customers in Nigeria towards mobile banking. Rogers (2003) provides further emphasis on this point by affirming that the adoption process changes over time and in order to understand the process and user behaviour, researchers should view the diffusion process at various moments in time, not just at the end of the diffusion process. With the results achieved from this investigation, innovation vendors as well as researchers will have proven research methods, an integrative research model as well as empirical evidence with which to conduct further investigations at different points in

the diffusion process of the technology in Nigeria. This approach will also reduce the degree of recall problem in future studies into mobile banking in Nigeria as the researcher, in conjunction with Rogers (1995), suggests that research be periodically conducted and compared to the results from this study, providing more in-depth and accurate knowledge of adoption trends in Nigeria.

Rogers' (2003) DOI also contributes to this study by bringing into consideration the role communication channels play in the diffusion process. Efficient use of communication channels to spread information about the innovation can positively influence the rate of adoption of the innovation across various adopter categories (Botha & Atkins, 2005). This research implements this concept in its discussion of the practical implications of the results achieved to stakeholders; further details on the role communication channels can play in relation to technology trust, reducing inequality, and understanding mobile banking adoption will be presented in the final chapter of this publication

The DOI's categorization of adopters also stands as a contribution to this study. From Rogers (2003) classifications, we can assess what category of users are currently engaged in both the adoption and non-adoption of an innovation. Consider the mobile banking adoption statistics revealed in Nigeria. Mobile banking had only achieved a 5% usage in the country in 2012 (EFINA, 2013) and 13% usage in 2013 (NOI, 2013). Rogers' (2003) adopter categories state that during early adoption of an innovation, the first 2.5% of adopters in the social system are innovators and the following 13.5% are the early adopters; suggesting that a total of 16% of early users consists of innovators and early adopters. This leads to the inference that Nigeria's current 13% mobile banking adoption rate can be attributed to 2.5% from innovators and 10.5% from early adopters, leaving a total of 87% of individuals still failing to adopt the innovation. Additional support for this inference comes from the correlation between Rogers (2003) classification of earlier and later innovation adopters and CBN's (2013) classification of current mobile banking adopters and non-adopters in Nigeria. Research by CBN (2013) revealed three categories of adopters namely those who clearly oppose the cashless policy; those who are not sure and view the policy with an amount of scepticism; those who believe in the benefits of the policy and are ready utilise the technologies supporting the policy. These 3 categories are explained by the DOI's adopter classification as the earlier adopters are those who are willing to utilise the technology; made up of early adopters or early majority categories or earlier adopters. While the later adopters are those who oppose the innovation and view it with a degree of scepticism; made up of laggards or late majority. With Rogers' (2003)

providing a theoretical background to understanding adopter characteristics, this study will also investigate the influence of various demographics in mobile banking adoption in Nigeria through the inclusion of demographic variables in its research model. By including these variables this study can validate the assertions made by Rogers' (2003) as well as investigate the influence of these characteristics on adoption behaviour and user propensity to trust mobile banking technology.

This study further reflects on the limitations of the DOI theory by taking steps to address the possibility of individual blame bias, and pro-innovation bias. To address the pro-innovation bias, Rogers (2003) and Hader and Kreps (2004) suggest that researchers avoid ad-hoc investigations of diffusion process and opt to study the diffusion process while it is ongoing rather than at the end of the process. Both researchers also advise researchers to conduct diffusion studies with objective mind-sets in order to avoid both pro-innovation bias and individual-blame bias. Hader and Kreps (2004) specifically note that taking into consideration both user perception variables as well as variables conceptualised from attributes of the innovation will lead to a significantly unbiased study as researchers can investigate the positive or negative influences both elements have on adoption behaviour while avoiding to subjectively blame one or the other for non-adoption of innovation. In the integrative model which will be introduced, in later sections, this study has taken pre-emptive steps to avoid these biases by conceptualising the variable of technology trust based on the seven factors described in previous sections as well as the inclusion of user perception variables. In the section hereafter, the model for this study into the impact of technology trust's role in mobile banking adoption in Nigeria is conceptualised based on the contributions from models such as the TAM and DOI as well as considerations to limitations in models such as the TPB and TRA and existing technology adoption literature.

## **2.6 CONCEPTUALIZATION OF AN INTEGRATIVE MODEL**

Prior to designing and introduction of research model for this study, it is necessary to discuss previous research where investigations into technology trust have been conducted with modified research models.

In research conducted by Jaradat and Twaissi (2010), a modified technology acceptance model was used to examine mobile banking adoption tendencies in Jordan. Trust, as well perceived

usefulness, perceived ease of use and behavioural intention were the factors considered in the hypothesised model for the study and a survey of 44 items was distributed to a sample size of 275 respondents. This study revealed a positive relationship between consumers trust in the technology and their attitude towards its use. Therefore, increased trust in mobile banking resulted in an increased willingness to use the technology in Jordan. There were also positive relationships uncovered between perceived usefulness and attitude towards use as well as positive relationships between perceived ease of use and attitude towards use. Ultimately, the study revealed that with consumer's attitude towards mobile banking exhibiting positive relationships with trust, perceived usefulness, perceived ease of use and behavioural intention, consumer's actual use of mobile banking technology was significantly influenced by these factors. One strong point of this research was the inclusion of both users and non-users of mobile banking as respondents and this provided a more holistic overview of the perspectives from both current and prospective users of the technology. However, in relation to trust, the researcher's lack of a detailed expansion on the concept of trust leads to the issue of data ambiguity as there is an absence of an explicit categorisation of what type of trust was measured. Also, the sample group and size leads to an inability to generalise the results of the study to the entire populace of Jordan as only 275 respondents were considered from a sample group consisting of only university students and company employees. Evidently, participants from other demographical representations such as those without university education and unemployed individuals were not considered.

Anus et al's (2011) research also shows evidence of demographical restrictions as the results of the investigation of trust's impact on the initial acceptance of mobile banking in Pakistan were analysed from a sample group consisting of only 306 students. The research focused on trust, perceived risk and performance expectancy and revealed perceived risk as having the most significant impact on the acceptance of mobile banking. Certain attributes of the sample group also make the results of this study impractical for generalisation as all the respondents, aged 18-34, had all used mobile banking for more than 12 months and were all technologically competent. Therefore, the results can only be applicable to users who share similar attributes with the sample group and not a larger demographic of both users and non-users of mobile banking who exhibit attributes such different careers, education level or a lack of familiarity with technology.

Kazemi et al's (2013) study into the factors affecting mobile banking adoption also adopted a model, which considered impact of trust, compatibility, perceived risk on consumer's intention



to adopt the technology. A survey of 310 respondents revealed a positive relationship between consumer's intention to use mobile banking and their perceived usefulness, perceived ease of use and compatibility. However, unlike previous research such as the works of Anus et al (2011) and Jaradat and Twaissi (2010), this study revealed trust as having an insignificant effect on consumer's intention to adopt the technology. Once again, trust was indistinctly investigated in this study with no specific identification of what category of trust was being measured. The researchers also highlight that the study did not take into consideration the relationship between the factors considered and consumer's actual use of the technology, therefore resulting in an inability to determine if the existing relationships between the factors considered ultimately resulted in consumers actually using mobile banking. Demographic characteristics such as age, gender, level of education or technology competency were also not considered and their direct or indirect influence on consumer's behaviour towards mobile banking could not be revealed. Despite this research's results discovering relationships between several factors and trust's insignificant role in mobile banking adoption, the lack of consideration of demographic information and its influence as well as the indistinct measurement of trust, leads to a gap in knowledge and areas of consideration for future work.

One research study that incorporated similar methods to those, which will be used in this research, is the work of Tao Zhou (2012) and the examination of mobile banking user adoption in China. Similar to this intended research, this study used confirmatory factor analysis, which will be discussed in detail in the chapter hereafter, as well as the technology acceptance model in its investigation. Unlike the works previously discussed, this research attempted to measure trust with distinctive components and the inclusion of structural assurances, ubiquity and flow as contributing components of trust, helped in providing a more detailed overview of trust as a factor being measured. Structural assurance comprised of consumer's willingness to trust mobile banking based on existing technological and legal frameworks regulating the service. Flow was considered as the holistic sensation that people feel when they act with total involvement, and ubiquity measured the consumer's adoption tendencies of mobile banking based on its availability. The survey results from a sample size of 300 revealed structural assurance was the main factor affecting consumer's trust of mobile banking and trust also had a mediating effect on the relationship between structural assurances and flow. The study also revealed perceived usefulness and ubiquity's had a significant relationship with flow. This means that the presence of sustainable technological and legal frameworks to govern mobile banking in China was seen to have a positive effect on user's trust in the technology and these

regulatory frameworks also affected consumers' willingness to engage in mobile banking based on trust. The results showed that trust had a significant relationship with flow and usage intention, which ultimately impacted on actual usage among users in China. Undoubtedly, the results provided a more in-depth view of trust as a contributing factor to mobile banking adoption but there exist several other factors that could have been considered as contributing to consumer trust including confidentiality, integrity and authentication, all of which have been discussed in previous chapters.

Similar to Tao Zhou (2012), Maroofi et al (2013) included structural assurances as a contributing factor to trust in mobile banking. Using the technology acceptance model, with trust as an external variable, 210 surveys were distributed to both users and non-users of mobile banking. The results showed that structural assurances was a significant contributor to trust in mobile banking and trust, as well as perceived usefulness and perceived ease of use which all contributed to the user's intention to use mobile banking. These results, despite lacking the consideration of other contributing factors to trust such as confidentiality and access control, provided evidence of trust's role in the adoption of the technology rather than the user's actual use of the technology.

Technology trust's role in mobile banking was investigated in Zhenhua and Shaobo's (2009) research and in their study, the researchers distinctively measured trust in mobile banking adoption by considering trust in technology, structural assurance and trust in mobile banking vendors as factors contributing to the overall trust in mobile banking adoption. 438 respondents in mainland China provided the results of this research through surveys and it was observed that trust was significantly affected by structural assurances, trust in vendors and trust in technologies. Zhenhua and Shaobo's (2009) findings bears a similarity with the results from Tao Zhou (2012) and Maroofi et al (2013), where structural assurances showed a significant effect on the user's trust in mobile banking. However, Zhenhua and Shaobo's (2009) results also showed that trust did not have a direct impact on consumer's intention to use the technology which differs from the results of Maroofi et al (2013). Regarding trust's relationship with other constructs, the researcher's findings revealed that trust had an indirect effect on intention to use the technology through its influence on perceived usefulness. Perceived usefulness was also shown to have a significant effect on intention to use. In summary, the user's perception of the technology's usefulness was affected by the presence of their trust in the technology and positively influenced their decision to use the technology as well. This

study does exhibit a limitation which provides an opportunity for future research. The respondents had all been users of online banking and their perceptions of the mobile banking will likely differ from those who have not had any prior experience with the technology. This limitation provides an avenue for consideration in future work and was taken into account as users without prior mobile banking experience will be included in the sample group

Another study, which explicitly defines the category of trust being investigated, is the work of Masrek et al (2012) which investigates the role of technology trust on mobile banking adoption. This study focused on trust in mobile networks, trust in mobile banking websites and trust in mobile phones as contributing factors to trust in mobile banking adoption in Malaysia. Mobile phone trust exhibited a significant influence on the overall trust and utilisation of mobile banking as the consumer's increased trust in the mobile phone hardware made them more likely to use the service. Mobile network trust also exhibits significant influence as the availability and reliability of the mobile network increased user trust in mobile banking and made them more likely to utilise the technology. Finally, trust in the mobile banking website also affects the user's overall trust and usage of the service, because improved service and information quality increased user's propensity to trust mobile banking and led them to adopt the service. However, despite revealing significant impact of all three factors on mobile banking utilisation, demographic limitations hamper the results from being considered as a comprehensive representation of the general population. Unlike the work of Maroofi et al (2013), only mobile banking users were surveyed and their perceptions of the technology will differ from that of those who have no experience with mobile banking. This also provides an avenue for future work as surveying both mobile banking users and non-users will provide a comprehensive view of overall trust and usage of the technology.

These studies display areas where, in addition to previously discussed frameworks, this study's model and overall study intends to contribute to both existing knowledge and gaps in knowledge. This study's mobile intends to consider the perceptions of both users and non-users of mobile banking as the researcher considers both categories of users as current and prospective users who can adopt or reject the technology. In addition, this study and its research model will consider the role of a large cross-section of demographics segmentations such as gender, ethnicity, mobile phone ownership, bank account ownership as well as from varying education levels, age groups and employment levels. This is increase the generalizability of the results as well as avoid the limitations of studies such as the works of Anus et al (2011) and Jaradat and Twaissi (2010). Hereafter, the requirements for this study's investigation of

technology trust and mobile banking will be outlined. These requirements are drawn from the research goals of this investigation, theoretical contributions from reviewed literature and the limitations of existing research, which this study aims to address. These requirements will also guide the creation of a conceptual model for this study.

## **2.7 THE THEORETICAL MODEL**

Based on the aims and objective of this study as well as the contributions and limitations from discussed literature and existing models, the designed model for use in this study, will have five key attributes based:

**Inclusion of user perception variables:** This is in-line with contributions from the DOI theory and TAM which suggest conceptualisation of research models to include user perception variables in order to both investigate how user's opinion on mobile banking technology and avoid pro-innovation bias. In addition, various studies have included user perception variables in their investigations in a bid to improve the predictability and validity of adoption trends as well as understanding the role factors such as technology trust play in user adoption behaviour. Researchers such as Agarwal and Prasad (2000) and Karahanna et al., (1999) stand as evidence that studies can successfully adopt perceived usefulness and perceived ease of use as variables from the DOI and TAM into modified models, which aid in the investigation of technology adoption.

**Inclusion of technology trust and its antecedents:** In view of the aims and objectives of this study, the role of technology trust in mobile banking adoption will be investigated by including it as a variable in the research model as well as investigating the degree of influence its seven antecedents have on the variable. Researchers such as Hartwick and Barki, (1994), Mathieson et al., (2001), Taylor & Todd, (1995) have been able to introduce external variables and constructs such as system characteristics, personality traits, trust and demographic segmentations into research models and successfully investigated the relationship between these factors as well as their influence on user adoption. Specifically, Anus et al's (2011) investigation into m-banking adoption in Pakistan and Jaradat and Twaissi's (2010) assessment of the introduction of mobile banking in Jordan, all considered the role of trust in technology adoption. Despite doing so successfully, these studies and their research models showed certain limitations such as Jaradat and Twaissi's (2010) failure to consider the antecedents of trust and Anus et al's (2011) failure to consider the impact of demographic variables. The research model

employed in this study aims to go beyond these limitations by considering specific attributes of technology trust in relation to demographic factors and mobile banking adoption.

**Inclusion of demographics variables:** Previously discussed research has highlighted the theoretical relationship between demographic variables and technology trust as well as technology adoption. In addition, Rogers (2003) classification of adopters provides further descriptions on the possible characteristics of innovation adopters. Including demographic variables such as age and gender and investigating their relationship with technology trust in Nigeria, as well as mobile banking adoption in the country, will help validate the existence of relationships between these variables as well as categorise the types of adopters and non-adopters in Nigeria. This inclusion will also address limitations of other studies, discussed earlier sections, such as Anus et al's (2011) and research models which fail to consider the influence of demographic variables in user adoption behaviour.

**Inclusion and differentiation between adoption intention and actual adoption:** Similar to the TPB and TRA models, this study's research model will incorporate variables for adoption intention and actual adoption. However, unlike these the TRA and TPB, the intended model will investigate both variables uniquely without the theoretical assumption that adoption intention ultimately leads to actual adoption. Several researchers and studies have shown varying results while examining the relationship between these two variables, leading academic researchers to conclude that adoption intention is not a perfect determinant of actual adoption (Sheppard et al. 1988). In addition, Morwitz et al (2007) found that the correlation between intention and actual behaviour was significantly lower for new products than for existing ones, further proving that the TRA and TPB's theoretical assumption is not entirely accurate. This research includes both intention to adopt and actual adoption as variables in the proposed research model with the aim of objectively examining data for both variables and revealing the existence or non-existence of a relationship with regards to customers and mobile banking in Nigeria.

Prior to discussing the applied methodology in this study, it is necessary to introduce the research model. The model is designed based on existing literature discussed in previous chapters with the aim of understanding user trust in mobile banking technology and adoption trends. Taking into account the contributions and limitations of previous studies and their research models, as well as the requirements for model designed presented above, Figure 2:9 is the proposed conceptual model for this study.

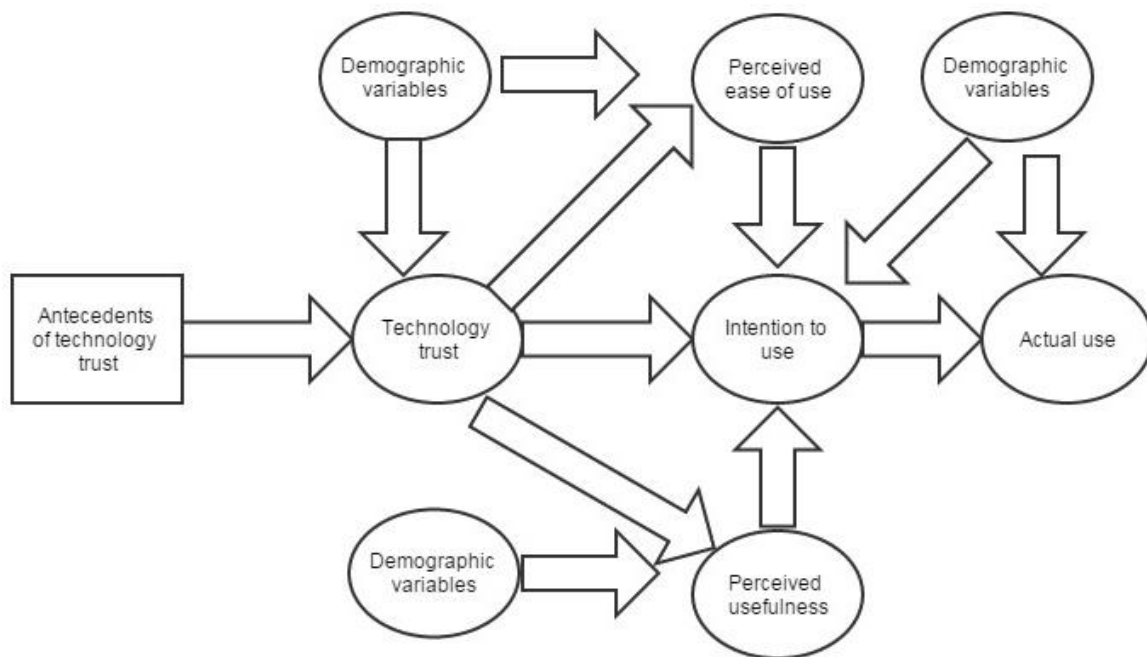


Figure 2:9: Conceptual research model

The conceptual research model presented in figure 2:9 is also designed to meet the stipulated requirements as well as consider the following:

- Number of significant factors which influence mobile banking technology trust and the degree of each factors impact
- The significant influence of mobile banking technology trust on user perception variables, perceived usefulness and perceived ease of use and the degree of influence
- The significant influence of mobile banking technology trust, perceived ease of use and perceived usefulness on user intention to use mobile banking
- The significant influence of user’s intention to use mobile banking on actual use of the technology
- The influence of demographic variables on the relationships involving the five latent constructs in the model

Based on these suggested causal relationships, a set of hypothesis have been generated which will be tested in the final structural equation model. These hypotheses are:

- H1: Technology trust in mobile banking has an effect on customers' intention to use mobile banking
- H1a: Technology trust has a significant effect on customer's perceived ease of use of mobile banking
- H1b: Technology trust in mobile banking has a significant effect on customers' perceived usefulness of mobile banking
- H2: Customers perceived usefulness of mobile banking has a significant effect on their intention to use mobile banking
- H3: Customers perceived ease of use of mobile banking also has a significant effect on their intention to use mobile banking
- H4: Customers intention to use mobile banking has a significant effect on their actual use of mobile banking.
- H5: Demographic variables play a significant role in the relationships between technology trust and other contributing factors to mobile banking adoption
- H6: Seven antecedents, namely confidentiality, integrity, authentication, availability, non-repudiation, best business practices and access control, significantly contribute to technology trust in mobile banking in Nigeria

## **2.8 CONCLUSION**

The aim of this chapter was to discuss relevant literature on trust; the types of trust, importance of trust in technology adoption as well as identify the various theoretical assumptions about user demographics and their characteristic adoption behaviour. In addition, the literature review in this chapter aimed at providing academic premise for the design of a theoretical model that would be used to investigate the role of technology trust in mobile banking adoption in Nigeria.

Considering this study's foundations in information systems management, the definition of trust adopted in this research was provided by Koo and Wati's (2010) who defined it as "an individual's willingness to experience vulnerability to financial institutions and their technology based on their perception of the institution and information technology infrastructure". This definition provided justification to investigate user's perception of technology aspect of mobile banking such as confidentiality and integrity and linked these perceptions with their trust in the technology and their perception of the institutions business

practices. This chapter also discussed the various types of trust and despite this study's focus on technology trust, highlighting definitions for organisational and person trust as well as providing further discussion on the concept of technology trust.

The importance of technology trust in technology adoption was discussed in this chapter as well with several statements from scholars such as Yousafzai et al. (2009), Lee & Ahn, (2013), Rousseau (1998) and Jarvenpaa et al, (2000) concluding the presence of trust in technology as a major factor in determining whether users adopt or reject that technology. Considering that reports from Nigeria by EFINA (2013) showed that the most predominant barrier to mobile banking adoption in the country was a lack of trust in the technology, the statements made by these scholars were warranted and this study intends to investigate the role technology trust plays using a comprehensive research model and providing empirically significant results.

Several scholars have identified socio-demographic factors as variables, which dictate users trust and adoption of technology. In this chapter, the varying technology trust and technology adoption tendencies of users based on gender, age and education level were discussed with academic literature suggesting that variations existed between the male and female demographic, older and younger age groups and the higher educated and lower educated demographics. This study includes these variables as factors in the theoretical model that are investigated to reveal any significant influence on technology trust and its relationship with other constructs in the model.

This chapter also introduced the conceptual model of research which was shaped based on contributions from relevant theoretical assumptions as well as existing technology acceptance frameworks. The TRA and TPB were reviewed in addition to the TAM and the DOI theory and this study's conceptual model made relevant adaptations from these models based on their strengths and limitations. Ultimately, the research intends the theoretical model used in this study to be an integrative framework that can be applied in similar technology acceptance studies. The design of this study's model led to a set of hypothesis, which were tested using data obtained from the sample group in Nigeria, analysed using statistical techniques and validated based on the results of the data. These hypotheses focused on the role of technology trust, technology trust's antecedents, perceived usefulness, perceived ease of use and intention to use, in relation to actual adoption of mobile banking in Nigeria. In the next chapter, the methodology used in this study, in relation to research approach, research philosophy and data



acquisition is presented with further discussions presented on the statistical techniques applied in this study.

### **3 METHODOLOGY**

In this chapter, the research philosophy, approach and schedule of work is outlined. In addition, elaborations on the tools and frameworks used during the course of the research is provided.

#### **3.1 RESEARCH PHILOSOPHY**

In selecting a suitable research philosophy to guide the researcher's approach towards understanding the impact of technology trust on mobile banking acceptance in Nigeria, the researcher adopts the positivist's paradigm as the chose philosophy for this study. Considering the nature of this research's aims and objectives as well as the research problem in question, the research design and the analysis process which will be used, it is suitable to adopt the positivist's philosophies as specific features of this study conform to criteria highlighted by Hussey and Hussey (1997) for the positivist philosophy paradigm. These criteria are:

- **Tends to produce quantitative data:** as seen in the quantitative data gathering and analysis method which will be discussed in section 3.8.
- **Uses large samples:** The researcher intends to gather data from a relatively large sample size and this conforms with the positivist's paradigm
- **Concerned with hypothesis testing:** this research aims to address the legitimacy of a set of hypothesis which have been constructed from identified factors and correlating variables which will be outlined hereafter in line with the aims and objectives of this research
- **Data is highly specific and precise:** The data gathered will be quantitative and analysis tools and methods, such as confirmatory factor analysis, will provide results specific and precise results.
- **Generalising from sample to population:** the research intends to generalise the results retrieved from the sample as analogous with data, which gathered from the entire population of Nigeria. This empirical evidence will be a result of the confirmatory factor analysis of quantitative data collected in Nigeria. Based on the findings of this study, the results will be generalised to the population of the country. These processes are in-line with the positivist's research philosophy and with an appropriate philosophy adopted for this study.

## 3.2 RESEARCH APPROACH

In chapter 2, it was established that studies, such as the works of Kazemi et al (2013), Anus et al (2011), Jaradat and Twaissi (2010) and Maroofi et al (2013), have previously been carried out regarding mobile banking adoption and the role of trust in user adoption of this technology. These studies have successfully investigated and identified the existence, or non-existence, of relationships between trust and mobile banking adoption using quantitative research methods and in consideration of this, as well as the chosen research philosophy, quantitative methods will be employed in this study as well.

### 3.2.1 QUANTITATIVE APPROACH

The importance of the empirical approach and the collection of empirical data is evident in the various existing literature reviewed in chapter 2 and also highlighted by Hussey and Hussey (1997:10) who state that the validity of a purposeful research requires the evidence of empirical data. Reviewed literature has now led to the adoption of the quantitative empirical approach as an appropriate methodology for this study. Choosing to apply quantitative methods was a decision based on existing literature, the nature of the research's limitations as well as the type of data which is required. Below is a list of the approach's criteria provided by Anderson (2006) and their application in this study:

- **The researcher tests hypothesis and theory with data:** As stated in chapter 2, a set of eight hypotheses were generated based on theoretical premises and these hypotheses will be tested based on obtained empirical data.
- **Explanation of theoretical assumptions by confirmation of hypothesis:** The theorised causal relationships between technology trust and other constructs presented in the hypothesis and conceptual model will be explained from the validated hypothesis.
- **Use of variables:** As presented in section 2.7.1, this study has assigned variables to related constructs in the model which will be used in data analysis

- **Identify statistical relationships among variables:** The influence of technology trust as well as other factors of technology acceptance will be measured and represented with statistical relationships
- **Collect quantitative data based on precise measurement using structured and validated data-collection instruments:** The use of validated surveys as the data collection instrument as well as statistical methods and software will ensure precise and specific measurement of data
- **Formal statistical report:** The final report will consist of statistical correlations, regressions and with statistical evidence to show the significance of findings
- **Generalizable findings providing representation of objective outsider viewpoint of populations:** The results from this study will be generalized to provide an objective presentation of user behaviour towards mobile banking adoption in Nigeria.

Use of quantitative methods is based on existing literature as well as its relevance to research aims and objectives. To successfully implement these quantitative methods, a sampling instrument will be designed with the aim of collecting quantitative data from a sample group in Nigeria. The process of this instrument design is detailed hereafter.

### 3.3 RESEARCH DESIGN

In this section, the design of the sampling instrument is discussed. For this research, surveys will be used as the empirical data collection instrument as it has been consistently implemented in studies discussed in the literature review such as the works of Anus et al (2011), Kazemi et al's (2013) and Tao Zhou (2013). The strategies used in developing the survey as well as ensuring validity and reliability of the items in the survey are outlined hereafter

### **3.4 INSTRUMENT DEVELOPMENT**

To develop the survey, the researcher drafted a group of questions from previous research in related technology adoption studies. The 11 variables, description and corresponding drafted questions as well as their references are included in Table 7:1 and 7:2 in appendix A. In addition to the 11 variables to be measured, 10 demographic information will also be included as variables, which will be tested for influence on technology trust and mobile banking acceptance in Nigeria. These demographic variables are gender, age, marital status, employment status, educational level, ethnic group, technology competence, bank account holder, mobile phone owner and mobile banking user. The importance of including and measuring the influence of demographic information can also be seen in Masrek et al's (2010) investigation of technology trust's impact on mobile banking utilisation and the limitations of not considering their impact is evident in works of Jaradat and Twaissi (2010), both of which have been reviewed in Chapter 2. After drafting this set of prospective questions from existing literature, a Q-sorting exercise was carried out. This aimed at reducing the number questions which will be in the survey through the identification of questions which are relevant to the research, ultimately resulting in the removal of questions which were not appropriate either due to reasons of clarity or relevance. Table 7:3 in appendix A shows the drafted questions which have been re-phrased to suit the purpose of this research before they are Q-sorted. The next section will explain the Q-sorting process in more detail

#### **3.4.1 Q-SORT EXERCISE**

According to Brown (1993), a Q-sort exercise provides a systematic assessment of viewpoints and opinions on a subject matter. In a typical Q-sort exercise, participants called the P-set are given a set of statements on a particular subject called the Q-set. They are then required to rank these statements based on their opinion or experience. In a more in-depth examination, the rankings from the P-set are then subjected to a factor analysis to identify correlations between viewpoints and rankings. However, the implementation of the Q-sort exercise in this research design process manifests in a less complex form as the prospective questions for the final survey, the Q-set, will be given to a group of academic staff, the P-set, for validation. The P-set were selected based on their research area and familiarity with several concepts of this research. The validation process will involve each participant reading slips of paper containing one of the prospective questions and placing the question in one of the eleven variable-labelled categories based on their opinion of the question and the variable they think it is designed to

measure. At the end of the exercise, the results from the P-set are recorded and the questions which show an above average percentage of placement in the right category are included as content for the final survey while those questions which show a high rate of placement in the wrong category are excluded from the final survey. A total of 5 academics were involved in the Q-sorting exercise as the P-set. Questions which were placed in the wrong category are denoted by a “0” while questions placed in the right category are denoted by a “1”. The sum of the results for each individual question’s placements is calculated and questions with a 50% or higher rate of placement in the right category are included in the final survey. Questions with a less than 50% rate of placement in the right category are ultimately removed from the final survey. Table 7:3 in appendix A shows the 81 possible questions which were Q-sorted and Table 7:4 in the appendix A shows the results of the Q-sort including the question’s respective identification numbers, the placement results from each participant in the P-set, the sum of placements for each question and their corresponding placement percentages .

Considering the Q-sort results in Table 7:4, a total of a total of 47 questions, out of a possible 81, had achieved a right-placement rate higher than 50% with 34 questions failing to reach the target percentage. These 34 questions were consequently excluded from the final survey. Also, the results showed that variables, such as best business practices (BBP), integrity (INT) and perceived ease of use (PEOU), contained a larger number of rightly placed questions in comparison to the other variables being Q-sorted. In order to facilitate an efficient statistical analysis of each variable and avoid redundancy amongst the questions relating to these variables, 17 additional questions were excluded from the final survey.

In total, the final survey instrument contain 40 questions which comprised of 10 demographic information items as well as 30 items which measured the 12 in the research model. Table 3:1 below shows the mappings of variables and their respective questions including literature references for each question. Also, a copy of the final survey can be found in appendix B. In section 3.7,

Table 3:1: Variable mapping with number of survey items and literature reference

<b>Construct</b>	<b>Number of items in survey</b>	<b>Reference</b>
Demographic: Age, Sex, Marital status, Employment status, Education level, Technology competence, Ethnicity, Mobile phone, Bank account, Mobile banking user,	1 item each. 10 in total	Tashmia et al (2011) Bankole et al, (2011) Suh And Han (2003)
Confidentiality	3	Tashmia et al (2011) Bankole et al, (2011) Suh And Han (2003)
Integrity	3	Tashmia et al (2011) Bankole et al, (2011) Suh & Han (2003)
Authentication	2	Taherdoost et al (2011) Suh And Han (2003)
Access control	3	Tashmia et al (2011) Suh And Han (2003)
Availability	2	Tashmia et al (2011) Koo & Wati (2010) Constance et al (2006)
Best business practices	4	Tashmia et al (2011) Bankole et al, (2011)

Non-repudiation	3	Connolly & Bannister (2007) McKnight et al (2003) Suh And Han (2003)
Perceived Usefulness	2	Tashmia et al (2011) Cheng et al. (2006) Curran and Meuter (2005) Aboelmaged and Gebba (2013)
Perceived ease of use	3	Tashmia et al (2011) Cheng et al. (2006) Curran and Meuter (2005) Aboelmaged and Gebba (2013)
Intended use	2	Ho and Ko (2008) Hsu and Chiu (2004) Aboelmaged and Gebba (2013)
Actual use	3	Tashmia et al (2011)

The next phase in the research design is identifying the sample group for data collective. To do this, an appropriate sampling method must be identified and implemented. The selection of this sampling method will be based on its specific attributes and relevance to quantitative research methods as well as an adherence to the purpose and scope of this research.

### 3.5 DATA SAMPLING AND COLLECTION METHODS

In this study, non-probability convenience sampling is used in recruiting sample subjects to participate in the data collection process. Convenience sampling enables the research to collect data from participants based on their accessibility and willingness to participate (Frey at al., 2000; Fink 1995). In addition to allowing the researcher to efficiently managed time and

financial resources (Tarhini, et al., 2013). Similar to this current study, previous investigations in areas of technology adoption have also adopted this sampling method in data collection, Tarhini et al., (2013) successfully employed this sampling technique in their study of into the factors affecting students' acceptance of e-Learning environments in Lebanon. Nasri (2011) also used convenience-sampling method to investigate the factors influencing the adoption of internet banking in Tunisia. These studies successful use of convenience sampling method in related investigations provide a premise for its implementation in this current mobile banking investigation. Furthermore, this study aims to investigate the role technology trust plays in mobile banking adoption in Nigeria with the scope covering the both users and non-users of the technology. Therefore, every member of the general population has an equal chance of participating in the study. This leads the researcher to consider the Nigerian population as homogenous; based on the assumption that no difference exists in the research results obtained from a random sample, a nearby sample, a co-operative sample, or a sample gathered in some inaccessible part of the population (Ross, 2005). Based on these factors, the researcher considers non-probability convenience sampling a satisfactory technique for this study.

As specified in section 3.4, surveys will be used as the data collection instrument with the items in the survey measuring the 11 variables in the technology acceptance model as well as the inclusion of 10 demographic variables which will also be considered. The justification for the use of surveys has been discussed in Chapter 2 and academic reliability highlighted in figure 7:2 in the appendix which shows the literature references for the items used in the survey.

Considering that mobile banking technology is expected to be adopted by the entire population of Nigeria, there are no restrictions on specific demographics, which can participate in the study, as both current mobile banking users as well as non-users are considered as viable members of the sample group. Two distribution channels were used during the process of collecting the data in Nigeria: paper-based and online surveys, with both having identical content. The paper-based survey was designed for face-to-face contact where the researcher gathered the data in person while the online-survey was designed to facilitate data collection from participants who could not be physically present to complete the survey face-to-face. These paper-based surveys were administered in several locations such as schools, company offices and malls in order to obtain an adequate survey representation for each of the demographic groups being studied in this research. This is based on suggestions from Babbie



(1995) stating that researchers who employ convenience sampling must ensure that the sample group is an adequate representation of the general population. Participants who provided data were approached with the survey and asked to provide answers to the set of items in the survey after an explanation of the research topic and survey questions was provided to them. The explanation aided in clarifying the research intentions and requirements as well as ensuring the participants understood the research and the type of data required and participated in the study voluntarily. Regarding the online surveys, identical questions were used to prepare an internet-based version of the paper-based survey and participants who could not be physically present to complete the paper-based surveys were asked to do so via personal computers and mobile devices. Participants were provided with an internet address, which gave them access to the survey, and the data provided by participants was collated and analysed by the researcher for analysis in addition to the data collected using the paper-based surveys. During this process, the research successfully obtained technology trust and mobile banking adoption data from both current users and non-users of mobile banking who represented the ten demographic groups being investigated.

### **3.6 ETHICAL CONSIDERATIONS**

To ensure this research meets professional and institutional standards, ethical issues were identified prior to the commencement, and during the process, of the data collection. Some of the ethical issues are identified and addressed in the University of Huddersfield's ethical approval form. Specific measures were taken to address both the ethical issues highlighted in this form as well as those which were experienced during the process of the study. These are discussed below

**CONFIDENTIALITY AND PRIVACY:** In order to ensure confidentiality and privacy protection, the researcher guaranteed no personal information which was not relevant to the purpose of this research was collected from participants. All the information which was collected through the surveys served the purpose of fulfilling the aims and objectives of this research and this was further verified by academic professionals who validated the survey and the data required it aimed to collect. In addition, participation in the survey is entirely anonymous and no sensitive personal information was collected from the participants as it is not a requirement for data analysis and further aids in ensuring participant's privacy protection

**FREE AND INFORMED CONSENT:** To ensure free and informed consent, three aspects were addressed: Information, voluntariness and comprehension. With regards to information,

participants were informed in detail about the nature of the research, its purpose, aims and objectives as well as risks and benefits of the research. No form of deception was used and providing each participant with this information aids in the establishment of participant comprehension of the research which ensures adherence to ethical standards as well as increasing the reliability of the data which will be collected. Voluntariness is another important aspect in this area as participants were required to provide their consent in collecting the data required and this consent was not given as a result of unethical instigation such as coercion or manipulation. Each participant provided the required data of their own free will and individuals in the intended sample group who did not wish to participate were allowed to exercise that right without consequence

**SAMPLE RECRUITMENT AND PARTICIPATION:** As stated earlier, participation in the survey is entirely anonymous and consensual. The sample group ensured fair inclusion of participants of different demographic segments and no incentive was offered for participation because they may harm the integrity of the data collected.

**LOCATION ISSUES AND SAMPLE SIZE:** In order to ensure research validity as well as improved generalisation potential of the research findings, the research location was intended to have minimal location and size restriction. The paper-based surveys were distributed in open areas as well as at the premises of several organisations in Abuja. This helped in increasing the sample size participating in the research as well as collecting data from a diverse range of participants. The major restriction with this distribution channel was financial and man power which was addressed majorly by the inclusion of an online-based survey which, in addition to increasing the potential sample size, did not experience the financial and an-power restrictions of the paper-based survey.

In addition to these ethical issues, the research highlights a few other ethical issues which are worth mentioning.

- This study did not involve any form of experimentation either on animals, animal tissue or human tissue
- This study did not involve studies on individuals who may be vulnerable such as children or adults with learning disabilities
- This research did not induce psychological stress on any of the participants beyond that encountered in normal life

- This research did not pose any risk to the stakeholders involved, living creatures, the economy or the environment

In the next section, the process of preparing the data will be explained. The procedure for converting the participant’s responses to usable numerical data will help in the statistical analysis of the survey responses

### 3.7 DATA PREPARATION

To facilitate the statistical analysis of the data collected, the responses of participants to the items in the survey must have numerical representations. Table 3:2 shows the variables being measured in the survey, the number of items in the survey related to them and how the responses will be transformed into numerical data for measurement and analysis

Table 3:2: Variables and respective method of measurement

<b>Construct</b>	<b>Number of items in survey</b>	<b>Method of measurement &amp; analysis</b>
Age, Sex, Marital status, Employment status, Education level, Technology competence, Ethnicity, Mobile phone, Bank account, Mobile banking user,	1 item each. 10 in total	Each item consists of a number of options for the participant to select as a response. Each response has a corresponding numerical denotation from 1-10 for statistical evaluation
Confidentiality	3	Likert Scale with anchors ranging from 1 as “Strongly Disagree” and 5 as “Strongly Agree”. A total of 5 possible responses, numbered 1-5, which can be used for statistical analysis
Integrity	3	
Authentication	2	
Access control	3	
Availability	2	
Best business practices	4	
Non-repudiation	3	
Perceived Usefulness	2	

Perceived ease of use	3	
Intended use	2	
Actual use	3	Each item consists of 4-5 possible responses which are represented numerical in the statistical analysis by 1-5.

The number of items which measure each variable was decided based on the results of the Q-sorting in Section 3.4.1. To statistically analyse the data, IBM SPSS version 21 was used for the descriptive analysis and Analysis of Moment Structures (AMOS) version 22 was used for the structural equation modelling (SEM). Following the two step-approach suggested by Anderson and Gerbing (1988), the measurement model was first tested for reliability and validity followed by the structural model to test research hypotheses. In subsequent sections, contains details of the data analysis procedure as well as the findings of this study.

### 3.8 STRUCTURAL EQUATION MODELLING

Structural equation modelling, or SEM, is a term used to describe several statistical methods, such as confirmatory factor analysis, which investigate and evaluate the relationships between constructs in a model (Lei & Wu, 2007). It is considered to be an important and widely-adopted data analysis process which Hair et al., (2006) states allows researchers to simultaneously investigate evaluate the theoretical relationships between various unobserved and observed variables. In addition, SEM is also a multivariate statistical approach examines the measurement model and structural model by simultaneously evaluating the relationships between multiple independent and dependent constructs within these models (Gefen et al., 2000; Tabachnick and Fidell, 2001). The SEM process takes a confirmatory approach to analysing a theoretical model with the aim of determining if the theorised model is consistent with the data obtained and this consistency is measured through model-fit statistics. Lei & Wu (2007) also note that studies involving multiple hypothesised independent-dependant relationships as well as latent constructs, which care defined by multiple measures or scale

items, would benefit from adopting SEM techniques as it is most suitable for confirmatory analysis such as these.

Considering the research models and hypotheses that are to be evaluated, the researcher adopted SEM in this current study, as the characteristics of the statistical technique are appropriate for analysis the models and data presented in this study. The aim of adopting SEM is to explore the relationships between factors and their scale items as well as the theorised relationships between variables such as PU, PEOU, and TechTrust and Intention to use. Additionally, adopting SEM is based on the premise detailed by Hoyle, (1995) and Hair et al., (2006) who state that SEM provides an effective systematic mechanism to validate relationships between constructs and their respective scale items as well as allowing researchers to evaluate the relationships between these construct and other constructs in the same model. Bryne, (2001) and Tabachnick and Fidell, (2001) also provide further justification for the application of SEM by affirming that it is an effective and rigorous statistical technique which is suitable for complex models with multiple constructs and relationships, such as the ones detailed in section 2.7.

The SEM process is comprised of two stages namely: the measurement level, where relationships between constructs and their scale items are validated using confirmatory factor analysis (CFA), and the structural level, where relationships between constructs is tested as well (Bentler, 1995; Hoyle, 1995, Hair et al., 2006). Both of these stages are detailed below.

### **3.8.1 THE MEASUREMENT MODEL**

Statistical techniques such as exploratory and confirmatory factors analysis have been widely used to evaluate the number of latent constructs that are defined by observed constructs and to evaluate the adequacy of individual scale items as measures of their respective latent constructs (Lei & Wu, 2007). In SEM, confirmatory factor analysis (CFA), a dimension of factor analysis is used to evaluate the measurement model (ibid). According to Carr (1992) and Gorsuch (1983), factor analysis involves a range of correlational analysis aimed at investigating the interrelationships among variables. Daniel (1988) also provides a description of the statistical process by describing it as procedure that explains the relationships between various factors by considering these factors as unobserved latent variables and examining the covariance between these variables. As stated earlier, confirmatory factor analysis was implemented in this current

study and the section hereafter discusses the CFA procedure and justification for its use in this study.

### **3.8.2 CONFIRMATORY FACTOR ANALYSIS**

Confirmatory factor analysis, (CFA), is a statistical procedure that aids researchers in testing the hypothesised relationship between observed variables or scale items and their respective latent or unobserved variable. The CFA procedure also determines if the hypothesised structure of constructs is a good fit with the data obtained, leading to the verification of the existence or non-existence of relationships between observed variables and their latent constructs (Child, 1990) By accomplishing this, the procedure verifies the factor structure of a set of variables (Kline, 2013). The CFA process begins with the researcher having a clear understanding of the underlying theories and concludes with the CFA data being used to assess the hypothesised model. (Albright & Park, 2009). Consequently, CFA is considered a theory-validating procedure rather than a theory-generating procedure (Stapleton, 1997). Stevens (1996) also notes that CFA is based on the researcher's comprehensive understanding of the related theories supporting the model to be evaluated. Hence emphasising that the first step in the CFA process is specifying a theoretical model and hypotheses, which the researcher suggests, will fit the obtained data.

In justifying its application in this study, we consider the difference between CFA and another factor analysis procedure known as exploratory factor analysis, or EFA. In comparison to CFA, scholars such as Child (1990) and Stapleton (1997) note that EFA is a theory-generating procedure where researchers consider the possible underlying factor structure of a set of observed variables without initially establishing a model, hypotheses or factor structure. Unlike CFA, which validates a pre-established theoretical factor structure and model, the EFA procedure generates the factor structure and model at the end of the analysis process from the data obtained. Stevens (1996) also notes that EFA is used in studies where the researcher does not possess adequate theoretical knowledge or hypothesis and intends to explore the data obtained with the aim of identifying factors which account for relationships and covariance between variables. Furthermore, Lei & Wu (2007) state that CFA differs from EFA because EFA often considers all factors to be measured by all the scale items or indicators in the study with results from analysis of these often examined by the researcher and a logical solution being interpreted from the analysis. However, in CFA, the number of factors and their

corresponding indicators in assumed prior to analysis with the results of the procedure resulting in a validation or rejection of the theorised relationships.

Considering that this study into technology trust and mobile banking adoption is supported by extensive theories, discussed in chapter 1 and 2, as well as a theoretical model with generated hypotheses which the researcher intends to evaluate statistically, CFA is considered to be the most appropriate analysis procedure to be used. Researchers such as Gorsuch (1983) further affirm CFA's appropriateness for data analysis in studies with prior theoretical models and hypothesis by stating that it is a potent data analysis tool because it explicitly allows researchers to validate hypothesis in order to resolve factor analytic problems based on theoretical suggestions. It is also important to highlight that Aboelmaged and Gebba's (2013) use of CFA in their investigation into mobile banking adoption in the UAE, Shroff et al's (2011) studying into student adoption of e-portfolio systems and Selim's (2005) research into critical success factors for e-learning acceptance all provide further justification for CFA. These studies successful implementation of CFA involved establishing extensive theoretical knowledge, designing a theoretical model and generating a set of hypothesis with the aim of understanding the relationships between the variables in the model and validating the hypotheses from acquired data. Kline (2013) also provides a description of the steps involved in the CFA process which are consequently followed in this study:

1. **Specification of Model by researching and reviewing existing literature to support design of hypothesised model:** As highlighted in sections 3.8 and 3.8.1, SEM and CFA techniques are used to evaluate models and data obtained after a theoretical model and hypotheses have been suggested based on an extensive theoretical background. In chapters 1 and 2, the concepts of mobile banking in Nigeria, technology adoption, the role of demographic characteristics play in technology adoption, technology trust and its relationship to technology adoption were discussed with relevant literature reviewed to provide insight into the existing theories and studies in these areas. In addition, existing literature regarding technology adoption frameworks were reviewed, citing contributions frameworks like the TAM and DOI made to this current studies model as well as limitations of these models, and their related studies, which this current study aims to address. These reviewed literature consequently led to the design of a conceptual model in section 2.7, as well as hypotheses, which provides this study with three structural model iterations, which will be tested in the measurement level of SEM

to identify the model which most appropriately fits the data obtained. These models are presented in sections 4.4, 4.5 and 4.6.

2. **Model estimation:** According to Lei & Wu (2007), a properly specified structural equation model often has some fixed parameters and some free parameters to be estimated from the data. In the models presented in sections 4.4, 4.5 and 4.6, there exist free parameters to be estimated, indicated by arrows drawn between latent variables and their respective indicators as well as paths between separate latent variables indicate these free parameters. An example of free parameters in the theoretical models are the paths between latent variable TechTrust, representing technology trust, and its seven confidentiality (CONF). The paths not shown in these models are fixed parameters such as paths between variables CONF and PEOU. These paths are not estimated, as they are not logically supported by theory, resulting in the parameters being set to zero. As suggested by Ullman (2006), it is also necessary to select an appropriate estimation technique to use in estimate the parameters of a model. Based on guidelines provided Hu et al (1992); Bentler and Yuan (1999), considerations must be given to sample size in order to select an appropriate estimation technique. This study's sample size stands at 1725 and aforementioned scholars suggest the maximum likelihood estimation is most appropriate for sample sizes ranging from 120 and above. Maximum likelihood is the most commonly used estimation technique in SEM) because it minimises the difference between covariance and observed matrices (Kline, 1998; Tabachnick and Fidell, 2001). Anderson and Gerbing, (1984) also suggest the use of maximum likelihood when the model does not have at least five indicators for each of its constructs. This is evidenced in section 3.7 which highlights that majority of the constructs in the model are measured by less than five indicators. Further justification for this technique is provided by Bollen, (1989), Kline, (2005) and Bryne, (2001) who suggest that it is a fairly unbiased estimation technique in cases of medium to large scale sample sizes and normal data with the number of categories in Likert scales ranging from 4 and above. To accomplish this estimation, analysis is conducted using a specialised SEM analysis program known as Asset Management Operating System, or AMOS.



3. **Model Testing and evaluation:** After the model is estimated, the next task is to assess how well the model fits the data. In the measurement level, the goodness of fit indices of the three models is assessed and compared. This will determine the theoretical model that most appropriately fits the data obtained. Section 3.9 provides further details on the goodness of fit indices. In addition to the goodness of fit criteria, other standardised estimates are also used to evaluate the measurement model such as factor loadings, and level of significance. These are also discussed in section 3.9.
  
4. **Model modification:** In the event that the evaluated model does not produce satisfactory model fit values, the model can either be rejected in favour of an alternative model with satisfactory goodness of fit statistics (Lei & Wu, 2007). Another option would be to modify the model by considering issues such as unsatisfactory factor loadings in the measurement level which failed to meet the factor loading requirements stipulated in section 3.9 (Churchill, 1979). Factor loadings may also exhibit poor level of significance, which makes them inappropriate for consideration in the model. These issues can result in the removal of the related factors in order to improve the overall fit of the model (Hair et al, 2010).
  
5. **Re-evaluation and interpretation of results:** Subsequent to modifying the model or considering an alternative model, the goodness of fit of is re-evaluated to determine if the theoretical model fits the obtained data based on the model fit criteria discussed in section 3.9. It is also necessary to test the validity and reliability of the final model to ensure that accuracy, consistency and reproducibility of the measures in the model (Sekaran, 2000). This was carried out after an ideal measurement model has been identified in section 4.7

In addition to these highlighted steps, there are also a few precautions which must be considered in order ensure the appropriateness of the CFA process. Firstly, the variable-to-factor ratio must be such that at each factor is assigned with at least two scale items. This ensures that each factor is stable and adequately represented by measuring items (Preacher & MacCallum, 2002: Anderson & Rubin, 1956; Costello & Osborne, 2005). Secondly, a large sample size is essential as it helps in ensuring the validity of the results and improves the generalizability of the

results (Everitt, 1975). Ideally, it is acceptable to have at least 10 cases for each variable in the model. (Holtzman & Vezzu, 2011). Consequently, a total number of 1,725 cases were recorded for this study. In the sections hereafter, the model was evaluated and modified to achieve a goodness of fit from the CFA process. In CFA it is also necessary to evaluate the goodness of fit of the specified models. In light of the three theoretical models that will be evaluated, using the goodness of fit criteria will aid in selecting which of these three models most appropriately fits the data obtained.

### **3.9 GOODNESS OF FIT INDICES**

The goodness of fit (GOF) of a model refers to how well the model fits with the data obtained for analysis (Lei & Wu, 2007). Ideally, the overall model's goodness of fit is reflected by the magnitude of discrepancy between observed values and the values expected to be observed by the model (ibid). Two classes of alternative fit indices have been identified, namely incremental and absolute fit indices (Bollen, 1989, Hu & Bentler, 1999).

Absolute fit indices measure the extent to which the specified model of interest reproduces the sample covariance matrix. Examples of absolute fit indices include the chi-square test (Gatignon, H., 2010) and root mean square error of approximation (RMSEA) (Steiger & Lind, 1980). The chi-square ( $\chi^2$ ) validates the assumption that the model is consistent with the data obtained by measuring the magnitude of difference between the observed covariance matrix and the theoretical covariance matrix (Hair et al, 2010). Essentially, smaller differences, such as values closer to zero, between both covariance matrixes indicate a good fit while larger differences indicate increased discrepancy between the observed and theoretical model, leading to a poor fit. However, the chi-square test is sensitive to sample size, resulting in the possibility of models being rejected because of a large sample size despite the data reasonably fitting with the data obtained (Lei & Wei, 2007). In response to this limitation of the chi-square test, several other goodness of fit index, such as RMSEA and CFI, are introduced which adjusts for the effect sample size (Stevens, 1996). The RMSEA avoids issues of sample size, an inherent problem with the chi-square test, by considering the hypothesized model, with optimally chosen parameter estimates, and analysing the difference between this mode and the population data obtained (Hair et al, 2010). Ideally, lower values of RMSEA, less than 0.05, suggest good fit and values up to 0.08 indicate reasonable errors of approximation in the population (Brown & Cudeck, 1989)

In contrast, incremental fit indices measure the increase in fit relative to a baseline model, often one in which all observed variables are uncorrelated (Lei & Wu, 2007). Examples of incremental fit indices include normed fit index (NFI) (Bentler & Bonett, 1980), Tucker-Lewis index (TLI) (Tucker & Lewis, 1973) and comparative fit index (CFI) (Bentler, 1990). The NFI is an incremental fit index, which evaluates the discrepancy between the chi-square value of the null model and the chi-squared value of the hypothesised model (Bentler & Bonett, 1980). The CFI evaluates the discrepancy between the hypothesised model and the data obtained while also regulating for sample size issues that limit the chi-squared model fit test (Bentler, 1990). Higher values of incremental fit indices indicate larger improvement over the baseline model in fit. Essentially, values greater than 0.90 are typically accepted as indications of adequate fit (Bentler, 1990; Hu & Bentler, 1999). It is also important to note that in addition to goodness of fit indices, standardised estimates are also used to evaluate the model at the measurement level. Factor loadings between latent factors and their observed variables must also be considered. According to Holmes-Smith (2002), the factor loadings value should be greater than 0.7; however, a value greater than 0.45 is also acceptable (Hair et al, 2010). Finally, to further ensure statistical significance, this study must also consider the p-value of each hypothesis tested, as the p-value is a measure of the significance of a stated hypothesis in comparison with the null hypothesis (Gelman, 2013). A small p-value proves the result of the study and ascertains that the result on the hypothesis did not happen by chance (ibid). Typically, p-values greater than 0.1 result in a rejection of the study's hypothesis in favour of the null hypotheses. Values between 0.05 and 0.10 are considered weak with low presumption against the null hypotheses. Values between 0.01 and 0.05 are considered moderate, values between 0.001 and 0.01 are considered strong and acceptable and values less than 0.001 are considered very strong and statistically significant, denoted by three stars, “\*\*\*” (Lieber, 1990).

Considering that this current study has three models to compare, the measurement level of SEM will allow the researcher to compare the factor loadings between factors and their indicators as well as the goodness of fit indexes of these alternative models to identify the model with the most optimal goodness of fit indices. The chosen model will then be evaluated in the second stage of SEM which is the evaluation of the structural model

### **3.10 THE STRUCTURAL MODEL**

As stated earlier, the SEM process consist of two levels: the measurement level and the structural level. After specifying the model, the next step is to either reject or retain the hypothesised models. This is done by assessing the goodness of fit indices of the models. In the structural level, the hypothesised causal relationships between the latent constructs in the theoretical model are evaluated based on theoretical assumptions, which are either supported or rejected by the statistical data obtained (Kline, 2005; Hair et al., 2006). This process is considered the theory-testing stage where the theories postulated and hypothesis generated prior to data analysis are either rejected or confirmed based on causal relationships between factors (Bollen, 1989). As shown in section 2.7, the theoretical model in this study led to the generation of a set of hypotheses regarding technology trust in mobile banking, mobile banking adoption and demographic influences. These hypotheses will be tested in the structural level with their degree of influence and level of significance used as criteria to evaluate the paths and relationships between factors. The results from the structural level are presented in Chapter 4.

### **3.11 CONCLUSION**

The aim of this chapter was to discuss elaborate on the methodology adopted for this study. Regarding research philosophy, the researcher adopted the positivist's paradigm as its characteristics were most appropriate for investigations that are qualitative in nature. The attributes of this research philosophy was discussed in this chapter, providing justification for its use in this study.

As a result of adopting the paradigm approach as a research philosophy, the study also based its investigations on the quantitative approach. This involved researching relevant literature to design a theoretical model consisting of variables, which represented the theoretical constructs of technology trust, perceived ease of use, perceived usefulness, intention to use, and actual use, as well as respective measurement items for the variables stated. The theoretical model consequently led to generating hypotheses that would be statistically proven or rejected based on the evaluation of the model on a structural level after being tested on the measurement level using CFA.

Based on its appropriateness and successfully implementation in previous related studies, the survey method was considered an effective tool in obtaining data on individual opinions and

perceptions, providing a noteworthy means of gathering data about sample groups. The question items in the survey were developed based on prior relevant research and screened using a Q-sorting process to validate which questions were appropriately designed in relation to the variables intended for investigations. The researcher also ensured that the questions were simple, easy to read and comprehend in order to avoid participants misunderstanding the questions or their intent. The surveys were administered face-to-face through a paper-based medium as well as online.

Regarding data analysis, SPSS 21 was used to analyse the quantitative data collected from the surveys. This software package is widely accepted, used by researchers in various fields of study and was applied in producing descriptive statistics such as frequencies and percentages. Using an SEM software package called AMOS, structural equation modelling was adopted in evaluating the theoretical model, the variable relationships and the hypotheses in the model in relation to the data obtained. This involved applying a two-step SEM evaluation procedure. The measurement level, which examined the unidimensionality, validity, and reliability of latent constructs using CFA and the structural model which examined the hypothesised relationships between the latent constructs in the proposed research model. The models were also evaluated based on goodness of fit requirements which are summarised in table 3:3

Table 3:3: Model fit criteria and literature reference

<b>MODEL FIT CRITERIA</b>	<b>THRESHOLD</b>	<b>REFERENCE</b>
<b>TFL</b>	$\geq 0.90$	Bentler & Bonett, 1980
<b>CFI</b>	$\geq 0.90$	Bentler, 1990; Hu & Bentler, 1999
<b>RMSEA</b>	$\leq 0.05$	(Brown & Cudeck, 1989)
<b>Factor loadings</b>	$\geq 0.45$	Hair et al, 2010

In the next chapter, the results from the analysis stage of this study will be presented.

## **4 RESULTS AND ANALYSIS**

### **4.1 INTRODUCTION**

In this chapter, the focus will be on the analysis of the data collected with the aim of validating the accuracy of the research model, identifying the existing or non-existing relationships between variables in the research model.

### **4.2 DEMOGRAPHIC PROFILE OF RESPONDENTS**

A total of 2,256 respondents participated in the study by filling the survey and out of this number, 1,725 were deemed usable with a total of 531 of the surveys being discarded because they were completed incorrectly or incompletely.

From the 1,725 respondents, 805 were male accounting for 46.7% of the sample population with female making up the rest of the 53.3%. With regards to age, the 25-34 year olds represented the largest number of participants with 817 respondents accounting for 47.4%, closely followed by the 18-24 year olds with 43.5% participation. The smallest participating age group was the 75 year olds and older with a frequency of 4, making of 2% of the total respondents. The 35-44 year olds, 55-64 year olds, 45-54 year olds and 65-74 year olds accounted for 5.1%, 1.9%, 1.6% and 0.3%% of the sample group respectively. Concerning marital status, 64.5% of the sample group were single with a frequency of 1,113. A total of 360 respondents were in a relationship with 239 being married and divorced respondents showing the smallest percentage of 8% with 13 respondents. In the area of employment status, majority of the participants were employed for wages showing a percentage of 45.8%. The smallest participating group were the retired with 2%. 230 Self-employed participants made up 13.3% of the sample group with Unemployed, Homemakers, students and military respondents accounting for 13.3%, 9.6%, 13%, 3.7% and 26.1% respectively. Table 4:1 shows the full demographic profile of the sample group

Table 4:1: Demographic profile of respondents

Demographic		Frequency	Percentage (%)
Gender	Male	805	46.7
	Female	920	53.3
Age	18-24	750	43.5
	25-34	817	47.4
	35-44	88	5.1
	45-54	28	1.6
	55-64	32	1.9
	65-74	6	0.3
	75	4	0.2
Marital status	Single	1113	64.5
	In a relationship	360	20.9
	Married	239	13.9
	Divorced	13	.8
Employment status	Employed for wages	790	45.8
	Self-employed	230	13.3
	Unemployed	165	9.6
	A homemaker	22	1.3
	A student	63	3.7
	Military	451	26.1
	Retired	4	.2
Educational level	No schooling completed	4	.2
	Nursery school	3	.2
	Primary school	8	.5
	Secondary school	71	4.1
	Undergraduate	192	11.1
	Master's degree	100	5.8
	Doctorate degree	13	.8
	Trade/technical/vocational training	838	48.6
	Professional degree	381	22.1
	Associate degree	115	6.7
Ethnicity	Ibo	445	25.8
	Hausa	123	7.1
	Yoruba	667	38.7
	Other	490	28.4

Technology competence		Not competent	35	2.0
		Novice	73	4.2
		Competent	772	44.8
		Advanced	552	32.0
		Expert	293	17.0
Mobile phone ownership		Yes, I own a mobile phone	1,712	99.2
		No, I do not own a mobile phone	13	.8
Bank account ownership		Yes, I own a bank account	1,711	99.2
		No, I do not own a bank account	14	.8
Mobile banking user		Yes, I use mobile banking	1,054	61.1
		No, I do not use mobile banking	671	38.9

In the next section, the first theoretical model, model 1A will be analysed using SEM. The first stage will be the measurement level, which will first test the hierachichal component of the model before testing the entire model. The model's goodness of fit indices will then be estimated and compared with the goodness of fit indices from the other three models.

#### **4.3 ANALYSIS OF DATA AND INTEPRETATION OF RESULTS**

In lieu of identifying an optimal final model for analysis, the conceptual model provides this study with four theoretical iterations. Confirmatory factor analysis and structural equation modelling were used to evaluate these models in order to identify the most ideal option structure model for this study. Details and justification for using these statistical methods will be provided in the methodology chapter and Figures 4:1, 4:2 and 4:3 are representations models A, B and C to be considered. The three models presented are based on theoretical contributions from previously reviewed literature in chapter 1 and 2 and will provide options for the researcher to consider in a bid to identify a model, which most appropriately fits the data, gathered, addressed previous limitations of studies and frameworks and provides a viable framework for application in future technology adoption research. Also, using confirmatory



factor analysis and structural equation modelling, the direction of causal relationships in the final structural model will provide insight into the significance of influence between the related factors as well as the degree of influence exhibited. It is important to also note that since the sample size obtained for this study is large, the chi-square for the models to be evaluated will always be significant as chi-square is sensitive to sample size (Kline, 2005). Therefore, the chi-square for the models being tested will be reported by exempted from interpretation as measure towards the goodness of fit of the models. In addition, demographic variables will be introduced as covariates in the final structural model after the models have been evaluated in the measurement level. The first model to be evaluated is model A.

#### 4.4 THEORETICAL MODEL A

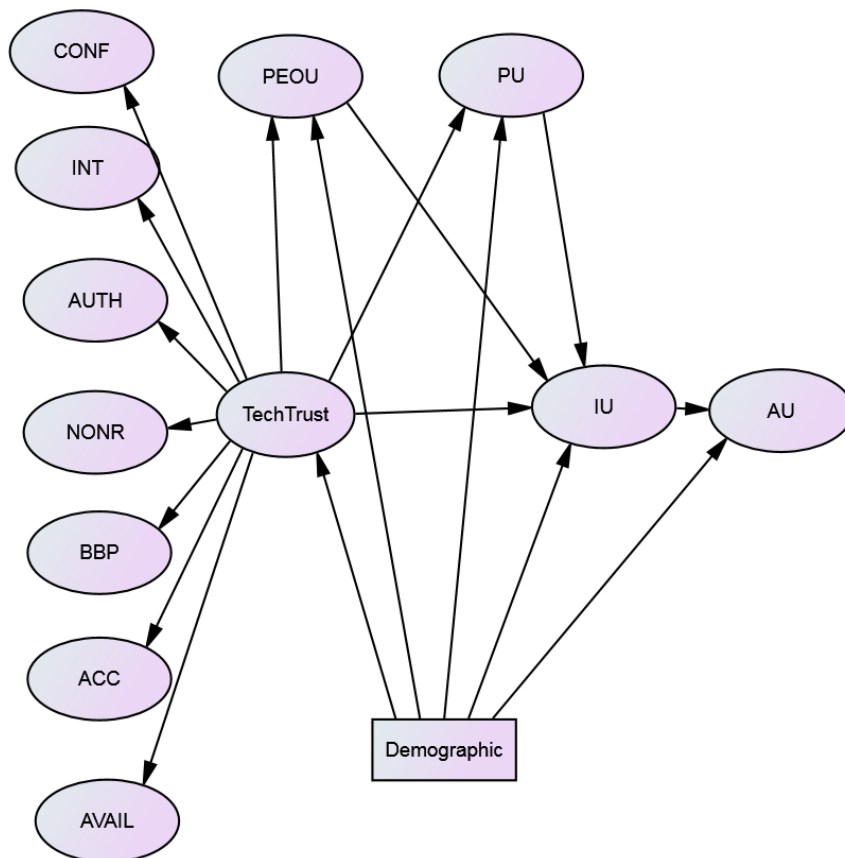


Figure 4:1: Theoretical Model A

Theoretical model A is the first iteration of the conceptual model in this study. As seen in figure 4:1, the model consist of a hierarchical component that depicts technology trust as a second-order factor, measured by seven latent factors namely: confidentiality, integrity, authentication,

non-repudiation, best business practices, access control and availability. This is in in-line with literature discussed in section 2.4.6 which outlines factors contributing to users' trust in technology. Scale items in the survey represent these seven factors respectively and confirmatory factor analysis was used to evaluate the individual influence of these factors on technology trust. In addition, this hierarchical component was tested in comparison to model fit requirements in order to determine the appropriateness of the relationships depicted and the legitimacy of the hierarchical component of this model. As discussed in section 2.6. The model also depicts a relationship between technology trust and perceived ease of use as well as trust and perceived usefulness. The direction of these relationships suggest that users' trust in mobile banking technology influences their perception of the complexity involved in using the technology as well as their perception of the benefits the technology offers them individually. Perceived usefulness and perceived ease of use are represented as unobserved variables and have respective scale items in the designed research instrument for this study. In addition, technology trust, perceived ease of use and perceived usefulness are depicted to influence users' intention to adopt mobile banking technology. This direction of these relationships propose that users' trust in mobile banking technology, as well as their perception of its usefulness and ease of use, all contribute to their intention to adopt the technology in Nigeria. In turn, their intention to either adopt or reject the technology is then linked to their actual use or non-use of the technology. Demographic factors such as age and gender will also be considered as covariates whose influence on technology trust, perceived usefulness, perceived ease of use and intention to use mobile banking will be evaluated for significance. This model, in its entirety, will be tested on both a measurement and structural level and its model fit values will be compared with the values obtained from models B and C to ascertain the most appropriate model in this study.

#### **4.4.1 EVALUATION OF MODEL A**

As recommended by Segars and Grover (1993), the measurement model should be assessed first before the structural equation model is examined. The first step is to use CFA to test the hierarchical technology trust component of model A in figure 4:1. The aim of this test is to validate the theoretical structure of technology trust's indicators by estimating if all, or some, of the seven factors actually measure technology trust based on their factor loadings on its variable, TechTrust. It is also important to note that the hierarchical technology trust

component is present in models A and B. Therefore, the results from the analysis on the hierarchical component in model A is applicable in both models.

#### 4.4.1.1 TESTING HIERARCHICALL TECHNOLOGY TRUST COMPONENT OF MODEL 1A

Table 4:2 shows the results from the CFA analysis of the hierarchical model showing the relationship between TechTrust and the seven antecedents of technology trust as well as the factor loadings of the seven factor's respective scale items and table 4:3 shows the initial model fit values for the hierarchical model

Table 4:2: initial factor loadings for model A hierarchical component

<b>Hierarchical Variable relationship</b>	<b>Unstanderdizd Estimates</b>	<b>Standerdized estimates</b>	<b>S.E.</b>	<b>P-Value</b>
CONF ← TechTrust	1.000	.752		
AUTH ← TechTrust	.874	.701	.051	***
INT ← TechTrust	.853	.889	.045	***
NONR ← TechTrust	.865	.735	.047	***
BBP ← TechTrust	.905	.886	.048	***
ACC ← TechTrust	.933	.779	.049	***
AVAIL ← TechTrust	.738	.200	.044	***
CONF13 ← CONF	1.080	.809	.038	***
CONF12 ← CONF	1.013	.809	.035	***
CONF11 ← CONF	1.000	.703		
AUTH25 ← AUTH	1.000	.725		
AUTH24 ← AUTH	1.044	.759	.050	***
INT16 ← INT	1.000	.638		
INT15 ← INT	1.192	.678	.054	***
INT14 ← INT	1.266	.749	.053	***
NON19 ← NONR	1.000	.744		
NON18 ← NONR	1.136	.552	.061	***
NON17 ← NONR	.861	.631	.042	***

BBB60 ← BBP	1.000	.628		
BBB55 ← BBP	.969	.658	.045	***
BBB36 ← BBP	1.150	.686	.052	***
BBB27 ← BBP	.931	.648	.043	***
ACC28 ← ACC	1.000	.762		
ACC27 ← ACC	1.015	.731	.042	***
ACC26 ← ACC	-.509	-.280	.050	***
AVAIL29 ← AVAIL	.027	.059	.060	.652
AVAIL30 ← AVAIL	1.000	1.324		
Note: S.E=Standard error; P=Significance value; ***=p<0.001				

Table 4:3: Initial model fit indices for hierarchical component of model A

<b>Model</b>	<b>TLI</b>	<b>CFI</b>	<b>RMSEA</b>
<b>Initial hierarchical A</b>	.930	.940	.048
Note: RMSEA = Root mean square error of approximation; NFI = Normated fit index; CFI = Comparative fit index.			

Table 4:3 above shows that after the CFA analysis of the hierarchical model, the RMSEA value achieved meets the model fit criteria of RMSEA being less than 0.05 and the TLI and CFI values meets the cut-off criteria of being greater than, 0.90. However, from the values shown in table 4:2, some of the factor loadings on the hierarchical model do not meet the stipulated requirements of being greater than 0.45. These factors were removed from the model to achieve an even better model fit indices (Hair et al, 2010). The first scale items removed is the “AVAIL” factor as it showed factor loadings of 0.20 on technology trust. It is also necessary to note that the factor loading of AVAIL30 on AVAIL is greater than one, which was considered inappropriate. Upon inspection of AVAIL30, it was observed that the error variance for the scale item is -2.345 with an R-squared value of 4.528. This explains the occurrence of a factor loading greater than 1 as a negative error variance and R-squared values greater than 1 indicate that the solution are inadmissible and the estimation is improper (McDonald, 1985). One suggestion by McDonald (1985) as a reason for this issue is an insufficient number of observed variables measuring the latent variable. McDonald (1985) offers a solution to this

issue by suggesting an introduction of additional scale items to address the negative variance and unsatisfactory R-squared value. However, based on the results from the Q-sorting exercise, the two observed variables in the current hierarchical model are the only factors considered theoretically appropriate to measure availability. Ultimately, the AVAIL variables was removed from the hierarchical model and not considered as a theoretical contributor to technology trust in this study. However, the researcher suggests that the study of availability in relation to technology trust can still be investigated in future research with additional observed variables used to avoid negative error variance and R-squared values greater than 1. AVAIL2 9 showed an unsatisfactory p-value greater than 0.05 and was also removed from the model. The final scale item removed is ACC26, as a factor loading of -0.280 indicates that the factor negatively influences the ACC construct. Its deletion will still leave two scale items to measure ACC which is considered acceptable (Kenny, 2012). Table 7:5 in Appendix A shows the new factor loadings for the remaining variables in the hierarchical model in model A and Table 4:4 shows the new model fit indices of the hierarchical technology trust component after the model's unsatisfactory latent factors and scale items were removed the re-evaluated using CFA.

Table 4:4: Final model fit indices for hierarchical component in model A

<b>Model</b>	<b>TLI</b>	<b>CFI</b>	<b>RMSEA</b>
<b>Final hierarchical A</b>	.960	.966	.042
Note: RMSEA = Root mean square error of approximation; NFI = Normated fit index; CFI = Comparative fit index.			

From table 4:4, it is seen that the hierarchical technology trust component of model A exhibits satisfactory factor loadings between the six antecedents of technology trust, all showing significant p-values at  $p < 0.001$ . In addition, the model fit indices achieved for the final mode, shown in table 4:4, are better than those achieved in the initial model and meet the stipulated model fit criteria of being greater than 0.90. In light of this, the next step is to test the entire measurement model to evaluate the relationships between the various latent constructs and their respective indicators as well as the relationship between latent constructs in model A.

#### **4.4.2 MEASUREMENT LEVEL FOR MODEL A**

Table 4:5 shows the values achieved from the measurement level of model A. Table 4:6 shows the correlations between the latent constructs and table 4:7 shows the final model fit indices for the model. The model achieved a significant chi-square value of 927.872 with 309 degrees of freedom at a probability level of  $p < 0.001$

Table 4:5: Measurement level values for model A

<b>Variable factor loadings</b>	<b>Unstandardised estimates</b>	<b>Standardised estimates</b>	<b>S.E.</b>	<b>P</b>
CONF←TechTrust	1.000	.753		
AUTH←TechTrust	.831	.702	.045	***
INT←TechTrust	.838	.908	.039	***
NONR←TechTrust	.819	.730	.041	***
BBP←TechTrust	.855	.876	.042	***
ACC←TechTrust	.880	.747	.042	***
PEOU32←PEOU	1.000	.804		
PEOU31←PEOU	.769	.583	.036	***
PU35←PU	1.000	.805		
PU34←PU	.941	.724	.035	***
IU37←IU	1.000	.759		
IU36←IU	1.180	.823	.039	***
AU38←AU	1.000	.704		
AU40←AU	1.421	.900	.046	***
AU39←AU	1.028	.795	.034	***
CONF13←CONF	1.000	.795		
CONF12←CONF	.969	.810	.027	***
CONF11←CONF	1.000	.723		
AUTH25←AUTH	1.000	.722		
AUTH24←AUTH	1.053	.762	.050	***
INT16←INT	1.000	.643		
INT15←INT	1.178	.675	.052	***
INT14←INT	1.252	.746	.052	***
NON19←NONR	1.000	.743		
NON18←NONR	1.133	.550	.061	***

NON17←NONR	.865	.633	.042	***
BBB60←BBP	1.000	.629		
BBB55←BBP	.973	.662	.045	***
BBB36←BBP	1.140	.681	.051	***
BBB27←BBP	.929	.648	.043	***
ACC28←ACC	1.000	.787		
ACC27←ACC	.974	.724	.042	***
PEOU33←PEOU	.808	.642	.035	***
Note: S.E=Standard error; P=Significance value; ***=p<0.001				

Table 4:6: Latent variable correlations for model A

<b>Latent variable correlations</b>	<b>Standardized estimates</b>	<b>S.E.</b>	<b>P</b>
PEOU←→PU	.732	.017	***
PEOU←→IU	.628	.018	***
PEOU←→AU	.369	.019	***
PEOU←→TechTrust	.576	.015	***
PU←→IU	.784	.018	***
PU←→AU	.409	.017	***
PU←→TechTrust	.573	.013	***
IU←→AU	.574	.021	***
IU←→TechTrust	.650	.016	***
AU←→TechTrust	.464	.016	***
Note: S.E=Standard error; P=Significance value; ***=p<0.001			

Table 4:7: Model fit indices for model A

<b>Model</b>	<b>TLI</b>	<b>CFI</b>	<b>RMSEA</b>
<b>Model A</b>	.96	.96	.034
Note: RMSEA = Root mean square error of approximation; NFI = Normated fit index; CFI = Comparative fit index.			

Considering table 4:5, it was observed that the factor loadings between latent variables and their respective scale items all satisfy the requirements of the factor-loading threshold. In addition, table 4:6 shows all correlations between the latent constructs in model A are significant and can be used to evaluate the model on a structural level. Table 4:7 shows that the model has also achieved satisfactory model fit indices which indicates that the theoretical model appropriately fits the data obtained. These model fit indices will be compared with the values achieved for model B and C to determine which model is most appropriate amongst the three iterations. The next model to be evaluated in the measurement level is model B.

#### **4.5 THEORETICAL MODEL B**

Similar to model A, model B, pictured in figure 4:2, comprises of a hierarchical technology trust component and a direction of relation suggesting that technology trust influences user adoption intention as well as their perception of the technology's usefulness and ease of use. However, theoretical model B introduces a second hierarchical component suggesting that intention to use perceived usefulness and perceived ease of use are latent variables contributing to a higher-order construct called "Perception and Intention", represented by the variable "Percep\_Int" in the model.



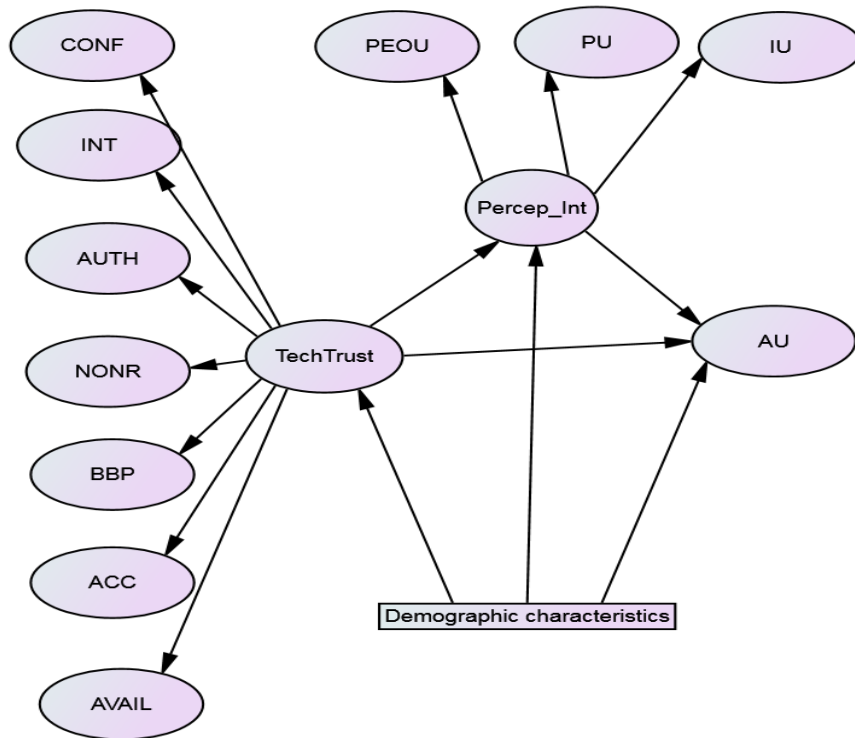


Figure 4:2: Theoretical model B

The premise supporting the introduction of this higher order factor stems from theoretical assumptions made by the researcher based on reviewed literature in chapter 2 regarding technology adoption how user perception influences the adoption intentions of users. Although existing frameworks such as the technology acceptance model consider these constructs to be separate variables, Rogers (2003) does suggest that including user perception variables in technology adoption frameworks will increase the predictability and validity of the frameworks. The research theorises that both perceived usefulness and perceived ease of use are constructs, which theoretically characterise user perception and jointly refer to the subjective or objective point of view users of technology. In addition, results shown in table 4:6 which reveals a high correlation between perceived usefulness (PU), intention to use (IU), and perceived ease of use (PEOU) in model A. These provide both theoretical and empirical premise to evaluate the possibility that the correlation between these three variables can be appropriately explained by the higher order factor, Percep\_Int. Based on these justifications, the researcher investigated the appropriateness of model B for the data obtained in Nigeria by evaluating the hierarchical user perception construct as well as the entire model in the measurement level of SEM. Subsequently to achieving satisfactory model fit criteria, the model's model fit indices was compared with the model fit indices values achieved in model A.

#### 4.5.1 EVALUATION OF MODEL B

Considering the hierarchical technology trust component in model A is also present in model B, the factor loadings, factor structure and model fit indices achieved for the hierarchical technology trust component in model A remains valid for model B. However, the hierarchical the perception and intention component in model B is yet to be testing. Evaluating this hierarchical component will assess the accuracy of the theoretical assumption made by the researcher that perceived usefulness, intention to use and perceived ease of use can all be treated as one construct.

##### 4.5.1.1 TESTING HIERARCHICALL USER PERCEPTION COMPONENT OF MODEL B

Table 4:8 contains the results from the CFA analysis of the hierarchical model showing the relationship between the higher order factor, Percip\_Int and its respective lower order factors, PU, PEOU and IU. The model achieved a significant chi-square of 86.396 with degrees of freedom =86.396. Table 4:9 contains the model fit indices for the hierarchical model

Table 4:8: Factor loadings for hierarchical component in model B

Hierarchical relationship	variable	Unstandardized estimates	Standardised estimates	S.E.	P
PU←Perc_Int		1.000	.957		
PEOU←Perc_Int		.735	.767	.041	***
IU←Perc_Int		1.106	.824	.053	***
PU35←PU		1.000	.802		
PU34←PU		.948	.726	.035	***
PEOU33←PEOU		1.000	.644		
PEOU32←PEOU		1.238	.807	.055	***
PEOU31←PEOU		.936	.575	.049	***
IU36←IU		1.000	.799		
IU37←IU		.901	.782	.033	***

Note: S.E=Standard error; P=Significance value; \*\*\*=p<0.001

Table 4:9: Model fit indices for hierarchical component in model B

<b>Model</b>	<b>TLI</b>	<b>CFI</b>	<b>RMSEA</b>
Hierarchical B	.965	.982	.063
Note: RMSEA = Root mean square error of approximation; NFI = Normated fit index; CFI = Comparative fit index.			

The results shown in table 4:9 suggests that the factor loadings for the hierarchical perception and intention component in model B satisfy the criteria of being greater than 0.45. Table 4:9 also suggests that the hierarchical component satisfies the model fit criteria for TLI and CFI with values greater than 0.90. However, the value for RMSEA fails to meet the criteria of being less than 0.05. This suggests that reasonable errors of approximation exists in the population and leading to the model being an inappropriate fit for the data obtained (Browne & Cudeck, 1989). Consequently, the less than satisfactory RMSEA value of the hierarchical perception and intention component of model B results in the entire model not achieving a more ideal set of model fit indices. Nonetheless, if the hypothesised model was to still be considered for evaluation in the measurement level, table 7:6 in appendix A shows the factor loadings for the entire model B with every factor loading exhibiting satisfactory values in comparison to the 0.45 threshold. Table 4:10 shows the final fit indices for both model A and B, revealing that model B's fit is inferior to model A.

Table 4:10: Comparison between Model A and Model B fit indices

<b>Model</b>	<b>TLI</b>	<b>CFI</b>	<b>RMSEA</b>	<b>Chi-square</b>	<b>Degrees of freedom</b>	<b>Probability level</b>
<b>Model A</b>	.96	.96	.034	927.872	309	0.000
<b>Model B</b>	.94	.949	.040	1261.274	338	0.000
Note: RMSEA = Root mean square error of approximation; NFI = Normated fit index; CFI = Comparative fit index.						

The final model considered is model C that is based on the theory that technology trust is measured by the seven identified antecedents in section 2.4.6 as well as perceived usefulness and perceived ease of use.

#### 4.6 THEORETICAL MODEL C

Theoretical model C bears similarities with model A as the seven identified antecedents of technology trust are depicted to have a causal relationship with technology trust. However, in light of the literature presented in section 2.5.3.2 which discuss the relationships between trust, perceived usefulness and perceived ease of use, the research theorises that perceived ease of use and perceived usefulness are also antecedents of technology trust. Figure 4:4 is a representation of the model.

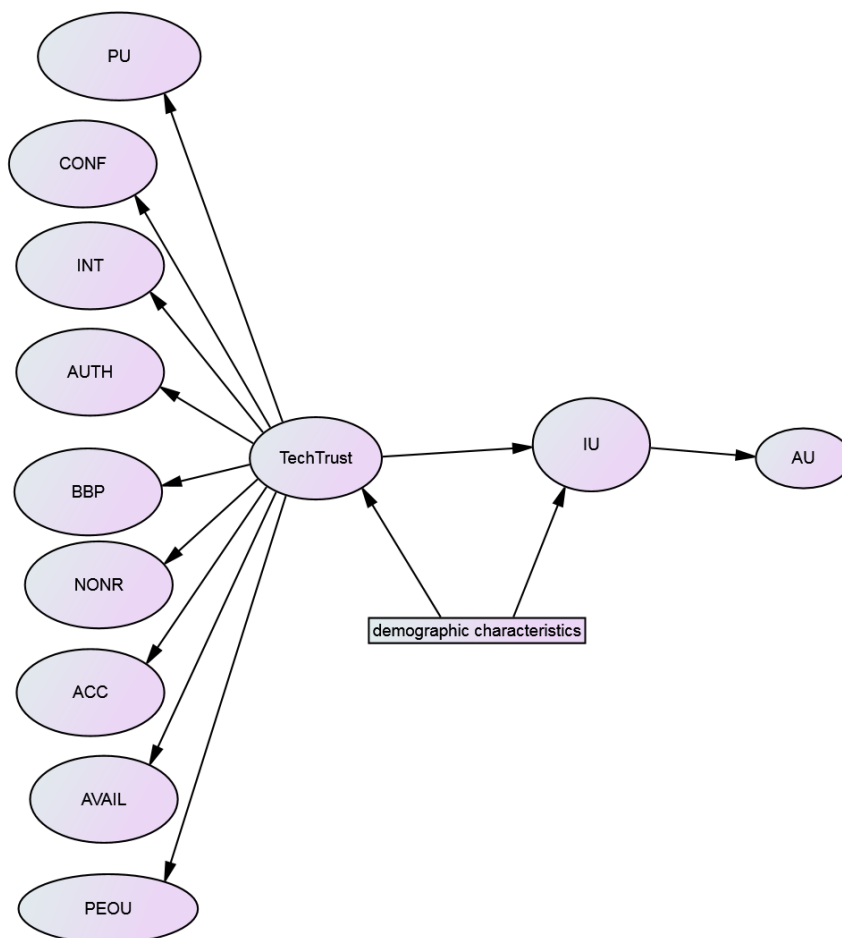


Figure 4:3: Theoretical model C

Model C is based on the theory that trust in mobile banking technology is influenced by their perception of its benefits and their opinion on the difficulty involved in using the technology. Essentially, in addition to the seven factors identified as theoretical antecedents of technology trust, the research also theorises that perceived ease of use and perceived usefulness are antecedents of technology trust as well. In addition, empirical evidence from the measurement

level test on model A revealed significant correlation between technology trust and perceived usefulness as well as technology trust and perceived ease of use. With both theoretical and empirical evidence to support this theoretical model, the research used CFA to evaluate the model on the measurement level. Firstly, an evaluation of the hierarchical technology trust component was conducted, followed by an evaluation of the model's factor loadings and structure. Finally, the models goodness of fit was evaluated and compared with the values achieved in models A and B to identify the most appropriate iteration of the conceptual model.

#### 4.6.1 EVALUATION OF MODEL C

Table 4:11 contains the results from the CFA analysis of the hierarchical model showing the relationship between the higher order factor, TechTrust and its respective lower order factors and table 4:12 shows the initial model fit indices of the hierarchical model.

Table 4:11: CFA results for Model C hierarchical component

<b>Hierarchical relationships</b>	<b>variable</b>	<b>Unstandardized estimates</b>	<b>Standardized estimates</b>	<b>S.E.</b>	<b>P</b>
PU←TechTrust		.725	.626	.039	***
PEOU←TechTrust		.789	.642	.043	***
CONF←TechTrust		1.000	.727		
AUTH←TechTrust		.873	.706	.047	***
INT←TechTrust		.842	.882	.041	***
NONR←TechTrust		.862	.737	.043	***
BBP←TechTrust		.904	.877	.044	***
ACC←TechTrust		.922	.745	.044	***
AVAIL←TechTrust		.077	.410	.043	.075
PEOU32←PEOU		1.000	.778		
PEOU33←PEOU		.833	.640	.039	***
PEOU31←PEOU		.844	.619	.041	***

Hierarchical relationships	variable	Unstandardized estimates	Standardized estimates	S.E.	P
	PU35←PU	1.000	.829		
	PU34←PU	.888	.703	.045	***
	CONF13←CONF	1.000	.794		
	CONF12←CONF	.974	.813	.027	***
	CONF11←CONF	1.000	.721		
	AUTH25←AUTH	1.000	.726		
	AUTH24←AUTH	1.040	.757	.049	***
	INT16←INT	1.000	.641		
	INT15←INT	1.192	.681	.053	***
	INT14←INT	1.250	.743	.053	***
	NON19←NONR	1.000	.746		
	NON18←NONR	1.124	.548	.060	***
	NON17←NONR	.860	.632	.042	***
	BBB60←BBP	1.000	.639		
	BBB55←BBP	.958	.663	.043	***
	BBB36←BBP	1.106	.672	.050	***
	BBB27←BBP	.914	.648	.042	***
	ACC28←ACC	1.000	.795		
	ACC27←ACC	.953	.716	.041	***
	AVAIL29←AVAIL	1.000	.113		
	AVAIL30←AVAIL	10.032	1.272	5.579	.072

Note: S.E=Standard error; P=Significance value; \*\*\*=p<0.001

Table 4:12: Initial model fit indices for hierarchal technology trust component in model C

<b>Model</b>	<b>TLI</b>	<b>CFI</b>	<b>RMSEA</b>
Initial hierarchical model C	.926	.935	.046
RMSEA = Root mean square error of pproximation; NFI = Normated fit index; CFI = Comparative fit index.			

From table 4:11, it is observed that majority of the factor loadings achieved satisfactory loadings which meet the criteria of being greater than 0.45 as well as achieving significant p values less than 0.01. However, considering the standardized factor loadings of availability on technology trust as well as the unsatisfactory p-value greater than 0.05, availability, represented by variable “AVAIL”, was removed from the hierarchical component. Considering that availability has been removed from the model, the modified hierarchical component will be re-evaluated to achieve a final model fit indices. Table 7:7 in Appendix A contains the final factor loadings for the hierarchical component, showing that each indicator achieved satisfactory fact loadings on their respective latent variables within the hierarchical model. The final hierarchical model achieved a significant chi-square of 951.685, 202 degrees of freedom and a p-value less than 0.001. Table 4:13 shows the final model fit indices, which are improvements over the values achieved in the initial hierarchical evaluation of model C.

Table 4:13: Final model fit indices for hierarchical component in model C

<b>Model</b>	<b>TLI</b>	<b>CFI</b>	<b>RMSEA</b>
Final hierarchical model C	.935	.943	.046
RMSEA = Root mean square error of approximation; NFI = Normated fit index; CFI = Comparative fit index.			

Subsequent to successfully evaluating the model fit indices of the hierarchical technology trust component, the entire model was evaluated in the measurement level and the fit indices achieved here was compared to the values achieved for models A and B. Table 7:8 in Appendix A shows the factor loadings achieved after evaluating model C with CFA. All factor loadings met the requirements of being greater than 0.45 and table 4:14 below shows the final model indices values for model C alongside model A and B.



Table 4:14: Model fit indices for models A, B and C

Model	TLI	CFI	RMSEA	Chi-square	Degrees of freedom	Probability level
Model A	.96	.096	.034	927.872	309	0.000
Model B	.94	.949	.040	1261.274	338	0.000
Model C	.935	.943	0.46	951.685	202	0.000

RMSEA = Root mean square error of approximation; NFI = Normated fit index;  
CFI = Comparative fit index.

As stated earlier, the chi-square values will not be considered when evaluating the model with the most ideal goodness of fit values. From table 4:14, model A emerges as the model that achieved the optimal values in the measurement level with CFI and TLI values that meet the stipulated criteria of being greater than 0.90 and an RMSEA value which is significantly less than 0.05. In comparison to model B and C, model A is observably the most appropriate theoretical model that fits the data obtained and will consequently be evaluated in the second stage of SEM, which is the structural level. Figure 4:5 is a representation of model A's measurement level structure.

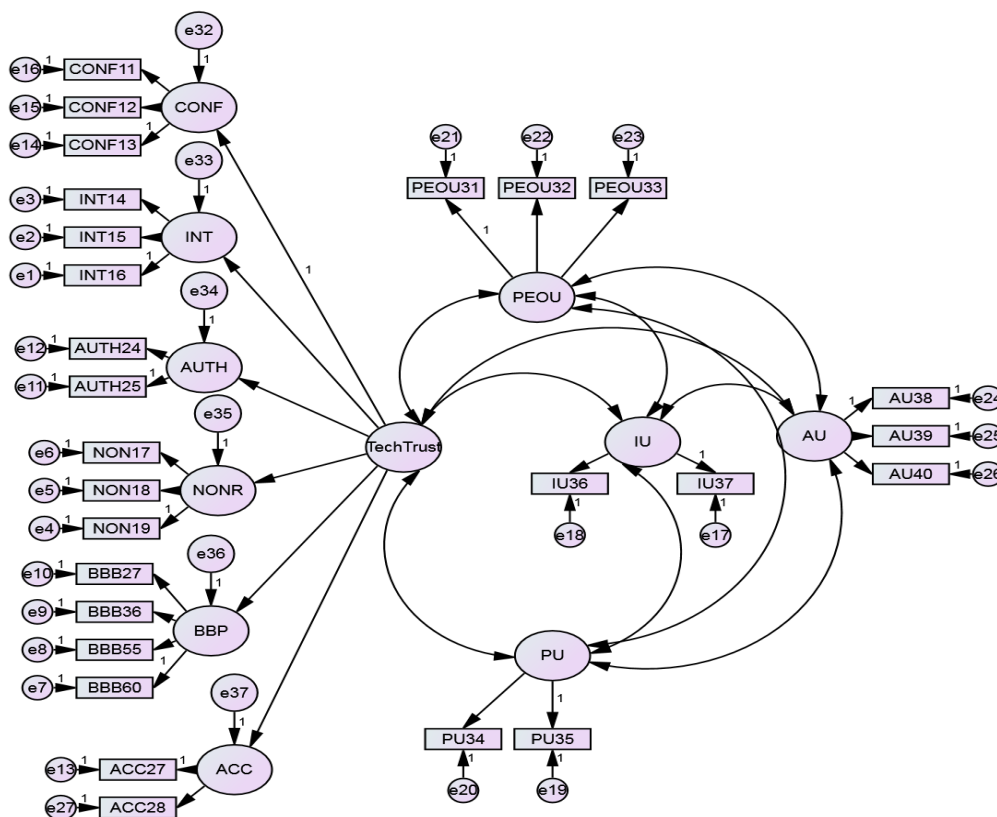


Figure 4:4: Tested measurement model

## 4.7 RELIABILITY AND VALIDITY OF MEASUREMENT ITEMS

In order to substantiate the results of this study, the reliability and validity of the final research model must be established (Hair et al., 2010; Byrne 2010).

### 4.7.1 RELIABILITY

To establish reliability, this study will consider the Cronbach alpha and composite reliability values of the measures in the model. Composite reliability ensures that the scale items and the results they produce in the study are dependable and this is done by assessing the independence of the measures and results from random errors (Hair et al, 2010). Hair, et al (2010) suggests that the recommended cut-off value for composite reliability should be 0.7 and uses the formula below uses the standardised factor loadings and respective error variances to evaluate composite reliability

$$CR = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum \text{Var}(\epsilon_i)}$$

$\lambda$  = Standardised factor loadings

$\text{Var}(\epsilon_i)$  = Error variances (Raykov, T, 1997; Fornell & David,1981)

Another statistical technique which will be used to ascertain the reliability and internal consistency of the study and its constructs is evaluating the Cronbach alpha values. This will verify if the scale items actually measure their related latent variable consistently and the cut-off value of the Cronbach alpha, denoted by  $\alpha$ , is greater than or equal to 0.7 but also less than or equal to 0.9 because values greater than 0.9 portrays redundancy between scale items (Nunnally & Bernstein, 1994; Bland & Altman, 1997). The formula below is used to calculate Cronbach Alpha ( $\alpha$ )

$$\alpha = \frac{n}{n-1} \left(1 - \frac{\sum V_i}{V_{\text{test}}}\right)$$

$n$  = number of questions

$V_i$  = variance of scores on each question

Vtest = total variance of overall scores (Bland & Altman, 1997).

Table 4:15. shows the values achieved for composite reliability and Cronbach alpha for this study

Table 4:15: Composite reliability and Cronbach alpha table.

<b>Construct</b>	<b>Items</b>	<b><math>\Lambda</math></b>	<b>Var (<math>\epsilon</math>)</b>	<b><math>(\sum \lambda_i)^2</math></b>	<b>Composite Reliability</b>	<b>Cronbach alpha</b>
TRUST	Confidentiality	.753	0.26	22.231	.940	.889
	Integrity	.908	0.48			
	Authentication	.701	0.23			
	Non-repudiation	.730	0.19			
	Best business practices	.876	0.07			
	Access control	.747	0.19			
PEOU	PEOU31	.583	0.55	4.112	.765	.720
	PEOU32	.803	0.26			
	PEOU33	.642	0.45			
PU	PU35	.805	0.21	2.338	.821	.736
	PU34	.724	0.30			
AU	AU38	.704	0.67	5.756	.805	.842
	AU39	.795	0.41			
	AU40	.900	0.31			
IU	IU37	.759	0.35	2.503	.791	
	IU36	.823	0.31			
CONF	CONF13	.809	0.32	5.392	.827	0.815
	CONF12	.809	0.28			
	CONF11	.704	0.53			

INT	INT16	.643	0.39	4.260	.782	0.729
	INT15	.675	0.46			
	INT14	.746	0.34			
AUTH	AUTH25	.722	0.41	2.202	.741	.710
	AUTH24	.762	0.36			
NONR	NON19	.743	0.33	3.709	.728	0.650
	NON18	.550	1.20			
	NON17	.633	0.45			
BBP	BBB60	.629	0.47	6.864	0.797	.749
	BBB55	.662	0.37			
	BBB36	.681	0.46			
	BBB27	.648	0.45			
ACC	ACC28	.787	0.28	2.283	0.776	.725
	ACC27	.724	0.38			
Notes: $\Lambda$ = Standardised factor loadings; Var ( $\epsilon$ ): Error variance;						

From table 4:15, it can be seen that all constructs showed good composite reliability values, well above the stipulated 0.7 cut-off mark, ranging from 0.8 to 0.9. Regarding Cronbach alpha, all constructs showed satisfactory values of 0.7 and above, indicating satisfactory consistency and reliability, apart from NONR (0.65). As Cronbach alpha is an evaluation of the scale consistency in regards to participant response (ref), the response rate for NONR was therefore viewed as having satisfactory reliability but not satisfactory consistency at the 0.7 level.

#### 4.7.2 VALIDITY

Validity aims to highlight relationships between concepts and the instruments designed to measure them by measuring how relevant scale items are to the construct it intends to measure. This ensures the instrument is free from the influence of systematic or non-random errors (Hair et al, 2010). To establish the validity of the constructs in this study, construct validity will be

established. The two methods which can be used to establish construct validity are convergent and discriminant validity. Demonstrating both of these validities ultimately demonstrates construct validity (Malhotra, 2002).

### CONVERGENT VALIDITY

Convergent validity shows the level of positive correlations between a scale and other items of the same construct (Malhotra 2002) and can be demonstrated by establishing satisfactory composite reliability values, factor loadings and average variance extracted values (Fornell and Larcker, 1981; Anderson & Garbing, 1988). Satisfactory factor loadings and composite reliability values have already been established and Average Variance Extracted (AVE), which is an estimation of the average level of variance latent variables can explain in their related scale items (Fornell & David, 1981).

To calculate the AVE, Fornell & David (1981) provide the formula below:

$$AVE = \frac{\sum_{i=1}^n \lambda_i^2}{n}$$

- $\lambda$  = standardized factor loading,
- n = number of item

Fornell & Larcker (1981) recommend an AVE cut-off of  $\geq 0.5$  for items measured but values of 0.4 are still acceptable as long as the composite reliability values of that construct are greater than 0.6 (Batra & Sinha, 2000). Table 4:16 shows the achieved AVE values for this study

Table 4:16 Convergent validity and construct reliability

CONSTRUCT	ITEMS	$\Lambda$	$\Lambda^2$	COMPOSITE RELIABILITY	AVE
TRUST	Confidentiality	.753	0.567	0.932	0.624
	Integrity	.908	0.825		
	Authentication	.701	0.491		
	Non-repudiation	.730	0.533		

	Best business practices	.876	0.767		
	Access control	.747	0.558		
PEOU	PEOU32	.583	0.340	0.767	0.500
	PEOU33	.803	0.645		
	PEOU31	.642	0.412		
PU	PU35	.805	0.648	0.824	0.586
	PU34	.724	0.524		
AU	AU38	.704	0.496	0.806	0.646
	AU40	.795	0.632		
	AU39	.900	0.81		
IU	IU37	.759	0.576	0.787	0.627
	IU36	.823	0.677		
CONF	CONF13	.809	0.655	0.828	0.602
	CONF12	.809	0.655		
	CONF11	.704	0.496		
INT	INT16	.643	0.415	0.782	0.476
	INT15	.675	0.456		
	INT14	.746	0.557		
AUTH	AUTH25	.722	0.521	0.739	0.551
	AUTH24	.762	0.581		
NONR	NON19	.743	0.552	0.728	0.419
	NON18	.550	0.303		
	NON17	.633	0.401		
BBP	BBB60	.629	0.400	0.805	0.430
	BBB55	.662	0.438		
	BBB36	.681	0.463		
	BBB27	.648	0.420		
ACC	ACC28	.787	0.619	0.776	0.571
	ACC27	.724	0.524		
Notes: $\Lambda$ = Standardised factor loadings; AVE=Average variance extracted					

Fig 4:16 shows that each construct in this study satisfies the criteria for convergent validity because of their satisfactory AVE values. Next, discriminant validity will be measured as establishing both convergent and discriminant validity are the two steps needed to confirm construct validity

### DISCRIMINANT VALIDITY

Malhotra (2002) describes discriminant validity as the extent to which a construct does not correlate with other constructs which it is not theoretically related to in a study. Fornell & Larcker (1981) also contribute by stating AVE can be used to measure discriminant validity by a comparison of the AVE of a particular construct with the shared variance between that construct and other constructs in the study. If the value of the AVE is higher than the value of the shared variance between both unrelated constructs then discriminant validity has been achieved (Bove et al, 2009; Hassan et al 2007; Walsh et al, 2009). Table 4:17 shows the discriminant validity values

Table 4:17: Discriminant validity via AVE comparison with covariance

Constructs	AVE	CONF	INT	AUTH	BBP	NONR	ACC	PEOU	PU	IU	AU
CONF	.604	.602									
INT	.475	.294	.476								
AUTH	.550	.256	.191	.551							
BBP	.430	.261	.227	.234	.430						
NONR	.419	.226	.205	.252	.250	.419					
ACC	.572	.302	.220	.277	.245	.220	.572				
PEOU	.466	.191	.187	.218	.201	.188	.199	.500			
PU	.594	.191	.167	.171	.168	.179	.167	.312	.586		
IU	.619	.266	.222	.226	.198	.211	.202	.300	.331	.627	
AU	.645	.226	.196	.178	.173	.158	.164	.208	.204	.321	.646

AVE=Average variance extracted

Table 4:17 shows that the AVE values for each construct in the study is well above the shared variance between that construct and any other construct in the model with all covariance significant at  $p < 0.001$ . This proves that each construct is distinct from all other constructs in the model and ultimately establishes discriminant validity. Given that discriminant and convergent validity have been established, the construct validity of this study has been proven. In the next section, the model was evaluated on a structural level as well as introduced

demographic variables into the model as covariates. This stage in the SEM is aimed at evaluating causal relationships and proving or disproving the study's hypotheses.

#### 4.8 STRUCTURAL EVALUATION OF MODEL A.

As discussed in section 3.8, structural equation modelling takes a two-step approach that this study applies in its investigation. Subsequent to evaluating the models in the measurement level and identifying a valid and reliable model with acceptable model fit values using CFA, the next stage is to evaluate the model on a structural level and test this study's hypotheses based on the results from the structural level assessment. Afterwards, demographic factors are introduced as control variables to examine the hypothesised influence these factors have on the relationships between latent constructs in the model (Byrne, 2001). Results of structural model testing are presented in later sections and figure 4:6 is a representation of the structural model for evaluation.

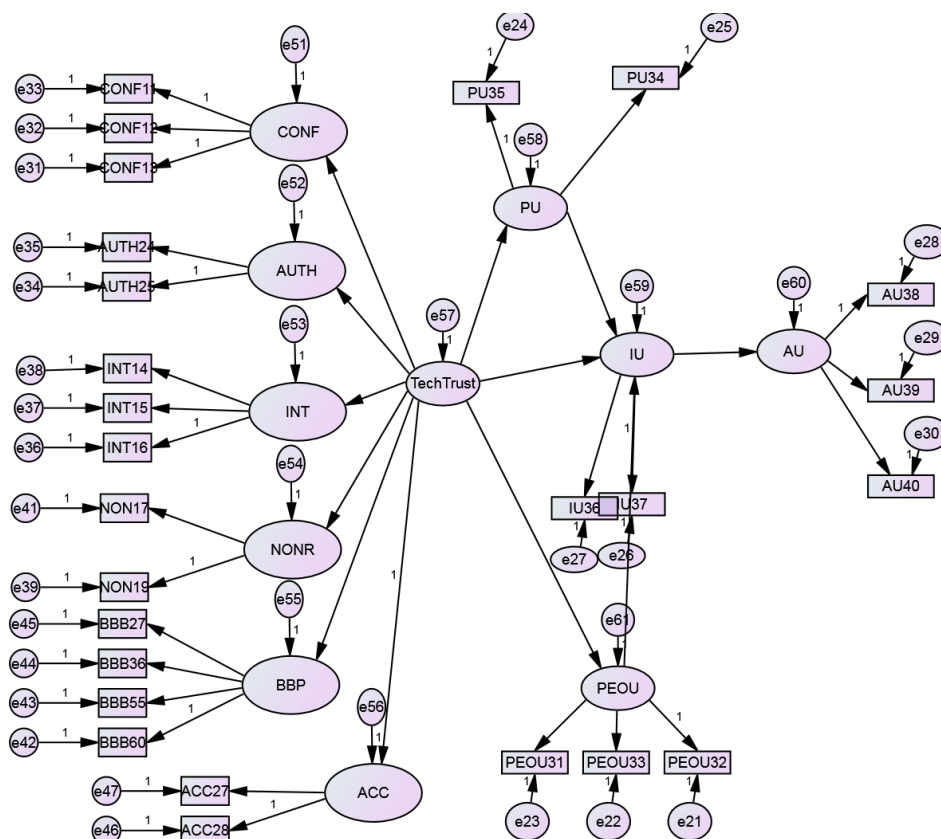


Figure 4:5: Structural model for evaluation



Figure 4:6 provides an overview of the variables and constructs in the structural model and the hypothesised relationships between them. The latent constructs used in the proposed theoretical model were classified into two main categories: observed and unobserved constructs. The unobserved constructs were PEOU, PU, IU, AU, CONF, AUTH, INT, NONR, BBP, ACC and TechTrust. The observed variables were PEOU32, PEOU33, PEOU31, PU35, PU34, IU37, IU36, AU38, AU39, AU40, CONF13, CONF12, CONF11, AUTH25, AUTH24, INT16, INT15, INT14, NON19, NON18, NON17, BBB60, BBB55, BBB36, BBB27, ACC28, ACC27. Table 4:18 contains a summary of this study's variables, hypothesised relationships and null hypotheses between the unobserved constructs in Figure 4:6

Table 4:18: Summary of constructs, variables and hypotheses

Variable	Hypotheses	Hypothesised Relationships	Null hypotheses
TechTrust	H1a	TechTrust→IU	H1a: $\beta(\text{TechTrust})(\text{IU})=0$
	H1b	TechTrust→PEOU	H1b: $\beta(\text{TechTrust})(\text{PEOU})=0$
	H1c	TechTrust→PU	H1c: $\beta(\text{TechTrust})(\text{PU})=0$
PU	H2	PU→IU	H2: $\beta(\text{PU})(\text{IU})=0$
PEOU	H3	PEOU→IU	H3: $\beta(\text{PEOU})(\text{IU})=0$
IU	H4	IU→AU	H4: $\beta(\text{IU})(\text{AU})=0$
Age, Gender, Technology, Bank, Phone, Ethnicity, Mbanking, Employment, Education, Bank	H5	Demographic factors→IU	H5: $\beta(\text{Demographic factors})(\text{IU})=0$
		Demographic factors→AU	$\beta(\text{Demographic factors})(\text{AU})=0$
		Demographic factors→TechTrust	H5: $\beta(\text{Demographic factors})(\text{TechTrust})=0$
		Demographic factors→PEOU	H5: $\beta(\text{Demographic factors})(\text{PEOU})=0$

Confidentiality, Integrity, Authentication, Access control, Non-repudiation, Best business practices, Availability	H6	Demographic factors→PU		H5: $\beta$ (Demographic factors)(PU)=0
		Technology antecedents→Techtrust	trust	H6: $\beta$ (Demographic factors)(TechTrust)=0
Notes: $\beta$ =Regression coefficients				

The first aspect of this evaluation is to estimate the parameters of the model, followed by evaluating the model fit values of the structural model and assessing the estimated parameters. Table 4:19 presents the regression weights between the constructs in the model.

Table 4:19: Regression weights of structural model

Variable relationships	Unstandardized estimates	Standardised estimates	S.E.	P
PU←TechTrust	.790	.611	.044	***
PEOU←TechTrust	.849	.625	.049	***
IU←TechTrust	.402	.294	.058	***
IU←PU	.538	.509	.041	***
IU←PEOU	.147	.146	.034	***
CONF←TechTrust	1.126	.744	.054	***
INT←TechTrust	.950	.903	.049	***
AUTH←TechTrust	.948	.702	.054	***
NONR←TechTrust	.930	.793	.051	***
BBP←TechTrust	.973	.869	.051	***
ACC←TechTrust	1.000	.740		
AU←IU	.689	.578	.038	***
PEOU32←PEOU	1.000	.782		

<b>Variable relationships</b>	<b>Unstandardized estimates</b>	<b>Standardised estimates</b>	<b>S.E.</b>	<b>P</b>
PEOU33←PEOU	.827	.639	.039	***
PEOU31←PEOU	.833	.615	.040	***
PU35←PU	1.000	.842		
PU34←PU	.861	.692	.036	***
IU37←IU	1.000	.754		
IU36←IU	1.178	.818	.040	***
AU38←AU	1.000	.704		
AU40←AU	1.418	.899	.046	***
AU39←AU	1.028	.795	.035	***
CONF13←CONF	1.000	.795		
CONF12←CONF	.971	.811	.027	***
CONF11←CONF	1.000	.722		
AUTH25←AUTH	1.000	.722		
AUTH24←AUTH	1.053	.762	.050	***
INT16←INT	1.000	.643		
INT15←INT	1.184	.678	.052	***
INT14←INT	1.249	.744	.052	***
NON19←NONR	1.000	.682		
NON17←NONR	.960	.645	.050	***
BBB60←BBP	1.000	.633		
BBB55←BBP	.969	.664	.044	***
BBB36←BBP	1.126	.677	.051	***
BBB27←BBP	.922	.648	.043	***
ACC28←ACC	1.000	.791		
ACC27←ACC	.964	.721	.042	***

Note: S.E=Standard error; P=Significance value; \*\*\*=p<0.001

Table 4:19 shows that all relationships within the structural model are statistically significant at p<0.001. The interpretation of these results is provided in section 4.8.3. Table 4:20 presents

the model fit statistics, showing the model achieved satisfactory and RMSEA, TLI and CFI values. It is also necessary to note that the likelihood ratio was significant at  $p=0.000$  with a chi-square of 1131.478 and degrees of freedom of 288

Table 4:20: structural model fit indices

<b>Model</b>	<b>CFI</b>	<b>TLI</b>	<b>RMSEA</b>
Criteria	$\geq 0.90$	$\geq 0.90$	$< 0.05$
Model values	0.952	0.945	0.41
RMSEA = Root mean square error of approximation; NFI = Normated fit index; CFI = Comparative fit index.			

#### 4.8.1 INTRODUCTION OF CONTROL VARIABLES

The next stage is to introduce the demographic variables investigated in this study as control variables into the model. Ten variables, namely: age, gender, marital status, ethnicity, employment level, education level, technology competence, bank account ownership, mobile phone ownership and mobile banking usage were identified based on reviewed literature highlighted in chapter 3. These variables were introduced into the model and the model fit indices of the structural model was re-evaluated. Table 7:9 in appendix A shows the values of the regression weights between constructs when these control variables were introduced. From table 4:21, the values show that the structural model failed to achieve a satisfactory TLI value when all control variables were introduced.

Table 4:21: Initial model fit values for model with all covariates.

<b>Model</b>	<b>TLI</b>	<b>CFI</b>	<b>RMSEA</b>
Initial values (with all covariates)	.898	.917	.034
RMSEA = Root mean square error of approximation; NFI = Normated fit index; CFI = Comparative fit index.			

Despite achieving an unsatisfactory TLI value, it is necessary to note that the introduction of the ten demographic variables did not alter the significance of the hypothesised relationships in the structural model. The p-values of the relationships between TechTrust and PEOU; TechTrust and PU; TechTrust and IU; PEOU and IU; PU and IU; and IU and AU all remain significant at less than 0.001. This indicates that despite the controlling for the ten demographic variables, the hypothesised relationships remain valid. Further discussion on these results are presented in chapter 5. Furthermore, the researcher intends to address the model fit issue here in order to present a strict structural model with only significant relationships. To resolve this issue, the significance level of the demographic variables was evaluated with variables exhibiting non-significant p-values greater than 0.10 being removed from the model to achieve better model fit.

#### 4.8.2 STRUCTURAL MODEL MODIFICATION AND REVALUATION

In addition to identifying which variables exhibit non-significant p-values, this process will also aid in identifying which demographic variables significantly influence relationships

between constructs in the model. Table 7:10 in Appendix A shows the regression weights of the latent constructs and corresponding p values. Based on the results shown in table 7:9 in appendix A, several factors exhibited insignificant relationships with constructs in the structural model with p-values greater than 0.05. In relation to technology trust, variables representing marital status (Marital), education level (Education), bank account ownership (Bank), gender (Gender), age (Age), and mobile phone ownership (Phone) showed non-significant p-values of 0.690, 0.217, 0.339, 0.299, 0.260 and 0.764. As a result, the respective paths between technology trust and these factors were removed from the structural model, leading to theoretical implications regarding the role demographic factors play in user's trust in mobile banking technology. These implications are discussed in section 4.9 with further details presented in chapter 5. Gender, Phone, Ethnicity, Age and Bank also showed insignificant relationships with the perceived usefulness construct in the model with values of 0.530, 0.294, 0.589, 0.805 and 0.522 respectively. In addition, Gender, Phone, Technology, Marital, Ethnicity and Bank theorised relationships with perceived ease of use were also removed from the structural model based on insignificant p-values. These six covariates showed values of 0.454, 0.130, 0.574, 0.215, 0.964 and 0.289 respectively. In relation to intention to use, Technology, Phone, Bank, Gender, Ethnicity, Marital, Employment and Age showed p-values of 0.807, 0.308, 0.949, 0.739, 0.935, 0.423, 0.560 and 0.579 respectively. The final set of insignificant relationships to be removed from the model are the relationships linked with actual use. Education, Employment, Age, Phone, Bank and Ethnicity showed p-values of p-values of 0.292, 0.910, 0.330, 0.219, 0.921 and 0.893. It is necessary to note that the exclusion of these non-significant demographic variables from the structural model suggests that these variables do not confound the relationships stipulated in the structural model through influence on constructs in the model. Subsequent to the removal of these non-significant paths, structural model was re-evaluated and the values in table 7:10 in Appendix A were achieved.

Table 7:10 in appendix A shows that all variables in the current model, including the control variables, are satisfactorily significant and in light of these modifications, the overall model fit of the new structural model was re-evaluated. The values in table 7:10 were achieved with the model showing a new chi-square = 1585.624 and degrees of freedom = 562, significant at  $p=0.000$ .

Table 4:22: Final model fit indices for structural model

<b>Model</b>	<b>TLI</b>	<b>CFI</b>	<b>RMSEA</b>
Final structural model values	.941	.950	.033
RMSEA = Root mean square error of approximation; NFI = Normated fit index; CFI = Comparative fit index.			

### 4.8.3 HYPOTHESIS EVALUATION

Subsequent to achieving satisfactory model fit values for the structural model, the next step is to evaluate the hypotheses of this study based on regression weights, which signify the degree of influence between independent and dependant variables, and p-values, which indicate the level of significance of the relationships. Table 4:23 below shows a summary of the final regression path coefficients, their corresponding levels of significance, the related hypotheses

Table 4:23: Summary of hypotheses evaluations

<b>Hypotheses</b>	<b>Hypothesised Relationships</b>	<b>Standardized regression weights</b>	<b>S.E</b>	<b>P- Value</b>	<b>Remarks</b>
H1a	TechTrust→IU	.231	.060	***	Accepted
H1b	TechTrust→PEOU	.578	.049	***	Accepted
H1c	TechTrust→PU	.552	.047	***	Accepted
H2	PU→IU	.506	.042	***	Accepted
H3	PEOU→IU	.141	.042	***	Accepted
H4	IU→AU	.301	.027	***	Accepted
H5	Demographic factors→IU	-.154	.033	***	Accepted for Mbanking
		-.046	.009	.016	Accepted for Education

Demographic→AU	.970	.016	***	Accepted for Technology
	-.559	.040	***	Accepted for Mbanking
	.052	.017	.002	Accepted for Marital
	0.46	.026	.006	Accepted for Gender
Demographic factors→TechTrust	-.337	.027	***	Accepted for Mbanking
	.131	.014	***	Accepted for Technology
	.069	.005	.005	Accepted for Employment
	.048	.010	.047	Accepted for Ethnicity
Demographic factors→PEOU	-.065	.007	.013	Accepted for Employment
	.077	.009	.002	Accepted for Education
	-.094	.031	***	Accepted for Mbanking
	-.093	.017	***	Accepted for Age
	.047	.157	.049	Accepted for Phone
Demographic factors→PU	-.154	.035	***	Accepted for Mbanking
	.051	.010	.034	Education
	.054	.018	.030	Technology



		-.046	.007	.050	Employment
		-.055	.020	.021	Marital
H6	Technology trust antecedents → Techtrust	.746	.060	***	Accepted by CONF
		.901	.040	***	Accepted by INT
		.728	.053	***	Accepted by NONR
		.873	.054	***	Accepted for BBP
		.702	.057	***	Accepted for AUTH
		.743	.056	***	Accepted by ACC AVAIL
		.200	.044	***	removed at measurement level
		Note: S.E=Standard error; P=Significance value; ***=p<0.001			

In interpreting these results, the p-values are considered as indicators of the level of significance of the relationships. Results presented in table 4:23 shows that four of this study's hypotheses were accepted fully while four were only partially accepted based on components of the hypotheses failing to achieve satisfactory p-values. The results are discussed below:

***H1a: Technology trust in mobile banking has an effect on customers' intention to use mobile banking***

As shown in table 4:23, the standardized regression weight from TechTrust to IU is 0.231 with a highly statistically significant p-value less than 0.001, suggesting that the null hypothesis is false. The results demonstrated a strong support for the hypothesis H1a proposed in chapter 3. The confirmation of this hypothesis indicates that an increase in user's trust in mobile banking technology will positively influence their intention to adopt the technology as well and identifies technology trust as an important determinant of adoption intentions.

***H1b: Technology trust has a significant effect on customer's perceived ease of use of mobile banking***

In addition to identifying technology trust as a determinant of intention to use, the evaluated relationship between trust in mobile banking technology and users' perceived ease of use of the technology reveals that hypothesis H1b is valid and technology trust significantly contributes to perceived ease of use. Table 4:23 shows that the relationship between both factors is highly significant with a p-value less than 0.001 and a regression weight of 0.578. With a higher regression weight than the relationship between technology trust and intention to use, the results reveal that despite technology trust having significant influences on perceived ease of use and intention to use, its influence is higher on the former factor than the latter.

***H1c: Technology trust in mobile banking has a significant effect on customers' perceived usefulness of mobile banking***

Table 4:23 also shows that a significant relationship exists between technology trust and perceived usefulness. The results from the structural level evaluation reveals that the regression weight between these factors is 0.552 and highly significant at p-value less than 0.001. This confirms hypothesis H1c and reveals that technology trust has an almost equivalent influence on both perceived usefulness and perceived ease of use, with a lesser influence on intention to use. In summary, if user's trust in mobile banking technology increases, their perception of the technologies usefulness and ease of use are affected positively

***H2: Customers perceived usefulness of mobile banking has a significant effect on their intention to use mobile banking***

Hypothesis H2 was also valid based on the results presented in table 4:23. The standerzided regression weights between perceived usefulness and intention to use was 0.506 at a highly significant p-value less than 0.001. This result indicates that user's intention to adopt mobile banking technology is positively influenced by their perception of the technology's usefulness to them. Considering that the regression weight between perceived usefulness and intention is greater than the regression weight between technology trust and perceived usefulness, the indication is that despite both perceived usefulness and technology trust having highly significant statistical influences on intention to adopt; perceived usefulness has more of an influence than technology trust.

***H3: Customers perceived ease of use of mobile banking also has a significant effect on their intention to use mobile banking***

Perceived ease of use was revealed to significantly affect intention to use; validating the assumptions made in hypothesis H3. Based on table 4:23, the relationship between perceived ease of use and intention to use identified with a standardised regression weight of 0.141 and a highly significant p-value less than 0.001. These results confirm that adoption of mobile, in addition to technology trust and perceived usefulness, perceived ease of use also influences users' intention to adopt the technology. However, when considering the hierarchy of influences on adoption intention, perceived ease of use is the least influence of the three identified factors as the value of its regression weight is lesser than those obtained for technology trust and perceived usefulness. Nonetheless, the results show that user's intention to adopt mobile banking in Nigera will be positively influenced if their perception of the technology's ease of use is increased.

***H4: Customers intention to use mobile banking has a significant effect on their actual use of mobile banking.***

Following the validation of hypotheses H1 to H3, hypothesis H4 was also accepted, indicating that intention to use significantly influences actual use of the technology. The results shown in table 4:23 revealed a relationship between both constructs with a regression weight of 0.301 that was highly significant with a p-value less than 0.001. The validation of this hypothesis suggests that, while being influenced by technology trust, perceived usefulness and perceived ease of use, user's intention to adopt mobile banking is highly correlated with their actual adoption of the technology. In summary, actual adoption of mobile banking is increased by influencing users' adoption intention through increased trust in the technology, increased perception of its usefulness and increased perception of its ease of use.

***H5: Demographic variables play a significant role in the relationships between technology trust and other contributing factors to mobile banking adoption***

This study investigated the influence of ten demographic factors on technology trust, perceived usefulness, perceived ease of use, intention to use and actual use. The results shown in table 4:23 reveal that demographic factors exhibit significant relationships with the latent constructs but do not majorly alter the relationships between the latent constructs. Regarding the factors influencing intention to use, mobile banking usage and education level were the only demographic characteristics found to influence adoption intention. Mobile banking usage was

the most statistically significant relationship with a p-value less than 0.001 and a regression weight of -.154. Table 4:23 also showed that education level exhibited a p-value of .016 signifying that its -0.046 regression weight with intention to use was of weak statistical significance. The implications of these findings suggest that users' mobile banking usage negatively influences user intention to adopt the technology in Nigeria. The results also suggest that education level negatively affects the intention to adopt the technology but at a weaker statistical significance than mobile banking usage. Demographic factors such as gender, age, technology competence ethnicity, employment status, bank account ownership and mobile phone ownership were all revealed to have no confounding relationship with adoption intention.

Regarding the influence of demographic factors on technology trust, the results of this study showed that four demographic factors had an influence on users trust in mobile banking technology. Mobile banking usage showed a -.337 influence on technology trust that as highly significant at p-value less than 0.001. Technology competence also showed a highly significant p-value less than 0.001, which indicates that its regression weight with intention to use, shown as 0.131, was valid. Employment level showed a significant p-value of 0.005 with a regression weight of 0.069 and Ethnicity achieved a regression weight of 0.048 with a weak p-value of 0.047. These results suggest that user's trust in mobile banking technology in Nigeria actually decreases based on their usage of the technology. However, their trust in the technology is positively affected by the level of their technology competence, employment level and Ethnicity. No other demographic variables in this study exhibited statistically significant relationships with technology trust.

Regarding perceived ease of use, mobile banking usage, education level, employment level, phone ownership and user age were the factors, which showed strong statistical significance in their relationship with perceived ease of use. The results in table 4:23 showed that mobile banking usage achieved a -0.94 regression weight with perceived ease of use with a significant p-value less than 0.001. Age achieved a -0.093 regression weight that was strongly significant with a p-value less than 0.001. Employment level showed a negative influence of perceived ease of use with a regression weight of -0.65 between the constructs. However, its p-value was 0.013, indicating moderate statistical significance. Education level was the only demographic variable which positively influenced perceived ease of use, with a strong p-value of 0.002 and a regression weight of 0.77. These results show that user's perception of the ease of use of mobile banking in Nigeria is negatively impact by their mobile banking usage, their

employment level their education level, indicating that increased usage of mobile banking, and higher employment levels resulted in decreased perception of the technologies ease of use in Nigeria. Furthermore, the results show that the older users have a negative perception of mobile banking's ease of use. In addition higher education levels result in increased perceived ease of use and factors such as gender, marital status and ethnicity played no significant role in user perception of the technology's ease of use

The relationship between demographic factors and perceived usefulness was also revealed in this study. Table 4:23 shows that technology competence and education level all had positive influences on perceived ease of use with similar moderate statistical significance levels. Education level showed a regression weight of 0.51 with a p-value of 0.34 and Technology competence showed a regression weight of 0.54 with a p-value of 0.30. Mobile banking usage showed a strongly significant p-value less than 0.001 with a regression weight of -0.154, indication a negative influence on perceived usefulness of mobile banking in Nigeria. In addition, the regression weight between marital status and perceived usefulness was -.055 and a p-value of 0.20 indicating a negative influence on perceived usefulness at a moderate level of statistical significance. These results show that some demographic factors influence the perceived usefulness of mobile banking in Nigeria. Specifically, increased mobile banking usage leads to a decrease in the users perception of the technology's usefulness and marital status also leads to a decrease in perceived ease of use with users who are either married or divorced suggested to have the lowest perception of the technology's usefulness. However, perceived ease of use is positively influence by increased education levels and technology levels, suggesting that an increase in user education levels and technology competency leads to higher perception of mobile banking's ease of use in Nigeria

Regarding actual use, four demographic variables showed significant relationships with the construct. Technology competence positively influences actual use with a regression weight of .970 and a strong statistical significant p-value less than 0.001. Mobile banking usage also achieved a strong statistical significance less than 0.001 but with a negative regression weight of -.559. Marital status achieved a regression weight of 0.052 with a significant p-value of 0.002. Finally, Gender showed a regression weight of 0.46 with a significant p-value of 0.006.

Despite the combined positive and negative influences of these demographic factors on the the latent constructs, a comparison between the regression values in table 7:9 and the values in table 7:10 shows that the relationships between the latent constructs remained significant and

the introduction of significant control variable did not result in noteworthy changes in regression values between the latent constructs.

***H6: Seven antecedents, namely confidentiality, integrity, authentication, availability, non-repudiation, best business practices and access control, significantly contribute to technology trust in mobile banking in Nigeria***

In evaluating the factors which contribute to technology trust, the results of this study show that confidentiality, integrity, non-repudiation, best business practices, authentication and access control all significantly influence mobile users trust in mobile banking technology with corresponding regression weight values of .746, 0.902, 0.728, 0.872, 0.702 and 0.743; all strongly significant at p-values less than 0.001. Availability was consequently removed at the measurement level due to error variance and R-squared issues. In terms of the hierarchy of influence, the results from table 4:23 shows that integrity has the highest influence on technology trust, followed by best business practices, confidentiality, access control, non-repudiation and authentication

## **4.9 CONCLUSION**

In this chapter, the researcher presented the results from the statistical analysis performed on the data obtained in Nigeria. The aim was to present a procedural explanation on the processes involved in evaluating the responses from participants in the sample group, identifying an appropriate theoretical model from the various alternatives hypothesised to be ideal fits for the data obtained and substantiating the eight hypotheses specified in chapter 2.

1,725 respondents provided the data that used for statistical analysis in this study and an overview of the demographic profile of the respondents in section 4.2 shows that male and female respondents had an almost equal representation in the sample group. The highest age-group representation in this study came from the 18-34 year olds who collectively made up 90.9 percentage of respondents. In addition, 93.80% of the respondents considered themselves either competent, advanced or experts with regards to their technology competence. A total of 99.2% of the respondents reported to own mobile phones and bank accounts but only 61.1% of respondents had actually used mobile banking prior to this study. A comprehensive summary of the demographic attributes of the 1,725 respondents is provided in section 4.2

Using AMOS version 22.0, the researcher applied structural equation modelling (SEM) to analyse the appropriateness of the theoretical model. During this process, the researcher tested three model alternatives with the aim of identifying which model would be the best fit for the data obtained. The SEM process involved a two-step procedure involving evaluating models on a measurement level and structural level. In the measurement level, the measurement model of model A, B and C were assessed using confirmatory factor analysis (CFA) and each models model fit indices was estimated using CFA, evaluated based on model fit criteria and compared with the values achieved in the other models. The results showed that model A was the most ideal model of the three with model fit values of 0.96 for TLI; 0.96 for CFI and 0.034 for RMSEA with a chi-significant chi-square of 927.872. Based on the results from the measurement level evaluation of model A, it was confirmed that six of the seven theorised factors have a significant contribution to technology trust with availability removed from the model due to unsatisfactory CFA factor loadings, the six antecedents revealed were confidentiality, integrity, best business practices, authentication, access control and non-repudiation. Prior to testing model A in the structural level, the model's reliability was tested based on Cronbach's alpha values and composite reliability values. The values achieved in the composite reliability and Cronbach's alpha tests affirmed that the scale items in this study were dependable, consistent and relevant to the constructs they were designed to measure. The model's validity was also tested and confirmed in section 4.7 based on convergent and discriminant validity tests.

Subsequent to evaluating the model on a measurement level, the model was also tested on a structural level to ascertain the existence of relationships between constructs in the model and the significance of these relationships. Eight hypotheses (i.e. H1a, H1b, H1c, H2, H3, H4, H5 and H6) were represented with causal paths between latent constructs and control variables in the model. To validate these hypotheses, the goodness of fit indices of the structural model and the standardised regression weights of the its causal paths were examined. Initially, the model fit values achieved were unsatisfactory and the model required modification in order to achieve a better model fit indices. The researcher examined the causal relationships between constructs in the model and removed relationships between constructs with p-values greater than the cut-off, 0.10. The model was subsequently re-evaluated and achieved the satisfactory model fit indices. Figure 4:8 is a representation of the final structural model for this study with the statistically relevant relationships between constructs.

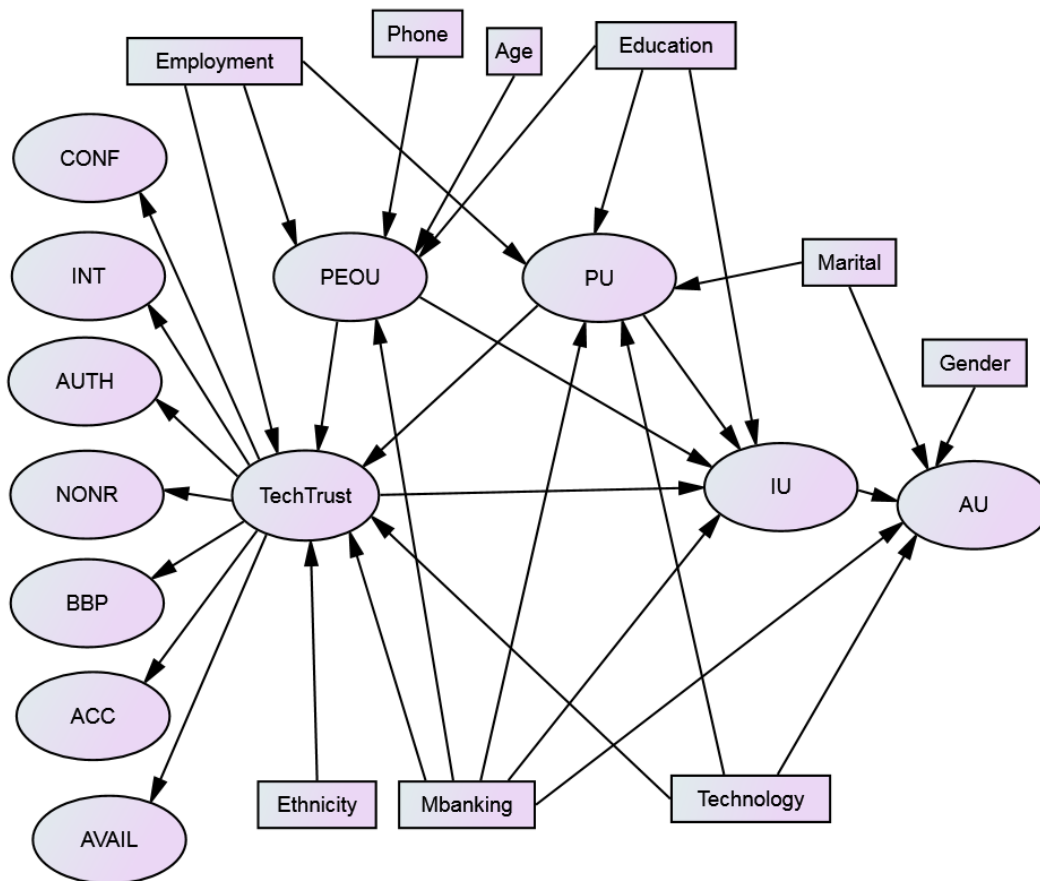


Figure 4:6: Final structural model for this study

In summary, from the model in figure 4:8 and the validated hypotheses, the researcher has been able to address the research questions specified in chapter 1. They are presented below

***What are the significant contributing factors to technology trust in Nigeria and what level of impact do these factors have on technology trust in Nigeria?***

From the results shown in table 4:23, six factors have strongly significant impact on technology trust with varying degrees of influence on the factor. In order of descending level of influence, they are: Integrity, best business practices, confidentiality, access control, non-repudiation and authentication

***Are there any other contributing factors to mobile banking adoption in Nigeria and how significant is the impact these factors?***

From the results of this study, perceived ease of use and perceived usefulness were also identified as strongly significant contributing factors to mobile banking adoption in Nigeria. In



addition to both factors, being significant, perceived usefulness had the most influence of both factors.

***What degree of impact does technology trust have on Nigerians' intention to use mobile banking?***

In comparison to other constructs in the model, technology trust was revealed as the second most influential factor on mobile banking adoption with perceived usefulness being the most influential on the factor

***Does technology trust influence these other factors related to consumer adoption of mobile banking in Nigeria?***

Technology trust exhibited a strongly significant influence on perceived usefulness and perceived ease of use, leading to the conclusion that in addition to influencing mobile banking adoption directly, technology trust also indirectly influences adoption intention through these two factors.

The implications of the results from this study and the evaluations of the hypothesis are discussed in the next chapter.

## **5 DISCUSSIONS, IMPLICATIONS AND FUTURE WORK**

### **5.1 INTRODUCTION**

In this final chapter, the researcher aims to facilitate a knowledgeable discourse about the findings of this study in relation to existing and prospective studies by blending the reviewed literature, theories, assumptions and hypothesis with the findings of this study. In this chapter, the first section focuses on discussing the results of this research with subsequent sections focusing on implications, conclusions and recommendations for future work.

### **5.2 DISCUSSION OF KEY FINDINGS**

This research's investigation into mobile banking technology adoption in Nigeria provides a novel look into the adoption behaviour of individuals in the developing country during the early stages of a new technology's diffusion into the population. It also provides results, which the researcher considers as significant contributions to gaps in knowledge regarding technology adoption in developing countries. The purpose of this research was to determine the factors affecting users' technology trust, identify the influence of technology trust on mobile banking adoption intention as well as ascertain other factors affecting users' adoption behaviour. In this thesis, the developed theoretical model aided in understanding the overall influences technology trust had on perceived ease of use and perceived usefulness, as well as intention to use. These influences were evaluated empirically and led to the authentication of hypotheses; providing statistical evidence of the theorised influences existing between the factors in the model. These influences and the constructs in the theoretical model, as well as their related hypotheses were based on an extensive literature review where the current mobile banking environment in Nigeria was discussed and relevant theories and frameworks in technology adoption, trust and the mobile banking environment in Nigeria were appraised. The review of these relevant literatures helped provide academic premise for this study and in light of the results achieved, this section discusses the similarities and contrasts between this study's findings and existing literature while also highlighting areas where this study makes significant contributions to previous academic literature. In discussing the results of this study, it is necessary to bear in mind that this study successfully investigated technology trust and technology adoption based on data collected from a sample group size of 1,725 in Nigeria. Previous studies into technology adoption had rarely achieved a sample size of this scale. To mention a few, consider the works of Jeong and Yoon (2013) who investigated consumer

acceptance of mobile banking in Singapore and obtained results for their study based on data gathered from 165 respondents. Nasri (2011) researched the factors influencing the adoption of internet banking in Tunisia with a sample group size of 253 respondents. Al-Jabri (2012) selected 330 active mobile banking users for a study on mobile banking adoption in Saudi Arabia. A similar trend is noted in the technology adoption studies of Kazi and Mannan (2012) and Yousafzai et al (2009) whose research obtained data from a sample group size of 372 and 441 respectively. Finally, Safeena's (2012) investigation into technology adoption amongst consumers in India used the least sample group size of all the reviewed studies with results and conclusions of the study based on data provided by 58 respondents. By citing these studies, the researcher highlights the significant difference in sample size between existing studies and this current study. This is relevant in further discussions presented in subsequent sections, as it affirms the researcher's notion that results achieved here are meaningful and generalizable because they were obtained from a large cross-section of the population. The first area discussed is the antecedents of technology trust. Bear in mind that in evaluating the significance of the relationship between constructs, the p-value was considered, and in evaluating the strength of relationship between constructs, the standardised regression weights are considered.

### **5.2.1 ANTECEDENTS OF TECHNOLOGY TRUST**

Prior to the statistical analysis of technology trust in this study, its antecedents were suggested and adopted based on theoretical contributions from the works of Jamieson (1996), Bhimani (1996), Marcella et al (1998) and Parker (1995). These scholars identified confidentiality, integrity, non-repudiation, access control, authentication, availability and best business practices as the seven factors influencing users' trust in technology. Consequently, the researcher evaluated their theorised influence by incorporating them into the theoretical model and evaluating them with statistical evidence. Based on the results achieved, only six of the seven theoretical factors influenced mobile banking technology trust in Nigeria.

In view of the strength of relationships with technology trust, integrity emerged as the most influential of the six factors, exhibiting a factor loading of 0.902 on technology trust at a strong significance level of  $p < 0.001$ . These results provided support to hypothesis H6 that implied a theoretical influence of integrity (INT) on technology trust (TechTrust), as well as six other factors, and technology trust. Considering that the definition of integrity, provided in chapter two, focuses on transaction accuracy and operation consistency, this result supports the proposition that both users and non-users consider integrity as a paramount criterion towards

establishing trust in mobile banking in Nigeria (Tunji, 2013). As stated in chapter one, Agwu and Carter (2013) and Odunmeru (2013) highlighted a lack of data integrity and transaction reliability as one of the issues facing the cashless policy and its technologies in Nigeria. Reports published by EFINA (2013), pictured in figure 1:5, also show that unreliability is one of the top five issues Nigerians face with the cashless policy. Using this study's theoretical model and SEM statistical techniques, this study provides insight into the level of significance of integrity's influence on user trust in mobile banking as well as the degree of influence in comparison to the other seven factors hypothesised by existing scholars. The results from this research also provide empirical evidence showing that integrity's positive relationship with technology trust in mobile banking means an increase in the integrity of mobile banking technology will lead to an increase in user trust in the technology. The researcher explains the occurrence of this result based on affirmations by Marcella et al., (1998); Riggins and Rhee, (1998); Senn, (2000) who all agree that integrity is an integral part of user trust in any facet of technology usage. Mobile banking provides an advantageous cashless transaction platform for users and the accuracy of the transactions, consistency of operations and reliability of its data are determinants of user's trust and adoption intention. Essentially, if mobile banking fails to be perceived by the customers as an innovation with satisfactory levels of integrity then users' trust in the technology will decline; consequently leading to a decline in adoption as well.

The second-most influential factor on users trust in mobile banking technology was best business practices, with a strongly significant factor loading of 0.872 at  $p < 0.001$  on technology trust. Similar to the results achieved with integrity, this result supports part of hypothesis H6 and provides empirical evidence to theoretical assumptions highlighted in chapter two regarding the factors affecting technology trust. The identification of best business practices as a significant influential factor in users' trust in mobile banking technology holds true both in the results of this study as well as in the real-world mobile banking environment. In chapter one, CBN, (2013) and EFINA, (2013) highlighted poor complaint resolution, customer care and business practices as factors deterring users from adopting cashless technologies like mobile banking. The results from this study's cross-sectional examination of both users and non-users of mobile banking suggest that users are more likely to trust in mobile banking technology if appropriate policies and customer services practices are established. When considered from an alternative point of view, best-business practices is conceptually similar to organisational trust, a dimension of trust discussed in chapter two. Similar to this study's appraisal of best business practices, Mcknight et al, (1998) and Keen et al. (1999) definition of

organisational trust consider the concept to be a dimension of trust which is dependent on legal frameworks, adequate policies and good customer care, as prerequisites to increasing user trust in technology. Popoola (2013) states that trust in an organisation is directly dependant on the presences of assurances to the user that organisation will be held liable for recompense in a situation where the user has experienced any form of harm or loss while using the mobile banking service. Considering the similarities between these scholars' definition of organisational trust and this study's evaluation of best business practices, the researcher proposes the existence of a relationship between organisational trust and technology trust. This proposition is evidenced by the results achieved in this study as well conclusions made by Zhou (2012), Maroofi et al (2013) and Zhenhuen & Shaobo (2009) which state that users will not trust or adopt mobile banking technology if there are unsatisfactory legal and technological guidelines and business practices governing the use of the technology. The research considers this theorised relationship, drawn from the results of this study, as a catalyst for future investigations into the existence of a relationship between organisation trust and technology trust .

Confidentiality and access control come in as the third and fourth most-significant influential factor in users' trust in mobile banking technology. The results achieved for both factors lend support to the overall hypothesis H6 and highlights the continued importance of user privacy in technology adoption with both factors showing strongly significant p-values at  $p < 0.001$  and factor loadings of 0.746 and 0.743 respectively. Despite existing in the third and fourth position of influence on technology trust, the researcher highlights the identical statistical significance and minute difference in regression weight values as evidence that both confidentiality and access control are equally important factors in determining technology trust. Consider the definitions of both constructs presented in chapter two, confidentiality refers to user privacy issues, financial data protection and prevention of unauthorised access, disclosure or manipulation. Access control focuses on the infrastructures established to ensure only authorised access to personal data (Ratnasingam et al, 2002). In essence, the researcher considers confidentiality as the concept of privacy protection, while access control are the measures ensuring the concept of confidentiality. In Nigeria's online banking environment, the issue of e-fraud has been a prevalent problem affecting cashless banking channels like internet and mobile banking (CBN, 2013), e-fraud had already been reported by CBN (2013) to have cost the Nigerian economy over N160 billion in losses between the year 2000 and 2008. As stated in chapter two, Odunmeru (2013) and Agwu and Carter (2013) also theorised that online

crimes and security issues as major problems facing mobile banking payment systems; resulting in lower trust and confidence in the technology. The results from this study provide empirical evidence to these assertions by going beyond theoretical assumptions and providing concrete statistical evidence of the role privacy and privacy control issues play in technology trust and mobile ultimately banking adoption. The results show that an increase in measures that ensure confidentiality of customer details will directly increase users' trust in the technology. In the same vein, a lack of assured confidentiality and appropriate access control infrastructures will result in increased reluctance to adopt the technology. In addition, by revealing a parity between the influence of confidentiality and access control, this study also provides a unique contribution to existing literature by suggesting that increased access control is in tandem with increased confidentiality. This indicates that if measures are put into place to ensure the user personal information are protected from unwanted access, manipulation and distribution, then confidentiality has been established as well. Bear in mind that the reverse is also the case in this situation, as a lack of access control frameworks will also result in a lack of protection of users' personal information

Based on the results of this study, the fifth and sixth significant factors to influence technology trust are non-repudiation and authentication respectively. These constructs, represented by the variable NONR and AUTH, both achieved strongly significant p-values at  $p < 0.001$  and satisfactory factor loadings of 0.728 and 0.702 on technology trust (TechTrust). The results show that, in addition to data integrity, best business practices, confidentiality and access control measures, users also consider the non-denial of transaction participation and the verification of transaction party's identity as factors influencing their trust mobile banking in Nigeria. In understanding the role of non-repudiation in mobile banking trust and adoption, consider the statement by Garrett and Skevington (1999) who suggest that all forms of transactions carried out electronically, from a phone, personal computer or mobile phone, must have adequate measures ensuring authentication, non-repudiation, confidentiality and trust. The revealed significant influences here, as well as its support for hypotheses H6, suggest that the results are theoretically and empirically accurate. The researcher bases the explanation of the statistical links between these constructs on the respective definitions of non-repudiation and authentication, with respect to their processes of operation and establishment. Non-repudiation in mobile banking usage refers to protocols and measures established to ensure that parties involved in a transaction, will not be able to deny their involvement in the transaction after it is completed (CeronmaniSharmila & Komala, 2012). Authentication refers to the

established legitimacy of transactions and the perception that all the elements involved in the transaction are genuine based on provided evidence (Ratnasingam et al, 2002). Principally, completed transactions must provide forms of confirmations, such as receipts or confirmatory emails and text messages, which stand as evidence that both parties were intentionally participating in the transfer of funds or exchange of goods and services for payment (Adeyeye, 2012). The standard of non-repudiation requires that the sender or customer in a transaction receive a “proof of receipt” indicating that the receiver or seller has received the information or funds. In turn, the receiver also receives a proof of sender, assuring the receiver that sending was involved in sending the information or funds that were received (Sullivan, 2013). In satisfying this non-repudiation requirement, the process has also accomplished authentication by legitimising the transaction for both parties and guaranteeing both parties that the participants involved are genuine. Essentially, in order to achieve authenticity, non-repudiation must be established. The researcher indicates the results of this study as an additional contribution to knowledge which suggests that despite researchers such as Jamieson (1996), Bhimani (1996), Marcella et al (1998) and Parker (1995) stating that non-repudiation and authentication are two independent constructs, consideration should be given to the notion that authentication is a by-product of non-repudiation. In understanding their relationship with trust, the establishment of non-repudiation and authentication assures both parties involved in a transaction that the other party will not be able to reject the transaction and cause a dispute based on the pretext that they were not involved in the transaction. The evidence provided to both parties by the payment system not only establishes trust between both parties but also between the parties and the cashless payment system utilised. In summary, if mobile banking ensures authentication and non-repudiation, customers will be more likely to trust and adopt the technology.

The sixth factor hypothesised to influence technology trust in hypotheses H6 was availability. However, during the course of this study’s evaluation of availability’s relationship with technology trust as a contributing factor, availability achieved unsatisfactory standardised factor loadings of 0.200 and unwanted values for error variance and R-squared. Consequently, availability, represented by the variable AVAIL, was removed from the measurement model and not considered in this study’s theoretical assessment as a factor adequately influencing users trust in mobile banking technology in Nigeria. Despite the rejection of its hypothesised influence on technology trust, hypothesis H6 was still accepted as six out of seven of the factors theorised to influence technology trust were verified and supported with empirical data.

However, availability's lack of statistically influence on technology trust can be addressed in future researcher by introducing additional scale items to measure the variable. In Masrek et al's (2012) research into mobile banking trust in Malaysia, the research model accounted for mobile network trust as a factor affecting technology trust and was measured by the availability of the mobile banking services to consumer's as well as the reliability of the service. Availability was also considered in Tao Zhou's (2012) research in China and though it was referred to as ubiquity, it also focused on the availability of the service and its impact on user trust. Both mobile network trust and ubiquity are factors from previous research which are one and the same with the availability factor in this study and the findings in those studies show that availability of the mobile banking service improves its perceived reliability among consumer's and increases their willingness to trust in the service because it is consistent. Theoretically, the influence of availability on technology trust is still plausible in Nigeria as availability issues have constantly been a barrier hindering technology usage and adoption in Nigeria (Nwankwo and Eze, 2013). As defined in chapter two, availability influences customer's willingness to trust mobile banking technology baseking d on the regular presence of mobile banking infrastructure (Ratnasingam et al, 2002). Therefore, issues such as a weak or absent signal, faulty devices and lack of power supply to support the operation of technology infrastructure are considered as constraints hindering mobile banking availability and technology trust. As discussed in chapter two, CBN (2013), Odunmeru (2013), Agwu, and Carter (2013) had theorised that availability of cashless payment systems was one of the major factors hindering mobile banking technology adoption with Nigeria's lack of constant power supply being a major contributor to the availability issues in the country. In addition, Nwankwo and Eze (2013) also considered availability as a major barrier affecting the adoption of cashless banking systems by stating that the current power supply challenges in Nigeria have led customers to feel frustrated with online banking services as power outages at banks result in decreased operation times and even absolute disruption in services. These reports have led to the theoretical assumption that availability would be a major determinant of users' propensity to trust mobile banking technology. Despite this study's removal of the construct from the research model, the research suggests that this is an area which can be evaluated in future research.



## **5.2.2 TECHNOLOGY TRUST, PERCEIVED EASE OF USE AND INTENTION TO ADOPT**

Subsequent to arguments from Tao Zhou (2012), Kamalruzaman (2007) and Koufaris and Hampton-Sosa (2004) who theorised a relationship between trust in technology and perceived ease of use, this study hypothesised that technology trust in mobile banking in Nigeria influenced users perception of its ease of use. Despite the similarity between this hypothesis and evaluations made by Chinomona (2013) and Maroofi et al (2013), this study contributes additional knowledge by also considering the influence of socio-demographic factors as control variables dictating the degree of influence of technology trust on users' perceived ease of use of the technology. Analysis of the data obtained revealed that technology trust exhibited a strongly significant influence on perceived ease of use with a regression weight of 0.578 and a p-value at  $p < 0.001$ . This result supports hypothesis H1b by asserting that users trust in mobile banking technology will positively influence their perception of the difficulty involved in using the technology. This also tallies with the results from Chinomona (2013) and Maroofi et al (2013) studies as well and provides further evidence that an increase in technology trust will result in an increase in perceived ease of use. Furthermore, the influence of ten demographic factors were investigated in relation to the relationship between technology trust and perceived ease of use. While controlling for employment level, age, phone ownership, education, marital status, technology competence, mobile banking usage and ethnicity, neither of these variables caused as noteworthy change in the significance of the influence between technology trust and perceived ease of use. Prior to their introduction, the relationship between technology trust and perceived ease of use was strongly significant at p-value less than 0.001 with a regression weight of .625. After their introduction, the regression weight achieved was .578. The researcher considers this as an indication that regardless of user's employment status, age bracket, mobile phone ownership status, level of education, marital status, perception of technology competence, or ethnicity, users trust in mobile banking technology still positively influences their perception of the complexity involved in using the technology. These findings contradict Roger's categorisation of innovation adopters, which specifies that individuals exhibit different affinities toward technology adoption based on demographic characteristics such as technology competency and knowledge and age group. According to the DOI categories discussed in chapter two, individuals of a younger age bracket, more advanced technology competency are more likely to adopt technology early rather than users of an older age group and less technology competency. Literature discussed in chapter 2 also highlights a

discrepancy in adoption tendencies in relation to gender, age and occupation variation, suggesting that users of an older age, female gender and lower employment levels are theoretically less likely to trust and adopt technology. These suggestions may be valid based on the estimated relationships between the control variables and the latent constructs of technology trust, but ultimately, the results of this study show that neither of these variables exhibit an influence which alters the relationship between the constructs in the model significantly/. With this in mind, the research suggests a revision of the adopter categories using empirical evidence to each category and the attributes stipulated to be characteristics for the categories.

In addition to evaluating the hypothesised relationship between technology trust and perceived ease of use, this study also validated the relationship between perceived ease of use and mobile banking adoption intention. The results from the structural model evaluation indicated that a statistically significant relationship exists between both constructs as the theorised path from PEOU to IU showed a regression weight of 0.122 with a p-value less than 0.001. By revealing a significant relationship between both factors, hypothesis H3 was supported with the empirical data indicating that users' perception of the complexity of mobile banking directly influences their intention to use the technology. In essence, increased ease of use results in increased intention to adopt. This validates the assumptions made in Rogers (2003) DOI theory, which highlighted complexity as a factor, which can increase users' willingness to adopt technology. However, rather than only consider perceived ease of use, or complexity, as a factor, which determines adopters behaviour, this study reveals that both adoption and non-adoption of technology are influenced by a range of factors including perceived ease of use. It is also necessary to note that despite having a statistically significant influence on intention to use, perceived ease of uses' influence on user adoption intention is lesser in comparison to the influence of technology trust and perceived usefulness.

### **5.2.3 TECHNOLOGY TRUST, PERCEIVED USEFULNESS AND INTENTION TO USE**

The relationship between users' trust in technology, their perception of the technology's usefulness and the adoption intentions is an area of research that has resulted in several studies being conducted on technology adoption and user behaviour in developed countries (Akour & Dwairi, 2014). This is because perceived usefulness is theoretically considered as an important determinant of user adoption behaviour (Eriksson et al., 2005; Laforet & Li, 2005; Polatoglu

& Ekin, 2001; Cheung, 2002). However, extensive literature on user adoption behaviour of technology and the factors influencing adoption behaviour in developing countries is lacking (Akour & Dwairi, 2014). The results of this study's evaluation of the relationship between technology trust and perceived usefulness showed that the regression weight between both variables was 0.551 with a strong significant p-value less than 0.001. These results strongly support the assumption of hypothesis H1c that proposed technology trust had a significant influence on perceived ease of use. The results also indicates that when users trust mobile banking in Nigeria, it leads an increase in their perceived usefulness of the technology and support the assertions made by Rogers (2003) of Gefen et al. (2003) and McCord (2004), about the importance of users perception of the advantages an innovation has over its predecessor as well as to the user. In addition to exhibiting a positive relationship with technology trust, the results also showed that perceived usefulness exhibits a positive relationship with intension to use as the hypothesised path between these constructs showed a regression weight of 0.441 at a statistical significance level less than 0.001. These results tally with conclusions made in the works of Kazemi et al's (2013), Anus et al (2011) and Jaradat & Twaissi's (2010) and further supports the suggestion by Goodhue and Thompson's (1995) who affirmed that perceived usefulness is a factor which innovators must take into consideration when aiming to increase technology adoption.

This study's results further contributes to existing knowledge with results showing that in addition to exhibiting a positive relationship with technology trust, perceived usefulness also positively influences intention to use mobile banking in Nigeria. The hypothesised path from PU to IU exhibited a regression weight of 0.441 with a strongly significant p-value less than 0.001. This result supports the researcher's hypothesis in H2, which suggested that users perception of the usefulness of mobile banking in Nigeria increases their willingness to adopt the technology. These results also support the theoretical assumptions of Rogers (2003) Kazemi et al (2013) and Jaradat & Twaissi (2010) in Zhenhua & Shaobo's (2009) who all affirm that increased adoption of technology is facilitated by increasing user perception of the usefulness of the technology in question. Despite both perceived ease of use and perceived usefulness exhibiting statistically significant regression weights with intention to use, the results show that perceived usefulness' influence on user adoption behaviour in Nigeria is greater than the influence of perceived ease of use. The research concludes that this indicates a hierarchy of priority amongst users in Nigeria; meaning that in considering whether or not to adopt mobile banking, individuals place priority on the technologies usefulness rather than its ease of use. It

is also necessary to highlight that these relationships were evaluated while controlling for the influence of demographic factors. Despite the consideration of non-significant and significant influences from the control variables, as well as the elimination of control variables with non-significant p-values, the relationships between perceived usefulness and trust as well as perceived usefulness and intention to use remained significant. Essentially, irrespective of all the demographic differences such as gender distributions and varying education levels, trust in technology in mobile banking significantly influenced perceived usefulness and perceived usefulness significantly influenced intention to adopt mobile banking. Considering that research into user technology adoption behaviour in developing countries is lacking, these results provide an in-depth understanding of the factors which collectively determine the adoption trends of users during the early stages of adoption. The next relationship discussed is the link between technology trust and intention to use

#### **5.2.4 TECHNOLOGY TRUST AND INTENTION TO ADOPT**

Hypothesis H1a in this study theorised that, in addition to other hypotheses in the model, technology trust also directly influenced user adoption intention. This hypothesis was based on theoretical assumptions discussed in chapter two, which highlighted assertions made by Yousafzai et al. (2009), Lee & Ahn 2013, Rousseau (1998), Jarvenpaa et al, (2000) and Koo and Wati, (2010) that users' trust in technology was a direct determinant of their intention to adopt the technology. In evaluating this hypothesis, a path from technology trust to intention to use was included in the theoretical model and the subsequent evaluation of this theorised path showed a strongly significant influence with a p-value less than 0.001 and standardised regression weight of 0.234. With this empirical evidence, the theoretical influence of technology trust on intention to adopt was justified, supporting hypothesis H1a. This positive relationship between technology trust and intention to use was also tested while controlling for demographic factors as control variables and the significance of the relationship remained constant with no noteworthy change in estimated regression weight from technology trust to intention to use. This result justifies the assumptions of the research and the assertions of previous scholars discussed in chapter two who stated that trust in technology results in increased intention to adopt. In addition to revealing a positive relationship between both factors, one interesting finding is the lack of a notable change in the significance of influence subsequent to the introduction of control variables. As suggested by Rogers (2003), non-

adoption of innovations may be due to laggards being sceptical about new technology or lack of adequate technology competency. Rogers (2003) also suggest that what differentiates early adoptions from later adopters is that early adopters are more willing to risk the adoption of innovations rather than the later adopters who are more cautious. Furthermore, reviewed literature in chapter two theorised a disparity between age groups, education levels and gender about willingness to trust technology and willingness to adopt. The lack of a significant change in the influence of trust on intention to use suggests that the discussed hypothesis and suggestions which identify trust as a determinant of trust amongst are valid. Trust remains a significant factor that influences intention to use and an increase in trust leads to a more favourably attitude among users to adopt the technology. Inversely, a decrease in trust leads to a decrease willingness to adopt technology.

It is also important to note that the regression weights of perceived usefulness, perceived ease of use and technology trust, towards intention to use, indicate that perceived usefulness exhibits more of an influence on intention to adopt than technology trust and technology trust's influence is greater than that of perceived ease of use. In summary, users will first consider if mobile banking in Nigeria is useful before evaluating its trustworthiness based on confidentiality assurances, non-repudiation establishment, access control infrastructures, best business practices of mobile banking vendors, authentication procedures and integrity measures. Perceived ease of use, though still a significant factor, is then considered afterwards.

### **5.2.5 INTENTION TO USE AND ACTUAL USE**

While developing this study's theoretical model, one requirement was to address limitations experienced by some existing technology adoption models. The models in question here are the TPB and TRA, which theorised that behaviour intention inevitably led to actual behaviour (Sheppard et al. 1988; Morwitz (2007). This study evaluated both constructs individually based on the notion that intention to adopt did not automatically result in actual adoption (Hale et al., 2003. Relevant scale items adopted from relevant existing literature were used to measure both constructs and the hypothesised influence of intention to use on actual use. The subsequent evaluation of the hypothesised relationship, represented by hypothesis H4, was evaluated and the results showed a strongly significant influence on actual use from intention to use with a p-value of  $p < 0.001$  and regression weight of 0.708. This result supports the hypothesis suggesting that intention to use, upon adequate positive influence from technology trust, perceived ease of use and perceived usefulness, positively influences actual use of mobile banking in Nigeria.

However, the researcher believes that intention to use does not result in outright adoption and must be considered only as a significant determinant of adoption behaviour and not an absolute indicator of the adoption (Hale et al., 2003). Considering Rogers (2003) classification of rejection and discontinuance, discussed in chapter two, users can actively reject an innovation after adopting it or reject the innovation without trying it at all. Users can also intend to adopt, actually adopt it and then discontinue using the technology based on a more advantageous substitute or a dissatisfaction with the technology's performance. In these scenarios, intention to use ultimately led to a discontinuance of use. The researcher suggests that in considering user's behaviour towards technology adoption, researchers and innovators should adopt the research methods in this investigation by considering specific aspects of the technology in question and how they relate to user's perception and adoption trends, but also not consider intention to use as an absolute determinant of actual adoption. This will help avoid pro-innovation bias and provide a more holistic view on how aspects of the technology in question can affect technology adoption. The final aspect of this study's results to be discussed is the mobile banking environment, early adoption and the temporal effect on adoption

#### **5.2.6 ADOPTION AND TIME**

Time was highlighted by Rogers (2003) in the DOI theory as an important component of technology diffusion. However, several technology adoption studies, such as the studies by Kamaluzaman (2007), Koufaris and Hampton-Sosa (2004), Kazemi et al (2013) and Jaradat and Twaissi (2010) Zhenhua and Shaobo's (2009), fail to recognise the influence of time and how it can alter the nature of technology adoption constructs (Kim & Malhotra, 2005). Consider the reports published by EFINA (2013) regarding the adoption rate of cashless payment systems in Nigeria. In 2012, mobile banking had achieved only a 5% adoption across the nation. However, by 2013, the adoption had increased to 13%. Additionally, consider also table 1:1 in chapter 1, mobile phones in Nigeria had only attained 0.02 million subscribers in 1998, with a telecommunication density of 0.02%. However, by 2014, the number of subscribers was over 200 million with a teledensity of 91.4%. These facts show that adoption rates are not constant and can change over periods. Kim and Malhotra (2005) suggest that time is a factor which influences almost every aspect of technology adoption and because of this temporal influence, variables which influence adoption, such as trust, and adoption itself, are not constant. Lee and See (2004) also agree with this notion and concurs with Rogers (2003) who also classified adopter categories based on time by stating that earlier adopters have a

higher rate of adoption than later adopters do. Regarding the influence of time on adoption of mobile banking adoption in Nigeria, CBN's cashless policy was introduced in 2011 with the aim of fostering a complete adoption of cashless payment systems among Nigerians (Ibikunle & Mayo, 2012). Despite the slow adoption rate, Nigeria is still in the early stages of adoption and the percentage of mobile banking usage has increased from its inception in 2011. Currently, according to the reports from EFINA (2013) which were shown in chapter 1, a lack of trust is a major issue hindering the adoption of mobile banking in Nigeria and this study has revealed that trust, as well as additional constructs, are currently influencing the intention to adopt mobile banking and the actual adoption of mobile banking in Nigeria. With these in mind, the researcher suggests that time also be considered as a factor which theoretically influences the results achieved in this study. In essence, despite being a cross-sectional study into the influence of technology on mobile banking in Nigeria, the researcher also suggests that this study act as a benchmark for understanding the adoption trends of the Nigerian mobile banking environment in this moment in time. Using the results achieved here as a measure of how mobile banking is being perceived in this moment in time and how consumer trust affects the adoption of the technology, a snapshot of user adoption behaviour has been achieved. However, the researcher suggests that this study act as a premise to conduct more longitudinal and periodical set of investigations in order to fully understand the evolution of mobile banking adoption in Nigeria and the change, if any, in user trust in the technology as well as variations perceptions of its useful and ease of use. The next section will focus on the implications of this study and the contribution the results have made to the academic and managerial environment

### **5.3 IMPLICATIONS AND CONCLUSION**

The findings of this study provide significant theoretical implications as well as implications for policy and technological recommendations. This study aimed to investigate the impact of technology trust on mobile banking adoption in Nigeria by implementing a model designed based on adaptations from existing technology adoption frameworks. This study also hypothesised relationships of influence between technology trust, as well as perceived ease of use, perceived usefulness, intention to adopt and actual adoption. In addition, this research provided further insight into the relationships between these constructs by evaluating the possible changes in relationship significance when socio-demographic factors were introduced. Ultimately, the significance of this study's contribution to knowledge is based on its key

findings, implications and contributions to the lack of extensive research on technology adoption in developing countries.

Regarding the key findings, this study was able to investigate and prove the influence of the technological aspects of mobile banking technology, namely confidentiality, access control, integrity, and authentication on technology trust as well as the influence of organisational factors, namely best business practices, on technology trust as well. The positive relationship between these factors and trusts suggests that user trust in mobile banking technology is influenced by technological and organisation factors and among the six factors identified as contributors to technology trust, integrity showed the greatest influence. In addition, this study revealed that technology trust influenced perceived ease of use and perceived usefulness, indicating that users' trust in mobile banking can alter their perception of the technology as well. Technology trust was also revealed to influence intention to use directly, and indirectly through its significant influence on perceived ease of use and perceived usefulness. This is because both perceived ease of use and perceived usefulness were directly influenced by technology trust and directly influence intention to use. Furthermore, the hierarchy of factors influencing intention to use starts with perceived usefulness followed by technology trust and perceived ease of use. This suggests that customers perception of the usefulness of mobile banking in Nigeria has a higher influence than their trust in the technology and their perception of its ease of use. However, technology trust is still a crucial factor as it affects perceived ease of use and usefulness. This study also revealed that despite the presence of demographic factors, these relationships remained significant, affirming that for all demographic variations in this study, trust in mobile banking, perceived ease of use and perceived usefulness dictate users intention to adopt the technology, and ultimately lead to actual or non-adoption. These findings also pose significant practical implications for mobile banking in the country.

### **5.3.1 THEORETICAL IMPLICATIONS**

As stated by the researcher in section 5.2.6, this study's model has evaluated user adoption behaviour during the early stages of mobile banking adoption in Nigeria. Therefore, the results here can serve as a theoretical and empirical reference for future studies, which can investigate technology trust and mobile banking in Nigeria and compare the results achieved here with future findings. The results of this study were achieved using an integrative model, which included theoretical contributions from the TAM and DOI. This model was used to investigate the early adoption trends in Nigeria concecal validationrning mobile banking and trust in the



technology. The success of this model's incorporation of technology trust and its antecedents as well as its successful implementation in studying early adoption in a developing country indicates that theoretical model in this study exhibits considerable theoretical premise and empirical significance. Consequently, this model is a valid technology adoption framework based on justified theoretically and capable of statistical validation in investigating technology adoption and usage behaviour. This model can be applied, not just in evaluating mobile banking and technology trust, but also in other technology adoption and user behaviour studies such as cloud computing and trust, video gaming and intelligence or social media and self-esteem. By implementing this model, researchers can itemize the factors of the technology in question, relate it to the external variable such as trust, intelligence, self-esteem or ego and investigate how these constructs dictate user adoption behaviour while also evaluating the influence of demographic factors on relationships.

Previous frameworks such as the TRA and TPB failed to consider the role of external variables in relation to technology adoption and considered actual use as an absolute result of intention to use. As discussed in chapter two, studies, which have implemented the TAM, have focused on controlled sample groups that led to research results, which lack real-world generalizability. Criticisms of the TAM also revealed that its application has been largely concentrated on studies of voluntary technology use with a lack of studies conducted in environments, which require individuals under their jurisdiction to use the newly implemented technologies with no alternatives. This study's model goes beyond the TPB and TRA's limitations by measuring intention to use and actual use as separate constructs. In addition, this study's model goes beyond the limitations of the TAM by investigating mobile banking adoption behaviour in an environment where using traditional banking methods is being phased out in support of the semi-mandatory cashless banking methods being implemented by Nigeria's financial governing body. Therefore, the researcher considers this study's model as an appropriate tool for investigating technology adoption behaviour and suggest further application of the model in fields of study which seek to understand user behaviour and adoption of technology

### **5.3.2 TECHNOLOGY AND POLICY IMPLICATIONS**

Nigeria's traditional cash-heavy financial system has been disadvantageous to the nation (CBN, 2013), causing financial institutions and policy makers to seek alternative methods of banking which can alleviate the problems a cash-heavy economy poses towards economic and national development. In deliberating on possible solutions to the cash-heavy problems of the

nation, CBN has considered the widespread usage of mobile phones as an opportunity to exploit an already established mobile technology user base, of significant proportions, to introduce mobile banking as an instrument that offers enough benefits to encourage Nigerians to transition from cash-heavy transactions to cashless transactions. However, adoption levels of the technology are currently unsatisfactory and with financial institutions investing resources in the development and distribution of mobile banking services, understanding the reasons behind the current user adoption trend towards mobile banking will allow policy makers and financial institutions to focus on priority areas to improve user adoption of mobile banking in Nigeria. With this in mind, technology trust was identified as a significant theoretical factor that determines intention to adopt the technology. Integrity was revealed as the most influential factor in determining technology trust followed by best business practices, confidentiality, access control, non-repudiation and authentication. These findings are significant to policy makers and mobile banking application developers because they indicate that user's adoption of mobile banking can be increased by increasing their trust in the technology. To accomplish this, policy makers and application developers must recognise the establishment and maintenance of mobile banking integrity as a priority for mobile banking application development. Mobile banking reliability, and transaction accuracy should be foremost on the design requirements of the application. Once vendors can ensure that mobile banking services operate reliably and accurately, vendors must then consider their customer care procedures and the methods they use in handling customer complaints and enquiries regarding mobile banking usage. The results from this study show that best business practices is the second most influential factor on users trust in mobile banking technology in Nigeria. Users will be more likely to trust and adopt the technology if it operates reliable and their complaints can be addressed by vendors in circumstances when it does not operate reliably. Subsequent to establishing an application that operates reliably as well as establishing satisfactory business practices, customer privacy protection and access control must be guaranteed. Adequate security measures must be in place to ensure that user financial information is safeguarded from unauthorised access and manipulation. Upon reaching satisfactory integrity and confidentiality measures, non-repudiation and authentication are the next priority. Vendors must then consider that users require assurances that participants involved in transactions are genuine and will not be able to deny participating in a transaction after actually participating. Ensuring that only valid and authenticated users participate in transactions, increases users trust in the technology and ultimately their adoption of mobile banking. In light of these suggestions, the research would also like to note despite certain factors like integrity and perceived usefulness showing

higher degree of influence on technology trust and intention to use respectively, it does not indicate that all other influential factors should be considered with less priority. Instead, the research suggests that policy makers ensure that even when considering integrity as a priority because of its higher degree of influence on technology trust, confidentiality, best business practices and the other influential factors should be given adequate focus as well in order to create optimal mobile banking solutions. These suggestions can be addressed technologically as well as managerially by certifying that the design of mobile banking software meets appropriate standards for all six factors and guaranteeing that policy makers provide adequate support and impetuses to designers to meet these standards. By adhering to all this, trust in mobile banking technology and the adoption of the technology will increase.

In addition to technology trust's influence on intention to use mobile banking technology, perceived usefulness and perceived ease of use were revealed to significantly influence intention to use mobile banking directly, and influence actual adoption indirectly. The implications of this result suggests that mobile banking vendors must take steps to increase the usability of mobile banking applications as well as the helpfulness of the services they provide to customers. Perceived usefulness was revealed to have a greater influence than technology trust and perceived ease of use despite all three factors being significant contributors to users' intention to use the technology. Therefore, policy makers and mobile banker vendors must see it as a mandate to create strategies where the usefulness of the technology will be communicated to the general public. Consider Rogers (2003) description of various adopters. In his DOI theory, Rogers highlights the role of opinion-leaders and motivators who can influence the opinions of the early majority. By influencing the early majority, the early majority can in-turn influence the late majority and ultimately the laggards. The researcher suggests that the key to accomplishing an almost absolute adoption of the technology is to use appropriate communication channels, to publicise the cashless policy and its associated technologies. By establishing a technology which meets all the afore mentioned technological standards, communicating its usefulness and ease of use to the users will undoubtedly increase users intention to adopt it. However, considering trust influences perceived ease of use and perceived usefulness, application designers and financial institutions must also ensure that customers perceive their applications as trustworthy because regardless of the ease of use of their application or its usefulness, trust in the technology will continue to dictate users' actual perception of both factors. The researcher suggests mobile banking vendors run extensive prototype testing of mobile banking applications to measure users perception of their

applications usefulness and ease of use. This can provide extensive feedback to vendors and developers on what areas of their technology are perceived as advantageous or detrimental to the user. Policy makers must also ensure that standards for usefulness and ease of use are set and adhered to because these standards will encourage vendors to develop applications which have a higher chance of being adopted by customers.

The final implication of this study focuses on awareness and sensitization. As discussed in chapter 1, mobile banking has only achieved a penetration rate of 13% in 2013 (NOI, 2013). In addition, 60% Nigerians are still unaware of mobile banking despite CBN's sensitisation and awareness policies (EFINA, 2013). Mobile banking is still be in its early stages of adoption in Nigeria (Hamza & Shah, 2014) and strategies need to be established to increase the awareness of the technology across the populace. By increasing the awareness of the technology and sensitising the populace to its usage, the technology will have an increased probability of adoption. Rogers' (2003) classification of adopters identifies five categories of adopters and currently, only innovators and the early adopters have adopted mobile banking in Nigeria, making up the 13% adoption reported by EFINA (2013). In order to increase the adoption rate, mobile banking must be increasingly adopted by the early majority, late majority and laggards. In addition, since this study has revealed perceived usefulness, technology trust and perceived ease of use as significant factors that influence intention to adopt and actual adoption, policy makers must consider avenues to increase adoption among these later adopters using these factors as motivating tools. The research considers suggestions from Robinson (2009) regarding strategies, which innovation vendors should adopt in order to increase awareness and adoption. Firstly, in increasing awareness among the early majority, vendors must use mass media outlets to publicise the benefits of mobile banking and recruit opinion leaders as icons for the adoption of mobile banking. This is because early majority adopters look to the early adopters as role models and consider their opinions as valuable advice. If opinion leaders endorse an innovation such as mobile banking, the adoption intention of the early majority will increase (Sahin, 2006). Mobile banking vendors must also make sure that as adoption increases amongst the early majority, feedback from this group of adopters is used to improve the mobile banking service, making it easier to use, increasingly advantageous and trustworthy. By doing this, confidence in mobile banking will increase among the non-adopters in the early majority group, leading them to adopt the technology. Upon increased intention to adopt and actual adoption by the early majority, mobile banking vendors must then recruit members of the early majority adopters as peer-educators. These peer-educators will serve as

a link to the late majority and give the late majority more encouragement to adopt the technology. However, the late majority are more sceptical than the early majority and, as discussed in chapter 3, require adequate information about the advantages and disadvantages of an innovation before they decide to either adopt or reject it. Therefore, before considering an increased adoption amongst the late majority and laggards, policy makers and mobile banking technology developers must ensure that their applications meet adequate integrity, confidentiality & access control standards as well as sustained best business practices and adequate non-repudiation and authentication standards. In addition, the technology must be easier to use at this point and not be costly to adopt. This will provide the late majority with more motives to forgo their scepticism in favour of adopting the mobile banking technology. Finally, in order to increase adoption amongst the final 16% of the populace, known as the laggards, mobile banking vendors must consistently propagate the benefits of mobile banking to the laggards in a bid to convince them that traditional banking methods are detrimental to both themselves and the economy at large. Laggards must be made aware of how easy it is to transition to cashless banking as well as how easy it is to utilise the cashless banking technologies such as mobile banking. Laggards typically take longer during their adoption decision process so mobile banking vendors must be resolute in increasing adoption amongst this adoption group through improved services offered through mobile banking, continued communication of the technology's benefits and sustained reliability of the technology as well. These strategies will aid in increasing mobile banking adoption across the Nigerian populace and aid the economy growth and development which the cashless policy aims to achieve in the nation. In conclusion, the results of this study have provided both mobile banking technology developers and policy makers with a set of factors which, if considered as standards for mobile banking software, will increase user trust in the technology and lead to higher rates of adoption. The next sections will detail the limitations of this study as well as areas for future research

#### **5.4 LIMITATIONS**

Despite the key contributions made by this study, it has limitations, which also provide avenues for future research.

Firstly, this research focused mainly on technology trust, which is only one of several dimensions of trust. The theories discussed, frameworks designed and data collected were all directed towards understanding the role of technology trust on mobile banking adoption in Nigeria. However, there also exist other types of trust such as institutional trust and personal

trust (McKnight et al, 1998) or Masrek et al's (2012) organisational and person trust. These different dimensions of trust are characterised by several contributing factors that define them and provide possible areas for future research to be conducted. The research recommends that other dimensions of trust be investigated in relation to mobile banking adoption in Nigeria as well as the adoption of other forms of technology in other environments. By investigating other aspects of trust and combining those findings with the results in this study, researchers can provide a more in-depth and holistic understanding of the concept of trust and user adoption behaviour.

Another limitation of this study was geographical constraints. Considering the current threat of terrorist activity in Nigeria, several areas were unable to be considered as part of the sample group. However, the researcher still considers the data, which can be obtained from these areas as significant to mobile banking adoption studies as the population in these areas are both users and non-users of the technology. The research recommends future studies to consider obtaining data from these areas providing that safety can be assured by either increased security measures or the improvement in the socio-political issues in Nigeria.

An additional limitation of this study was resource constraints. These constraints occur as a result of time and finances constraints as well as socio-political issues within Nigeria. In this study, the researcher used online surveys, in addition to paper surveys to partially alleviate the effects of these constraints on this study. However, future research can go beyond this study by being afforded more resources to conduct research for longer periods, leading to more results that are extensive.

The final limitation regards sampling constraints. Convenience sampling was used to select participants for this study. Despite the sample group providing usable data for analysis, convenience sampling. However, more statistically rigorous sampling methods can be applied in similar studies to ensure that the sample group and the data provided by them have been statistically justified and validated

## **5.5 FUTURE WORK**

This thesis has developed an integrated model that provided a systematic approach to understand the adoption of mobile banking and the role trust plays in Nigeria. The development of this model has provided an avenue for its application in other areas of technology adoption. The researcher has already suggested further research into dimensions of trust and the

researcher suggests the application of this model in various adoption environments such as rural settings and in more developing countries. By investigating technology adoption in these areas, more evidence will be provided towards establishing the validity of the model

Section 5.2.6 discussed adoption and time in relation to technology adoption studies and time constraints were another limitation experienced in this study, leading to an inability to collect data from a considerably larger sample size and at different periods in the adoption stages of mobile banking in Nigeria. As suggested by Rogers (2003), technology adoption studies should consider longitudinal cross-sectional studies over different periods in the adoption cycle of an innovation. In section 5.3, the researcher highlights time as an important factor when studying adoption behaviour and prior literature indicates that individual's perceptions are formed and change over time, experience and continuous feedback from surroundings (Venkatesh & Davis, 2000; Davis et al., 1989). Thus, the researcher suggests that future research should incorporate longitudinal studies over different periods in order to uncover more extensive results and knowledge on user behaviour towards technology.

The researcher recommends that future studies should also consider more exhaustive set of demographic profiles in investigating their impact on trust and technology acceptance. A total of 10 demographic characteristics were considered in this study but there are several other demographic data sets which can be considered such as individual's monthly income, personal history with mobile banking on technology in general as well as considering the different banking institutions, their mobile banking applications and the user's specific experience with them. Even though this study revealed no significant relationship between the 10 demographic segmentations considered and technology trust, investigating more demographic segmentations would provide data for comparison with the findings of this study and lead to a more holistic outlook on demographic information, technology trust and technology acceptance.

Future research could also consider the addition of more external variables in a bid to understand technology adoption. For example, perceived risk is a factor that has been linked to user adoption (Lee et al. 2000; Pavlou2003). Perceived risk can be studied in relation to mobile banking in Nigeria as well as technology adoption in several other environments. The research suggests that the successful completion of this study provides a premise to future research to extensively study constructs like risk, trust, self-esteem, power, confidence and intelligence and their relationship with technology adoption.

## 6 REFERENCES

ACI Worldwide and Aite Group (2012) “Global Study Identifies Impact of Smartphone Use on Mobile Banking and Payments. Available at: <http://www.aciworldwide.com/news-and-events/press-releases/global-study-indentifies-impact-of-smartphone-use-on-mobile-banking-and-payments.aspx>. [Accessed on: 12 April 2014]

Adewoye, J. O. (2013). Impact of Mobile Banking on Service Delivery in the Nigerian Commercial Banks International Review of Management and Business Research Vol. 2 Issue.2

Adeyeye, M. (2008) “e-Commerce, Business Methods and Evaluation of Payment Methods in Nigeria.” [online] *The Electronic Journal Information Systems Evaluation*. Volume 11 Issue 1, pp. 45 – 50, Available from [www.ejise.com](http://www.ejise.com) [Accessed on: 12 November 2014]

Agarwal, R., & Prasa, J. (1998) A Conceptual and Operational definition of Persinal Innovativeness in the Doman of Information Technology. *Information Systems Research*, 9(2), 204-215

Agwu E. M. and Carter A. (2014) Mobile Phone Banking In Nigeria: Benefits, Problems and Prospects. *International Journal of Business and Commerce* Vol. 3 (6), 50-70

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes*, 50, 179-211. Available from: <http://courses.umass.edu/psyc661/pdf/tpb.obhdp.pdf> [Accessed on 1 May 2014]



Ajzen, I. & Fishbein, M. (2000). Attitudes and the attitude-behaviour relation: Reasoned and automatic processes. In W. Stroebe & M. Hewstone (Eds.), *European review of social psychology* (pp. 1-33). John Wiley & Sons.

Ajzen, I. & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.

Al-Jabri i. M. and Sohail S. M. (2012) Mobile banking adoption: application of diffusion of innovation theory. *Journal of electronic commerce research*, vol 13, no 4,

Anus S, Qureshi F.A, Malik S, Abbasi A, Chaudhry A and Mirza S. N, (2011) Trust and initial acceptance of Mobile Banking in Pakistan. *International Journal of Scientific & Engineering Research* Volume 2, Issue 8, August-2011 1 ISSN 2229-5518.

Bagozzi, R. P., Yi, Y. & Phillips, L. W. (1991). Assessing construct validity in organizational research. *Administrative Science Quarterly*, 36(3), 421-458. <http://www.jstor.org/pss/2393203>

Balmaceda Phillips-Wren (2004) *Innovations through Information Technology: Effect of Trust on the Success of IT Reform in Chile*. IGI Publishing. ISBN13: 9781616921255

Bagozzi, R. P., Davis, F. D., and Warshaw, P. R. (1992). 'Development and Test of a Theory of Technological Learning and Usage', *Human Relations*. Vol. 45, No.7, pp. 659-686

Bhimani, A. (1996) 'Securing the Commercial Internet', *Communications of the ACM* 39: pp. 29-35.

Bland J and Altman D. (1997) Statistics notes: Cronbach's alpha. *BMJ*. 1997;314:275.

Brancheau, J. C. & Wetherbe, J. C. (1990). The adoption of spreadsheet software: Testing innovation diffusion theory in the context of end-user computing. *Information Systems Research*, 1(2), 115-143. <http://dx.doi.org/10.1287/isre.1.2.115>

Central Bank of Nigeria, (2011). Further classification on cashless project. Available at: <http://www.cenbank.org/out/2011/pressrelease/gvd/cashless%20lagos%20brief%20for%20website%20revised2.pdf>. [Accessed on: 21 March 2013]

Central Intelligence Agency, (2014). The world factbook. Available at: <https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html> [Accessed on: 12 January 2014]

Cheah, C. M., Teo, A. C., Sim, J. J., Oon, K. H., and Tan, B. I. (2011). Factors Affecting Malaysian Mobile Banking Adoption: An Empirical Analysis. *International Journal of Network and Mobile Technologies*, 2(3), 149-160.

Chiravuri A. and Nazareth D. (2001). Consumer trust in electronic commerce: An alternative framework using technology acceptance. *Seventh Americas Conference on Information Systems*

Cho, D. Y., H. J. Kwon, and H. Y. Lee. 2007. "Analysis of Trust in Internet and Mobile Commerce Adoption." In *Proceedings of the 40th Hawaii International Conference on System Sciences (HICSS-40 2007)*. IEEE Computer Society. 3–6 January, Waikoloa, Big Island, Hawaii.

Crabbe M., Standing C. and Standing S.(2009) An adoption model for mobile banking in Ghana International Journal of Mobile Communications, Vol. 7, No. 5, 2009 515

Connolly R., and Bannister F. (2007) Consumer Trust in Electronic Commerce: Social & Technical Antecedents. International Journal of Human and Social Sciences 2:4 2007

Csikszentmihalyi M. and Csikszentmihalyi I.S. (1988) Optimal experience: psychological studies of flow in consciousness. Cambridge University Press, Cambridge, UK

Davis, F.D., (1989). "Perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS Quarterly, Vol.13, No.3, pp.319-40.

Davis, F.D., Bagozzi, R.P. and Warshaw P.R, (1989). 'User Acceptance of Computer Technology: A Comparison of Two Theoretical Model', Management Science, Vol.35 No. 8. pp. 982-1003

Davis, F. D. (1993). User acceptance of information technology: System characteristics, user perceptions and behavioural impacts. International Journal of Man-Machine Studies, 38(3), 475-487. <http://dx.doi.org/10.1006/imms.1993.1022>

Deans, K. R. and Gray B. J. (2010). Third screen communication and the adoption of mobile marketing: A Malaysia perspective. International Journal of Marketing Studies, Vol. 2, No. 1; May 2010

Doherty, M. (1994) Probability versus Non-Probability Sampling in Sample Surveys, The New Zealand Statistics Review March 1994 issue, pp 21-28.

Doney, P. M. and Cannon, J. P., (1997), "An Examination of the Nature of Trust in Buyer-Seller Relationship," *Journal of Marketing*, Vol. 61, pp. 35-51.

Donner, J. and Tellez, C. (2008). "Mobile banking and economic development: Linking adoption, impact, and use", *Asian Journal of Communication*, 18(4), 318-32

EFINA (2013) What does the CBN's Cash-less policy mean for financial inclusion in Nigeria? Available from: <http://www.efina.org.ng/assets/manualUploads/EFInAWhat-does-the-CBNs-Cash-less-policy-mean-for-financial-inclusion-in-NigeriaMarch-2013.pdf> [Accessed on: 12 April 2014]

Eriksson K, Kerem K, Nilsson D (2005). Customer acceptance of internet banking in Estonia, *International. Journal. Bank Mark.* 23 (2), 200-216.

Federal Reserve (2014) Consumers and Mobile Financial Services 2014. <http://www.federalreserve.gov/econresdata/consumers-and-mobile-financial-services-report-201403.pdf> [Accessed on: 12 April 2014]

Fishbein, M. & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley

Fornell C. and D. F. Larcker D. F. (1981). "Evaluating structural equation models with unobservable variables and measurement error," *Journal of marketing research*, pp. 39-50,

Gefen, D., and Straub, D.W. (1997) "Gender differences in the perception and use of e-mail: An Extension to the Technology Acceptance Model," MIS Quarterly (21:4), 1997, pp. 389-400

Geffen, D., Karaganda, E., and Straub, W.D., (2003) "Trust and TAM in Online Shopping: An Integrated Model," MIS Quarterly Vol. 27, No. 1, 2003, pp. 51-90.

GFT Technologies (2013) " Mobile Banking - Will Smartphones replace Bank branches? Available from: [http://www.gft.com/index/services/perspectives/bluepaper\\_will\\_smartphones\\_replace\\_bank\\_branches.html](http://www.gft.com/index/services/perspectives/bluepaper_will_smartphones_replace_bank_branches.html) [Accessed on: 08/05/2014]

Goodhue, D.L. and Thompson, R.L.(1995). Task-technology fit and individual performance, MIS Quarterly, 19(2), 213-236

Gould, J. D., Boies, S. J. and Lewis, C. (1991). 'Making Usable, Useful, Productivity-enhancing computer applications' Communication of the ACM

Gu, J., Lee, S. and Suh, Y. (2009) Determinants of Behavioural Intention to Use Mobile Banking. Expert Systems with Applications, 36, 1, 11605-11616.

Guerrero M.M., Egea J.,M.,O., Gonzalez M.,V.,R., profiling the adoption of Online Banking Services in the European

Union, Research paper, University of Almeria, Spain, Department of Business Administration

Gupta, P. (2005). Web Services: An Enabler for Mobile Banking. An Intellect White Paper. Available from: <http://www.polaris.co.in/new/PDF/Oct2005/SOA%20in%20Mobile%20Banking.pdf>. [Accessed on 2 November 2010]

Hamza, Aminu and Shah, Asadullah (2014) Gender and mobile payment system adoption among students of tertiary institutions in Nigeria. *International journal of Computer and Information Technology*, 3 (1). 13-20. ISSN 2279-0764

Hartwick, J., and Barki, H. "Explaining the Role of User Participation in Information System Use," *Management Science* (40:4), 1994, pp. 440-465

Hosmer, L. T. (1995). Trust: The Connecting Link between Organizational Theory and Philosophical Ethics. *Academy of Management Review* 20 (1995) 379-403.

Hwang A. C., Terence T. O and Hinston-Hudson V. D. (2010) *Managing Worldwide Operations & Communications with Information Technology: Antecedents of Online Trust and Acceptance of E-Commerce*.

Ibikunle F & Mayo Z. (2012). A Model for Implementing Mobile Banking in Developing Countries (e.g. Nigeria). *International Journal of Engineering and Technology* Volume 2 No. 3, March, 2012

Iddris F. (2013) Barriers to Adoption of Mobile banking: Evidence from Ghana. *International Journal of Academic Research in Business and Social Sciences* July 2013, Vol. 3, No. 7 SN: 2222-6990 356

Irwin B., Cajee Z., Douglas D., and Stroebel S., (2003). Cell phone banking: Predictors of adoption in South Africa-an exploratory study. *International Journal of Information Management*, 23, 381-394.

Isaac S. and Michael B. (1990). *Handbook in Research and Evaluation*. San Diego, California: Edits Publishers

Jamieson, R. (1996) 'Auditing and Electronic Commerce', EDI Forum, Perth, Western Australia.

Jaradat M. R., Twaissi N. M. (2010) Assessing the Introduction of Mobile Banking in Jordan Using Technology Acceptance Model. *International Journal of Interactive Mobile Technologies (iJIM)*, Vol 4, No 1 (2010)

Jarvenpaa, S.L. and Tractinsky N. (1999), Consumer Trust in an Internet Store: A Cross-Cultural Validation. *Journal of Computer Mediated Communication*, Vol. 5, No. 2:1-35, 1999.

Jayawardhena C. and Foley P., (2000) "Changes in the banking sector – the case of Internet banking in the UK", *Internet Research*, Vol. 10 Iss: 1, pp.19 - 31

Kabir M. (2013) Factors Influencing the Usage of Mobile Banking: Incident from a Developing Country. *World Review of Business Research*. Vol. 3. No. 3. July 2013 Issue. Pp. 96 – 114

Kamarulzaman, Y. (2007). Adoption of travel e-shopping in the UK. *International Journal of Retail & Distribution Management*, 35(9), 703-719.

Karahanna, E., Ahuja, M., Srite, A., & Galvin, J. (2002). Individual differences and relative advantages: The case of GSS. *Decision Support Systems*, 32. 327-341.

Karahanna, E., Straudb, D. W., & Chervany, N. L. (1999). Information Technology across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs. *MIS Quarterly*, 23(20), 183-213

Kazemi A, Nilipour A, Ashtar M, Kabiry N and Hoseini M. M. Factors Affecting Isfahanian (2013). Mobile Banking Adoption Based on the Decomposed Theory of Planned Behaviour. *International Journal of Academic Research in Business and Social Sciences* July 2013, Vol. 3, No. 7 ISSN: 2222-6990230

Kazi A. K. and Muhammad A. M. (2013) Factors affecting adoption of mobile banking in Pakistan: Empirical Evidence. *International Journal of Research in Business and Social Science IJRBS* Vol.2 No.3, 2013 ISSN: 2147-4478

Kim, D. J., Ferrin, D., & Rao, H. (2008). A trust-based consumer decision-making model in electronic commerce: The role of trust, perceived risk, and their antecedents. *Decision Support Systems*, 44, 544-564

Kini, A. and Choobineh, J. (1998), 'Trust in Electronic Commerce: Definition and Theoretical Considerations', *Proceedings of the 31st Hawaii International Conference on System Sciences*, Hawaii, 1998

Khraim H. S., AL Shoubaki Y. E. and Dr. Khraim A. S. (2011). Factors Affecting Jordanian Consumers' Adoption of Mobile Banking Services. *International Journal of Business and Social Science* Vol. 2 No. 20; November 2011



Kole, ES (2000). Connecting Women from Developing Countries to the Internet: Searching for an Appropriate Paradigm. Paper presented at the panel 'Making Connections in the Internet Era: Theory and Practice' for the 41st Annual Convention of the International Studies Association, 'Reflection, Integration, Cumulation: International Studies Past and Future', 14-17 March 2000, Los Angeles, U.S.A.

Koo, C. & Wati, Y. (2010). "Toward an Understanding of the Mediating Role of Trust in Mobile Banking Service: An Empirical Test of Indonesia Case," *Journal of Universal Computer Science*, 16(13), 1801-1824.

Koufaris, M. & Hampton-Sosa, W., (2004) "The Development of Initial Trust in an Online Company by New Customers," *Information and Management*, 413, 377-397.

Laforet S, Li X (2005). Consumers' attitudes towards online and mobile banking in China. *Int. J. Bank Mark.* 23 (5): 362-380.

Lee H. and Ahn H. (2013) The Role of Trust in the Adoption of Mobile Commerce: Comparison to the Adoption of E-Commerce. *Journal of Convergence Information Technology*. (JCIT) Volume8, Number16, November 2013

Lee, M.K.O., and Turban, E (2001) 'A Trust Model for Consumer Internet Shopping', *International Journal of Electronic Commerce* 6, 1: pp. 75-92

Li, Y. H. and Huang, J. W. (2009) Applying Theory of Perceived Risk and Technology Acceptance Model in the Online Shopping Channel. *World Academy of Science, Engineering and Technology* 53

Li, Y.M. Yeh, Y. S. (2010). Increasing trust in mobile commerce through design aesthetics .  
Computers in Human Behaviour, 26 pp, 673–684

Liao S., Shao, Y.P., Wang, h., & Chen, A. (1999). The adoption of virtual banking: An  
empirical study. International Journal of Information Management, 19(1), 63-74

Lippers, S. K., & Swiercz, P. M. (2005). Human resource information systems (HRIS) &  
technology trust. Journal of Information Science, 31(5), 340-353.

Lippert, S. K. & Davis, M. A. (2006). A conceptual model integrating trust into planned change  
activities to enhance technology adoption behaviour. Journal of Information Science. Vol. 32:5.  
434-448.

Lui H. K. and Jamieson R. (2012). An empirical study on service quality perceptions and  
continuance intention in mobile banking context in India. Journal of Internet Banking and  
Commerce, April 2012, vol. 17, no. 1

Lui, H.K. and Jamieson, R., (2003), “Integrating trust and risk perceptions in business-to  
consumer electronic commerce with the technology acceptance model”, In Proceedings of the  
Eleventh European Conference on Information

Lules I., Omwansa T. K. and Professor Waema M. T. (2002). Application of Technology  
Acceptance Model (TAM) in M-Banking Adoption in Kenya. International Journal of  
Computing and ICT Research, Vol. 6, Issue 1, June 2012

M. Suoranta, and M. Mattila (2004) Mobile banking and consumer behaviour: New insights into the diffusion pattern. *Journal of Financial Services Marketing*, vol. 8, no. 4, pp. 354-366, 2004.

Manoj, S. & Amar K.,(2007)Theory of Reasoned Action & Theory of Planned Behaviour in Alcohol and Drug Education Editor, *Journal of Alcohol & Drug Education*. *Journal of Alcohol and Drug Education*. Provided by ProQuest Information and Learning. All rights Reserved.

Marcella, A.J., Stone, L., and Sampias, W.J (1998) 'Electronic Commerce: Control Issues For Securing Virtual Enterprises', *The Institute of Internal Auditors*.

Maroofi F., Kahrarian F. and Dehghani M., An Investigation of Initial Trust in Mobile Banking *International Journal of Academic Research in Business and Social Sciences* September 2013, Vol. 3, No. 9 ISSN: 2222-6990 394

Masrek M. N., Omar N. and Uzir N. A. (2012) The Impact of Technology Trust on Mobile Banking Utilization *science Series Data Report* Vol 4, No. 12;Dec 2012 27 SDDR

Mathieson, K. (1991). Predicting user intentions: Comparing the technology acceptance model with the theory of planned behaviour. *Information Systems Research*, 2(3), 173-191. <http://dx.doi.org/10.1287/isre.2.3.173>

Mattila, M., Karjaluoto, H., and Pentto, T. (2003). Internet banking adoption among mature customers: early majority or laggards? *Journal of Services Marketing*, Vol. 17 No. 5, pp. 514-28.

Mayer R.C, Davis J.H, and Schoorman F.D.(1995). An Integration Model of Organizational Trust, *Academy of Management Review*, Vol. 20, No. 3:709-734, 1995

McCord, M., & Ratnasingam, P. (2004). The Impact of Trust on the Technology Acceptance Model in Business to Consumer e-Commerce. In *Proceedings of the International Conference of the Information Resources Management Association: Innovations Through Information Technology*. New Orleans, USA (pp. 921-924).

McKnight, D.H., Choudhury, V. and Kacmar, C (2002) 'Developing and Validating Trust Measures for E-Commerce: An Integrative Typology', *Information Systems Research*, Vol. 13 (3) pp. 334-359.

Misiolek, N., Zakaria, N. & Zhang, P. (2002). Trust in organizational acceptance of information technology: A conceptual model and preliminary evidence. *Proceedings of the Decision Sciences Institute 33rd Annual Meeting*, San Diego, California, November 23-26, 2002. 1-7.

Moon, J.W., Kim, Y.G., (2001), "Extending the TAM for a World-Wide-Web context", *Information and Management*, Vol.38, No.4, pp. 217-230.

Moore, G. C, and Benbasat, I. (1991). Development of an instrument to Measure the Perceptions of Adopting an Information Technology Innovation. *Information Systems Research*

Nadim J. and Noorjahan B. (2008). The role of perceived usefulness, perceived ease of use, security and privacy, and customer attitude to engender customer adaptation in the context of electronic banking. *African Journal of Business Management*, 1, 32-40.

Nigerian Communications Commission (2014) Industry data: Subscriber/Teledensity data Available at: [http://www.ncc.gov.ng/index.php?option=com\\_content&view=article&id=68&Itemid=67](http://www.ncc.gov.ng/index.php?option=com_content&view=article&id=68&Itemid=67) [Accessed on: 12 April 2014]

NOI Polls (2013) Adoption of Mobile Money Services Slow Due To Low Public Awareness. Available at: [http://www.noi-polls.com/index.php?s\\_id=3&p\\_id=259&p\\_pt=1&parent=8#.U3of5fldXng](http://www.noi-polls.com/index.php?s_id=3&p_id=259&p_pt=1&parent=8#.U3of5fldXng). [Accessed on 12 April 2014]

O'Casey, A., Fenech, T., (2003), "Web retailing adoption: exploring the nature of internet users' Web-retailing behaviour", *Journal of Retailing and Customer Services*, Vol.10, pp. 81-94.

Odumeru A. J. (2013) Going Cashless: Adoption Of Mobile Banking In Nigeria. *Arabian Journal of Business and Management Review (Nigerian Chapter)* Vol. 1, No. 2, 2013

Ogden, J. (2003). Some problems with social cognition models: a pragmatic & conceptual analysis. *Health Psychology*, 22(4), 424-428

Okereocha C (2008). Seven Years of Telecoms Revolution – One Revolution, a Thousand Gains.

Ojeaga, P. J. (2009). The impacts of the global financial crisis on the Nigerian banking industry. Second cycle, A1E. Uppsala: SLU, Dept. of Economics

Onoja, O (2000) Tell Magazine of Nigeria: The contributions of research and development in the banking industry in Nigeria

Parker, D.B., (1995) 'A New Framework for Information Security to Avoid Information Anarchy'. In Ellof J., Von Solms S. "Information security the next decade. Chaman and Hall 1995.

Pavlou, P.A. (2003). Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model. *International Journal of Electronic Commerce*, 7(3), 101-134.

Perea Y., Monsuwé, T., Dellaert, B. and de Ruyter, K., (2004). What drives consumers to shop online? A literature review. *International Journal of Service Industry Management*, 15, (1): 102–121.

Plouffe, C. R., Hulland, J. S., & Vanderbosch, M. (2010). Research report: Richness versus parsimony in modelling technology adoption decisions ) understanding merchant adoption of a smart card-based payment system. *Information Systems research*, 12(2), 208-222.

Polatoglu VN, Ekin S (2001). An empirical investigation of the Turkish consumers' acceptance of internet banking services. *International J. Bank Mark.* 19(4): 156-165

Popoola N. F. (2013) The Effect of Trust in Adoption of Internet Banking: A case study of Nigeria. *Academic Research Journals*. Vol. 1(2), pp. 19-24, November 2013. Available from: <http://www.academicresearchjournals.org/IJEBM/Index.htm> [Accessed on: 12 October 2014].

Ratnasingam P. and Pavlou P. A. (2002) The Importance of Technology Trust for B2B Electronic Commerce. 15th Bled Electronic Commerce Conference eReality: Constructing the eEconomy Bled, Slovenia, June 17 - 19, 2002

Raykov, T. (1997). Estimation of composite reliability for congeneric measures. *Applied Psychological Measurement*, 21(2), 173-184.

Rogers, E. M. (1995). *Diffusion of Innovations*. (4th Ed). The Free Press. NY

Rokibul K. M. (2013). Factors Influencing the Usage of Mobile Banking: Incident from a Developing Country. *World Review of Business Research* Vol. 3. No. 3. July 2013 Issue. Pp. 96 – 114

Ronnie H. Shroff, Christopher C. Deneen and Eugenia M. W. Ng Analysis of the technology acceptance model in examining students' behavioural intention to use an e-portfolio system The Hong Kong Institute of Education *Australasian Journal of Educational Technology* 2011, 27(4), 600-618

Rose, P.S. & Hudgins, S.C. (2005). *Bank Management and financial services* (6th ed.). New York: McGraw-Hill.

Rousseau D.M., Sitkin S.B, Burt R.S., and C.Camerer, (1998). Not so Different After All: A Cross-Discipline View of Trust. *Academy of Management Review*, Vol. 23, No. 3:393-404, July 1998.

Safeena R., Date H., Kammani A., and Hundewale N. Technology Adoption and Indian Consumers: Study on Mobile Banking. *International Journal of Computer Theory and Engineering*, Vol. 4, No. 6, December 2012

Selim J., Teresa G. Rivas M. (2012) Gender differences in economic experiments. *Revista Internacional de Sociología*. Special Issue on Behavioral and Experimental Economics. Vol. 70, extra 1, 99-111. ISSN: 0034-9712; eISSN: 1988-429X. DOI 10.3989/ris.2011.04.19

Soderstrom, E. (2009). Trust types: an overview. Proceedings of the 8th Annual Security Conference Discourses in Security Assurance & Privacy Las Vegas, NV, USA April 15-16, 2009

Söllner, M.; Hoffmann, A.; Hirdes, E. M.; Rudakova, L.; Leimeister, S. and Leimeister, J. M. (2010): Towards a Formative Measurement Model for Trust. In: 23. Bled eConference eTrust: Implications for the Individual, Enterprises and Society (Bled) 2010, Bled, Slovenia.

SourceWire (2013) Statistics Reveal That Technology is Transforming Mobile Banking. Available from: <http://www.sourcewire.com/news/80028/statistics-reveal-that-technology-is-transforming-mobile-banking-firstnumber-comments> [Accessed on: 12 April 2014]

Suhail S., Bingjia S., Feng X. and Muhammad K. S. (2014) The Impact of Psychological Factors on Consumers Trust in Adoption of M-Commerce. *International Business Research*; Vol. 7, No. 5; 2014 ISSN 1913-9004 E-ISSN 1913-9012

Suoranta, M. (2003), "Adoption of mobile banking in Finland", Jyväskylä Studies in Business and Economics, 28. ISBN: 951-39-1654-5



Sulaiman A., Jaafar N. I, and Mohezar S (2007). An overview of mobile banking adoption among the urban community, *International Journal of Mobile Communications*, vol. 5, no. 2, pp. 157-168, 2007.

Tanakinjal, G. H., Deans, K. R. & Gray, B. J. (2010). Third screen communication and the adoption of mobile marketing: A Malaysia perspective. *International Journal of Marketing Studies*, 2(1), 36-47.

Taylor, S., and Todd, P. A. (1995) "Assessing IT Usage: The Role of Prior Experience," *MIS Quarterly* (19:2), pp. 561-570.

Taylor, S. and Todd, P.A., (1995), 'Understanding information technology usage: a test of competing models' *Information Systems Research*. Vol. 6, No.2, pp. 144–176.

Tiwari, R, & Buse, S, 2007, "The mobile commerce prospects A strategic Analysis of opportunities in the Banking sector", a joint research Paper by Institute of Technology & Innovation Management Hamburg University of Technology, Germany & Chair of International Management University of Hamburg, Germany

Tiwari, R, & Buse, S & Herstatt, C 2007, "Mobile Services in Banking Sector: The Role of Innovative Business Solutions in Generating Competitive Advantage, in: Proceedings of the International Research Conference on Quality, Innovation and Knowledge Management", a research paper, pp. 886–894,

Truong, Y. (2009) "An Evaluation of the Theory of Planned Behaviour in Consumer Acceptance of Online Video and Television Services" *The Electronic Journal Information Systems Evaluation* Volume 12 Issue 2 2009, pp177 - 186

Tunji S., (2013). The Effect of Cashless Banking on Nigerian Economy. *eCanadian Journal of Accounting and Finance* Vol.1, Issue 2. pp.9-19

Turban E., King D., and Lee J (2006). *Electronic Commerce 2006: A Managerial Perspective*, New Jersey: Pearson Education, 2006

Venkatesh, V. (2000) "Determinants of Perceived Ease of Use: Integrating Perceived Behavioral Control, Computer Anxiety and Enjoyment into the Technology Acceptance Model," *Information Systems Research* (11:4), pp. 342-365.

Venkatesh, V. and Davis, F. D. (2000). A theoretical extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science*, 45(2), 186-2004

Venkatesh, V., and Morris, M. G. (2000) "Why Don't Men Ever Stop to Ask For Directions? Gender, Social Influence, and Their Role in Technology Acceptance and Usage Behaviour," *MIS Quarterly* (24:1), pp. 115-139.

Wang T. and Tseng Y. F. (2011). A Study of the Effect on Trust and Attitude with Online Shopping. *International Journal of Digital Society (IJDS)*, Volume 2, Issue 2, June 2011

Waterman, A (2004). Diffusion of Innovations. Web Source: [www.stanford.edu/class/symbysys205/Commentary-RogersDiffusionInnovations.html](http://www.stanford.edu/class/symbysys205/Commentary-RogersDiffusionInnovations.html)

Werner, P. 2004, 'Reasoned Action and Planned Behaviour', in S.J. Peterson & T.S. Bredow (eds), *Middle range Theories: Application to Nursing Research*, Lippincott Williams & Wilkins, Philadelphia, pp. 125-147

Yousafzai S., Pallister J. and Gordon Foxall (2009) Multi-dimensional role of trust in Internet banking adoption. *The Service Industries Journal*. Vol. 29, No. 5, May 2009, 591 –605. ISSN 0264-2069 print/ISSN 1743-9507 [online] Taylor & Francis. DOI: 10.1080/02642060902719958. Available from: <http://www.informaworld.com> [Accessed on 19 November 2014]

Zhou T, Lu Y., and Wang B, Integrating TTF and UTAUT to explain mobile banking user adoption, *Computers in Human Behaviour*, vol. 26, pp. 760-767, 2010.

## 7 APPENDIX A

Table 7:1: Table of constructs, number of items and references

Variable	Number of items in survey	Reference
Demographic: Age, Sex, Marital status, Employment status, Education level, Technology competence, Ethnicity, Mobile phone, Bank account, Mobile banking user,	1 item each. 10 in total	Tashmia et al (2011) Bankole et al, (2011) Suh And Han (2003)
Confidentiality	3	Tashmia et al (2011) Bankole et al, (2011) Suh And Han (2003)
Integrity	3	Tashmia et al (2011) Bankole et al, (2011) Suh & Han (2003)
Authentication	2	Taherdoost et al (2011) Suh And Han (2003)
Access control	3	Tashmia et al (2011) Suh And Han (2003)
Availability	2	Tashmia et al (2011) Koo & Wati (2010) Constance et al (2006)
Best business practices	4	Tashmia et al (2011) Bankole et al, (2011) Connolly & Bannister (2007)

Non-repudiation	3	McKnight et al (2003) Suh And Han (2003)
Perceived Usefulness	2	Tashmia et al (2011) Cheng et al. (2006) Curran and Meuter (2005) Aboelmaged and Gebba (2013)
Perceived ease of use	3	Tashmia et al (2011) Cheng et al. (2006) Curran and Meuter (2005) Aboelmaged and Gebba (2013)
Intended use	2	Ho and Ko (2008) Hsu and Chiu (2004) Aboelmaged and Gebba (2013)
Actual use	3	Tashmia et al (2011)

Table 7:2: Table of shortlisted questions and references for Q-sorting

Variable	Description/key areas	Item	Reference
Perceived usefulness	Perceived usefulness is defined as the extent to which a person believes that using a particular system will enhance his or her job performance.	1. I think that using mobile banking would enable me to accomplish my tasks more quickly.	Tashmia et al (2011)
		2. I think that mobile banking is useful.	Khumbula Masinge (2011)
		3. Mobile banking improves my work and life efficiency	Cheng et al. (2006)
		4. Mobile banking allows me to easily acquire the information I need	Aboelmaged and Gebba (2013)
		5. Overall, mobile banking is useful	
Perceived ease of use	Perceived ease of use is defined as to which a person believes that using a particular system will be free of effort. Among the beliefs, perceived ease of use is hypothesized to be a predictor of intention	1. I think that interaction with mobile banking does not require a lot of mental effort.	Tashmia et al (2011)
		2. I think that it is easy to use mobile banking to accomplish my banking tasks.	
		3. I think that learning to use mobile banking would be easy.	
		4. It would take me lots of time to learn how to use mobile banking services.	
		5. I think that using mobile banking would make it easier for me to carry out my tasks.	

		6. Learning to use mobile banking is easy	Cheng et al. (2006)
		7. It is easy to use mobile banking	Aboelmaged and Gebba (2013)
		8. Overall, using mobile banking is easy	
Intended use	Intention is an indication of a person's readiness to perform a given behaviour, and it is considered to be the immediate antecedent of behaviour	1. I will adopt mobile banking as soon as possible	Ho and Ko (2008)
		2. I intend to use mobile banking in the future	Hsu and Chiu (2004)
		3. I will regularly use mobile banking in the future	Aboelmaged and Gebba (2013)
		4. I intend to use the bank's Website and/or ATM to carry out routine banking transactions	Michael Reid, (2008).
		5. I intend to use the bank's Website and/or ATM to carry out routine banking transactions	
		6. I will strongly recommend others to use the bank's Website and/or ATM	
Actual system use		I have used mobile banking Given the opportunity	Tashmia et al (2011)
		How many times do you use this site in a week?	
		How many hours do you spend using this site every month?	

Confidentiality	Confidentiality refers to privacy issues and determines customer trust based on the mobile banking information technology being able to protect transactions and personal data from unauthorised access, disclosure and manipulation	How frequent is your use of mobile banking	<p>1. I would not feel totally safe providing personal privacy information over mobile banking.</p> <p>2. I would not feel secure sending sensitive information across mobile banking.</p> <p>3. I believe my personal and bank information are well protected by the mobile service provider</p>	Tashmia et al (2011)
	Key areas: Privacy and Protection against disclosure		<p>4. Internet vendors are concerned about consumers' privacy.</p> <p>5. Internet vendors will not divulge consumers' personal data to other parties.</p> <p>6. I feel safe about the privacy control of Internet vendors.</p>	Bankole et al (2011)
			<p>7. All communications with this site are restricted to the site and me.</p>	Suh And Han (2003)
			<p>8. I am convinced that this site respects the confidentiality of the transactions received from me</p>	
			<p>9. This site uses some security controls for the confidentiality of transactions.</p>	
			<p>10. This site checks all communications between the</p>	



		site and me for protection from wiretapping or eavesdropping.	
Integrity	Integrity refers to mobile banking transaction accuracy as customers are more likely to exercise trust if all transaction operations are consistent carried out without being distorted	<p>1. Using mobile banking services would lead to a loss of convenience for me because I would have to waste time fixing payments errors.</p> <p>2. Mobile banking services may not perform well and process payments incorrectly.</p>	Tashmia et al (2011)
	Key areas: Accuracy, Completeness, Reliability	<p>3. Internet vendors usually ensure that transactional information is protected from accidentally altered or destroyed</p> <p>4. When transferring money through mobile banking, I am afraid that I will lose money due to careless mistakes such as wrong input of account number and wrong input of the amount of money.</p> <p>5. I like using mobile banking because it provides me with accurate and timely information on my account</p>	Bankole et al(2011)
		6. I think MB provides me with a complete set of Information	Koo and Wati (2010)
		7. MB provides me with all the information I Need	

		8. MB produces correct banking information (dropped)	
		9. There are few errors in the information I obtain from MB (dropped)	
		10. MB performs reliably and securely	
		11. The operation of MB dependable	
		12. This site checks the information communicated with me for accuracy.	Suh And Han (2003)
		13. This site takes steps to make sure that the information in transit is accurate.	
		14. This site takes steps to make sure that the information in transit is not deleted.	
		15. This site devotes time and effort to verify the accuracy of the information in transit.	
Authentication	Authentication determines customer's propensity to trust as it refers to the legitimacy of mobile banking transactions and the perception that all the elements involved in the transaction are genuine	1. Only authorized individuals are able to access to confidential information.	Taherdoost et al., (2011)
		2. I believe that smart card is able to confirm the identity of cardholder before using a card.	
	Key areas: Genuine, Originality, Legitimacy	3. The transactions I send are transmitted to the real site to which I want to transmit.	Suh & Ingoo Han (2003)

Non repudiation	<p>Non-repudiation refers to systems which protect the financial institution and customers interests of the mobile banking transaction by providing acknowledgment measures and standards which verify that each party involved in a transaction process is genuine in identity and participation</p>	<p>4. The messages I receive are transmitted from the real site from which I want to receive.</p> <p>5. This site ascertains my identity before sending any messages to me.</p> <p>6. This site ascertains my identity before processing the transactions received from me.</p> <p>1. This site will not deny having participated in a transaction after processing it.</p> <p>2. This site will not deny having sent me a message.</p> <p>3. This site will not deny having received a transaction from me.</p> <p>4. This site provides me with some evidence to protect against its denial of having sent a message.</p> <p>5. This site provides me with some evidence to protect against its denial of having received a transaction from me.</p>	Suh & Ingoo Han (2003)
Access control	<p>Key areas: Acknowledgment and Non-denial</p> <p>Access control defines the infrastructures set up to ensure transactions are carried out without intrusions and disruptions</p>	<p>1. I think my bank have access to the information needed to handle transactions appropriately</p> <p>2. I am worried about use mobile banking because other</p>	Tashmia Ismail and Khumbula Masinge

	<p>Key areas: Unauthorised and authorised access, Protection from manipulation</p>	<p>people may be able to access my account.</p> <p>3. The website is easily accessible from any interior pages</p> <p>4. The search engine on this website is always accessible</p> <p>5. This site devotes time and effort to preventing unauthorized access to my personal information.</p> <p>6. Databases that contain my personal information are protected from unauthorized access.</p> <p>7. This site will really remove my personal information when I request it to do so</p>	<p>McCord &amp; Ratnasingam (2004)</p> <p>Suh &amp; Ingoo Han (2003)</p>
<p>Availability</p>	<p>Availability refers to customer's willingness to trust based on the regular presence of mobile banking infrastructure as issues such as a weak or absent signal, faulty devices and outright absence of mobile banking service will lead to diminished customer confidence in mobile banking.</p>	<p>1. Mobile banking services may not complete transaction because of network problems.</p> <p>2. MB allows information to be readily accessible to me</p> <p>3. MB makes information easily to access</p> <p>4. MB provides information in timely fashion</p> <p>5. MB returns answers to my request quickly</p>	<p>Tashmia et al (2011)</p> <p>Koo &amp; Wati (2010)</p>

		6. I do not have the money to get Internet access for personal use	Porter et al, (2006)
	Key areas: Right to use, authorised access, protection from intruders	7. I cannot afford the Internet for personal use	
		8. I can find easily what I am looking for on this website	McCord & Ratnasingam (2004)
Best business practices	Best business practices focuses on the institutional aspect of mobile banking and leads customers to have more confidence in mobile banking based on regulatory infrastructures and operations which govern mobile banking	1. There are many reputable third party certification bodies available for assuring the trustworthiness of Internet Vendors. 2. I think third party recognition bodies are doing a good job. 3. Existing third party recognition bodies are adequate for the protection of Internet shoppers' interest. 4. The existing law is adequate for the protection of Internet shoppers' interest. 5. The existing legal framework is good enough to protect Internet shoppers. 6. I feel assured that legal and technological structures adequately protect me from problems on the mobile banking. 7. I feel confident that encryption and other technological advances on the Internet make it safe for me to do business there.	McKnight et al (2003)
	Key areas: Auditing, Legal frameworks, regulatory bodies		

8. In general, the Internet is now a robust and safe environment in which to transact business.

9. The existing law is adequate for the protection of Internet shoppers' interest. Connolly and Bannister (2007)

10. The existing legal framework is good enough to protect Internet shoppers.

11. I believe my mobile service provider is competent and Trustworthy Bankole et al., (2011)

12. The existing law is adequate for the protection of interests of those relying on this online service.

13. The existing legal framework is adequate for the protection of interests of those relying on this online service.

14. Overall, I have confidence in the legal framework that governs my interaction with this system.

15. Mobile banking service providers have the skills and expertise to perform transactions in an expected manner Tashmia et al (2011)

16. I think my bank make good-faith efforts to address most customer concerns.

17. I think my bank is fair in  
conduct of customer  
transactions.

18. I think my bank fair in  
customer service policies  
following a transaction.

Table 7:3: Table of shortlisted questions and re-phrased for Q-sorting

Variable	Item
Perceived usefulness	<ol style="list-style-type: none"> <li>1. I think that using mobile banking would enable me to accomplish my tasks more quickly.</li> <li>2. I think that mobile banking is useful.</li> <li>3. I think Mobile banking improves my work and life efficiency</li> <li>4. I think Mobile banking allows me to easily acquire the information I need</li> <li>5. Overall, I think mobile banking is useful</li> </ol>
Perceived ease of use	<ol style="list-style-type: none"> <li>1. I think that interaction with mobile banking does not require a lot of mental effort.</li> <li>2. I think that it is easy to use mobile banking to accomplish my banking tasks.</li> <li>3. I think that learning to use mobile banking would be easy.</li> <li>4. I think It would take me lots of time to learn how to use mobile banking services.</li> <li>5. I think that using mobile banking would make it easier for me to carry out my tasks.</li> <li>6. I think Learning to use mobile banking is easy</li> </ol>



	<p>7. I think It is easy to use mobile banking</p> <p>8. Overall, using mobile banking is easy</p>
Intended use	<p>1. I will adopt mobile banking as soon as possible</p> <p>2. I intend to use mobile banking in the future</p> <p>3. I will regularly use mobile banking in the future</p> <p>4. I intend to use mobile banking routine banking transactions</p> <p>5. I will strongly recommend others to use mobile banking</p> <p>6. I would use mobile banking given the opportunity</p>
Actual system use	<p>1. I have used mobile banking given the opportunity</p> <p>2. How many times do you use mobile banking in a week?</p> <p>3. How many hours do you spend using mobile banking every month?</p> <p>4. How frequent is your use of mobile banking?</p>
Confidentiality	<p>1. I would not feel totally safe providing personal privacy information over mobile banking.</p> <p>2. I would not feel secure sending sensitive information across mobile banking.</p> <p>3. I believe my personal and bank information are well protected by the mobile banking service provider</p>

Integrity

4. I think Mobile banking vendors are concerned about consumers' privacy.
5. I think Mobile banking vendors will not divulge consumers' personal data to other parties.
6. I feel safe about the privacy control of mobile banking
7. I think all communications with mobile banking are restricted between the service and myself
8. I am convinced that mobile banking respects the confidentiality of the transactions received from me
9. I think Mobile banking uses some security controls for the confidentiality of transactions.
1. I think using mobile banking services would lead to a loss of convenience for me because I would have to waste time fixing payments errors.
2. I think Mobile banking services may not perform well and process payments incorrectly
3. I think Mobile banking vendors usually ensure that transactional information is protected from accidentally altered or destroyed
4. When transferring money through mobile banking, I am afraid that I will lose money due to careless mistakes such as wrong input of account number and wrong input of the amount of money.
5. I think mobile banking provides me with accurate and timely information on my account
6. I think Mobile banking provides me with a complete set of Information
7. I think Mobile banking provides me with all the information I need
8. I think Mobile banking produces correct banking information
9. There are few errors in the information I obtain from Mobile banking
10. I think Mobile banking performs reliably and securely
11. I think the operation of Mobile banking is dependable

12. Mobile banking checks the information communicated with me for accuracy.

13. I think Mobile banking takes steps to make sure that the information in transit is accurate.

14. I think Mobile banking takes steps to make sure that the information in transit is not deleted.

15. I think Mobile banking devotes time and effort to verify the accuracy of the information in transit.

Authentication

1. I think Mobile banking only allows authorized individuals access confidential information.

2. I believe that Mobile banking is able to confirm the identity of account holder before allowing me access

3. I believe The transactions I send are through mobile banking are transmitted to the real site to which I want to transmit.

4. I think The messages I receive from Mobile banking are transmitted from the real site from which I want to receive.

5. I think Mobile banking ascertains my identity before sending any messages to me.

Non repudiation

1. I believe Mobile banking will not deny having participated in a transaction after processing it.

2. I think Mobile banking will not deny having sent me a message.

3. I think Mobile banking will not deny having received a transaction from me.

	<p>4. I think Mobile banking provides me with some evidence to protect against its denial of having sent a message.</p> <p>5. I think Mobile banking provides me with some evidence to protect against its denial of having received a transaction from me.</p>
<p>Access control</p>	<p>1. I think Mobile banking has access to the information needed to handle transactions appropriately</p> <p>2. I am worried about using mobile banking because other people may be able to access my account.</p> <p>3. Mobile banking devotes time and effort to preventing unauthorized access to my personal information.</p> <p>4. Mobile banking databases that contain my personal information are protected from unauthorized access.</p> <p>7. Mobile banking will really remove my personal information when I request it to do so</p>
<p>Availability</p>	<p>1. Mobile banking services may not complete transaction because of network problems.</p> <p>2. Mobile banking allows information to be readily accessible to me</p> <p>3. Mobile banking makes information easily to access</p> <p>4. Mobile banking provides information in timely fashion</p> <p>5. Mobile banking returns answers to my request quickly</p> <p>6. I do not have the money to get Mobile banking for personal use</p>

	<p>7. I cannot afford the Mobile banking for personal use</p>
	<p>8. I can find easily what I am looking for on Mobile banking</p>
<p>Best business practices</p>	<p>1. There are many reputable third party certification bodies available for assuring the trustworthiness of Mobile banking</p> <p>2. I think Mobile banking third party recognition bodies are doing a good job</p> <p>3. Existing third party recognition bodies are adequate for the protection of Mobile banking customer interest.</p> <p>4. The existing law is adequate for the protection of Mobile banking customer interest.</p> <p>5. The existing legal framework is good enough to protect mobile banking customers.</p> <p>6. I feel assured that legal and technological structures adequately protect me from problems on Mobile banking</p> <p>7. I feel confident that encryption and other technological advances make it safe for me to use mobile banking</p>

8. In general, Mobile banking is now a robust and safe environment in which to transact

9. I believe my mobile service provider is competent and Trustworthy

10. The existing law is adequate for the protection of interests of those relying on Mobile banking service.

11. Overall, I have confidence in the legal framework that governs my interaction with the Mobile banking system.

12. Mobile banking service providers have the skills and expertise to perform transactions in an expected manner

13. I think my Mobile banking provider make good-faith efforts to address most customer concerns.

14. I think my Mobile banking provider is fair in conduct of customer transactions.

15. I think my Mobile banking provider are fair in customer service policies following a transaction.

Table 7:4 Q-sorting results for shortlisted questions

VARIABLE		P1	P2	P3	P4	P5	sum	%
ACC51	I'm worried about using mobile banking because other people maybe able to access my account	1	0	1	1	0	3	60.00
ACC54	I think mobile banking has access to the information needed to handle transactions appropriately	1	0	0	1	1	3	60.00
ACC58	Mobile banking database that contain my personal information are protected from unauthorised access	0	1	1	1	1	4	80.00
ACC62	Mobile banking will really remove my personal information when I request it to do so.	0	0	0	0	0	0	.00
ACC65	Mobile banking devotes time and effort to preventing unauthorized access to my personal information	0	1	1	1	0	3	60.00
ACT19	How many hours do you spend using mobile banking every month	1	1	1	1	1	5	100.00
ACT45	How many times do you use mobile banking in a week?	1	0	1	1	1	4	80.00
ACT82	How frequent is your use of mobile banking	1	0	1	1	0	3	60.00
AUTH34	I believe that mobile banking is able to confirm the identity of the account holder before allowing me access	1	1	1	1	0	4	80.00

AUTH50	I believe the transactions I send through mobile banking are transmitted to the real site which I want to transmit	0	1	0	1	0	2	40.00
AUTH53	I think the messages I receive from mobile banking are transmitted from the real site from which I want to receive	0	1	0	1	0	2	40.00
AUTH7	I think mobile banking ascertains my identity before sending any messages to me	1	0	1	1	0	3	60.00
AUTH9	I think mobile banking only allows authorised individuals access confidential information	0	1	0	0	0	1	20.00
AVAIL14	Mobile banking provides information in timely fashion	0	0	1	0	0	1	20.00
AVAIL20	I do not have the money to get mobile banking for personal use	1	0	0	1	0	2	40.00
AVAIL3	Mobile banking makes information easy to access	0	0	1	0	0	1	20.00
AVAIL39	I cannot afford the mobile banking for personal use	0	0	1	0	0	1	20.00
AVAIL43	Mobile banking services may not complete transactions because of network problems	0	1	1	1	0	3	60.00
AVAIL59	Mobile banking returns answers to my request quickly	0	0	1	0	0	1	20.00
AVAIL70	I can easily find what I am looking for on mobile banking	0	0	0	0	0	0	.00



AVAIL72	Mobile banking allows information to be readily accessible to me	1	0	1	0	1	3	60.00
BBP17	I think my mobile banking provider is fair in the conduct of customer transactions	0	0	1	1	0	2	40.00
BBP21	I think mobile banking third party recognition bodies are doing a good job	1	0	0	0	0	1	20.00
BBP22	The existing law is adequate for the protection of mobile banking customer interest	1	0	1	1	1	4	80.00
BBP23	In general, mobile banking is now a robust and safe environment in which to transact	0	0	0	0	1	1	20.00
BBP27	I think mobile banking provider is fair in customer service policies following a transaction	1	0	1	1	1	4	80.00
BBP35	There are many reputable third party certification bodies available for assuring the trustworthiness of mobile banking	1	0	0	0	0	1	20.00
BBP36	Overall, I have confidence in the legal framework that governs my interaction with mobile banking system	0	0	1	1	1	3	60.00
BBP40	The existing legal framework is good enough to protect mobile banking customers	0	0	1	1	1	3	60.00

BBP49	I feel confident that encryption and other technological advances make it safe for me to use mobile banking	0	0	0	0	0	0	.00
BBP52	Existing third party recognition bodies are adequate for the protection of mobile banking customer interest	1	0	0	0	1	2	40.00
BBP55	Mobile banking service providers have the skills and expertise to perform transactions in an expected manner	1	1	1	1	1	5	100.00
BBP56	The existing law is adequate for the protection of interest of those relying on mobile banking service	0	1	1	1	1	4	80.00
BBP57	I feel assured that legal and technological structures adequately protect me from problems on mobile banking	1	1	1	1	1	5	100.00
BBP60	I think mobile banking provider makes good-faith efforts to address most customer concerns	1	1	1	1	1	5	100.00
BBP61	I believe my mobile service provider is competent and trustworthy	0	1	0	1	0	2	40.00
CONF11	I think mobile banking vendors are concerned about consumers' privacy	1	1	1	1	0	4	80.00
CONF24	I would feel totally safe providing personal privacy information over mobile banking	1	1	1	1	1	5	100.00

CONF29	I think mobile banking vendors will not divulge consumers' personal data to other third parties	1	0	1	1	1	4	80.00
CONF33	I believe my personal and bank information are well protected by the mobile banking service provider	0	0	1	0	0	1	20.00
CONF4	I would not feel secure sending sensitive information across mobile banking	0	0	1	1	0	2	40.00
CONF48	I am convinced that mobile banking respects the confidentiality of the transactions received from me	1	1	1	1	1	5	100.00
CONF64	I think all communications with mobile banking are restricted between the service and myself	0	0	0	0	0	0	.00
CONF69	I feel safe about the privacy control of mobile banking	1	0	1	1	0	3	60.00
CONF8	I think mobile banking uses some security controls for the confidentiality of transactions	0	0	0	0	0	0	.00
INT1	When transferring money through mobile banking, I am afraid that I Will lose money due to careless mistakes such as wrong input of account number and wrong input of amount of money	1	0	0	0	0	1	20.00
INT10	I think mobile banking produces correct banking information	1	0	1	0	1	3	60.00
INT16	I think mobile banking provides me with all the information I need	0	0	0	0	0	0	.00

INT2	I think using mobile banking services would lead to a loss of convenience for me because I would have to waste time fixing payment errors	0	0	1	0	0	1	20.00
INT28	I think mobile banking services may not perform well and process payments incorrectly	0	0	1	0	1	2	40.00
INT30	I think mobile banking devotes time and effort to verify the accuracy of the information in transit	1	0	1	0	0	2	40.00
INT31	I think mobile banking takes steps to make sure that the information in transit is not deleted	1	0	1	1	0	3	60.00
INT32	I think mobile banking vendors usually ensure that transactional information is protected from being accidentally altered or destroyed	0	0	0	1	1	2	40.00
INT41	I think mobile banking performs reliably and securely	1	0	1	1	0	3	60.00
INT42	I think the operation of mobile banking is dependable	0	0	1	1	1	3	60.00
INT47	I think mobile banking provides me with a complete set of information	0	0	0	0	0	0	.00
INT68	I think mobile banking takes steps to make sure that the information in transit is accurate	1	0	1	1	0	3	60.00

INT71	I think mobile banking providers me with accurate and timely information on my account	0	0	1	0	0	1	20.00
INT73	There are few errors in the information I obtain from mobile banking	1	0	1	1	1	4	80.00
INT75	Mobile banking checks the information communicated to me for accuracy	0	0	1	1	1	3	60.00
NON63	I think mobile banking provides me with some evidence to protect against its denial of having received a transaction from me	1	1	0	0	1	3	60.00
NONR25	I think mobile banking will not	1	1	1	0	1	4	80.00
NONR67	I believe mobile banking will not deny having participated in a transaction after processing it	1	1	1	0	1	4	80.00
NTU37	I would use mobile banking given the opportunity	1	0	1	0	1	3	60.00
NTU38	I intend to use mobile banking for my routine banking transactions	1	0	1	1	0	3	60.00
NTU46	I will strongly recommend others to use mobile banking	1	0	0	0	0	1	20.00
NTU66	I will regularly use mobile banking in the future	1	1	1	1	1	5	100.00
NTU78	I will adopt mobile banking as soon as possible	1	0	1	1	1	4	80.00

NTU80	I intend to use mobile banking in the future	1	0	0	1	1	3	60.00
PEOU12	I think that interaction with mobile banking does not require a lot of mental effort	1	1	1	1	1	5	100.00
PEOU13	I think that it is easy to use mobile banking to accomplish my banking tasks	1	1	1	0	0	3	60.00
PEOU44	Overall, using mobile banking is easy	1	1	0	0	0	2	40.00
PEOU5	I think it would take me lots of time to learn how to use mobile banking services	0	1	1	1	0	3	60.00
PEOU74	I think that learning to use mobile banking would be easy	1	1	0	1	1	4	80.00
PEOU76	I think learning to use mobile banking is easy	1	1	1	0	1	4	80.00
PEOU77	I think it is easy to use mobile banking	1	1	0	1	1	4	80.00
PU15	I think that using mobile banking would make it easier for me to carry out my tasks	0	0	0	1	1	2	40.00
PU18	I think mobile banking allows me to easily acquire the information I need	1	0	0	0	0	1	20.00
PU26	I think mobile banking would enable me to accomplish my tasks more quickly	1	1	0	1	1	4	80.00
PU6	I think mobile banking improves my work and life efficiency	1	0	1	0	0	2	40.00
PU79	I think that mobile banking is useful	1	1	0	0	1	3	60.00

PU81	Overall, I think mobile banking is useful	1	1	0	0	1	3	60.00
------	---	---	---	---	---	---	---	-------

Table 7:5: Final factor loadings for hierarchical component in model A

<b>Hierarchical relationship</b>	<b>Variable</b>	<b>Unstandardized estimates</b>	<b>Standardized estimates</b>	<b>S.E.</b>	<b>P</b>
CONF ← TechTrust		1.000	.755		
AUTH ← TechTrust		.865	.696	.051	***
INT ← TechTrust		.860	.894	.046	***
NONR ← TechTrust		.854	.730	.047	***
BBP ← TechTrust		.894	.885	.048	***
ACC ← TechTrust		.925	.758	.049	***
CONF13 ← CONF		1.079	.809	.038	***
CONF12 ← CONF		1.012	.809	.035	***
CONF11 ← CONF		1.000	.704		
AUTH25 ← AUTH		1.000	.725		
AUTH24 ← AUTH		1.044	.759	.051	***
INT16 ← INT		1.000	.641		
INT15 ← INT		1.184	.677	.053	***
INT14 ← INT		1.255	.746	.053	***
NON19 ← NONR		1.000	.742		
NON18 ← NONR		1.143	.554	.062	***
NON17 ← NONR		.864	.632	.042	***
BBB60 ← BBP		1.000	.623		
BBB55 ← BBP		.979	.659	.046	***
BBB36 ← BBP		1.166	.689	.053	***
BBB27 ← BBP		.939	.648	.044	***
ACC28 ← ACC		1.000	.780		
ACC27 ← ACC		.991	.731	.043	***

Note: S.E=Standard error; P=Significance value; \*\*\*=p<0.001



Table 7:6: Final factor loadings for model B measurement level

Variable relationships	Unstandardized estimates	Standardised Estimates	S.E.	P
Percep_Int ← trust	.795	.708	.051	***
CONF ← trust	1.209	.755	.065	***
AUTH ← trust	1.000	.700		
INT ← trust	1.012	.908	.058	***
NONR ← trust	.990	.731	.059	***
BBP ← trust	1.031	.875	.061	***
ACC ← trust	1.062	.746	.061	***
PU ← Percep_Int	1.021	.864	.046	***
IU ← Percep_Int	1.193	.904	.055	***
PEOU ← Percep_Int	1.000	.761		
AU ← Percep_Int	.678	.440	.071	***
AU ← trust	.265	.153	.073	***
PEOU32 ← PEOU	1.000	.802		
PEOU33 ← PEOU	.808	.641	.036	***
PEOU31 ← PEOU	.774	.586	.037	***
PU35 ← PU	1.000	.816		
PU34 ← PU	.915	.714	.035	***
IU37 ← IU	1.000	.768		
IU36 ← IU	1.153	.814	.039	***
AU38 ← AU	1.000	.706		
AU40 ← AU	1.415	.899	.046	***
AU39 ← AU	1.027	.797	.034	***
CONF13 ← CONF	1.000	.796		
CONF12 ← CONF	.968	.810	.027	***
CONF11 ← CONF	1.000	.723		
AUTH25 ← AUTH	1.000	.721		
AUTH24 ← AUTH	1.055	.763	.050	***
INT16 ← INT	1.000	.643		

<b>Variable relationships</b>	<b>Unstandardized estimates</b>	<b>Standardised Estimates</b>	<b>S.E.</b>	<b>P</b>
INT15 ← INT	1.177	.675	.052	***
INT14 ← INT	1.251	.746	.052	***
NON19 ← NONR	1.000	.744		
NON18 ← NONR	1.132	.550	.061	***
NON17 ← NONR	.865	.633	.042	***
BBB60 ← BBP	1.000	.629		
BBB55 ← BBP	.974	.662	.045	***
BBB36 ← BBP	1.140	.681	.051	***
BBB27 ← BBP	.930	.648	.043	***
ACC28 ← ACC	1.000	.786		
ACC27 ← ACC	.975	.725	.042	***

Note: S.E=Standard error; P=Significance value; \*\*\*=p<0.001

Table 7:7: Final factor loadings for hierarchical component of model C

<b>Hierarchical variable relationships</b>	<b>Unstandardized estimates</b>	<b>Standardised estimates</b>	<b>S.E.</b>	<b>P</b>
PU←TechTrust	.704	.612	.038	***
PEOU←TechTrust	.757	.625	.042	***
CONF←TechTrust	1.000	.737		
AUTH←TechTrust	.856	.703	.047	***
INT←TechTrust	.843	.892	.041	***
NONR←TechTrust	.844	.733	.042	***
BBP←TechTrust	.886	.879	.043	***
ACC←TechTrust	.908	.747	.043	***
PEOU32←PEOU	1.000	.777		
PEOU33←PEOU	.837	.642	.040	***
PEOU31←PEOU	.844	.618	.041	***
PU35←PU	1.000	.834		
PU34←PU	.876	.699	.045	***
CONF13←CONF	1.000	.794		
CONF12←CONF	.972	.812	.027	***
CONF11←CONF	1.000	.722		
AUTH25←AUTH	1.000	.725		
AUTH24←AUTH	1.043	.758	.050	***
INT16←INT	1.000	.644		
INT15←INT	1.184	.679	.053	***
INT14←INT	1.244	.742	.052	***
NON19←NONR	1.000	.745		
NON18←NONR	1.129	.549	.061	***
NON17←NONR	.862	.632	.042	***
BBB60←BBP	1.000	.634		
BBB55←BBP	.967	.663	.044	***
BBB36←BBP	1.124	.677	.050	***

<b>Hierarchical variable relationships</b>	<b>Unstandardized estimates</b>	<b>Standardised estimates</b>	<b>S.E.</b>	<b>P</b>
BBB27←BBP	.920	.647	.043	***
ACC28←ACC	1.000	.792		
ACC27←ACC	.962	.720	.042	***
Note: S.E=Standard error; P=Significance value; ***=p<0.001				

Table 7:8: Final measurement level values for model C

Variable relationships			Unstandardized estimates	Standardized estimates	S.E.	P
IU	←	TechTrust	1.301	.744	.072	***
CONF	←	TechTrust	1.179	.731	.065	***
AUTH	←	TechTrust	1.000	.697		
INT	←	TechTrust	.994	.888	.058	***
NONR	←	TechTrust	.987	.721	.059	***
BBP	←	TechTrust	1.019	.850	.060	***
ACC	←	TechTrust	1.050	.725	.061	***
PU	←	TechTrust	.922	.676	.054	***
PEOU	←	TechTrust	.963	.664	.059	***
AU	←	IU	.594	.596	.032	***
PEOU 32	←	PEOU	1.000	.784		
PEOU 33	←	PEOU	.826	.640	.038	***
PEOU 31	←	PEOU	.827	.612	.039	***
PU35	←	PU	1.000	.833		
PU34	←	PU	.879	.700	.041	***
CONF 13	←	CONF	1.000	.795		
CONF 12	←	CONF	.970	.811	.027	***
CONF 11	←	CONF	1.000	.722		
AUTH 25	←	AUTH	1.000	.720		
AUTH 24	←	AUTH	1.058	.764	.050	***
INT16	←	INT	1.000	.642		

<b>Variable relationships</b>	<b>Unstandardized estimates</b>	<b>Standardized estimates</b>	<b>S.E.</b>	<b>P</b>
INT15 ← INT	1.187	.679	.053	***
INT14 ← INT	1.250	.744	.052	***
NON1 9 ← NONR	1.000	.747		
NON1 8 ← NONR	1.126	.549	.061	***
NON1 7 ← NONR	.859	.631	.042	***
BBB60 ← BBP	1.000	.636		
BBB55 ← BBP	.970	.666	.044	***
BBB36 ← BBP	1.113	.672	.050	***
BBB27 ← BBP	.918	.647	.043	***
ACC2 8 ← ACC	1.000	.795		
ACC2 7 ← ACC	.955	.717	.042	***
IU36 ← IU	1.000	.828		
IU37 ← IU	.825	.742	.029	***
AU38 ← AU	1.000	.705		
AU39 ← AU	1.028	.796	.034	***
AU40 ← AU	1.418	.899	.046	***

Note: S.E=Standard error; P=Significance value; \*\*\*=p<0.001

Table 7:9: Regression estimates of latent constructs with all control variables

<b>Variable relationships</b>	<b>Standardised Estimates</b>	<b>Unstandardized estimates</b>	<b>S.E.</b>	<b>P</b>
TechTrust←Mbanking	-.328	-.340	.027	***
TechTrust←Technology	.068	.128	.014	***
TechTrust←Education	-.009	-.031	.007	.217
TechTrust←Phone	-.043	-.008	.143	.764
TechTrust←Bank	-.133	-.025	.139	.339
TechTrust←Gender	-.025	-.026	.024	.299
TechTrust←Ethnicity	.019	.045	.010	.066
TechTrust←Marital	-.007	-.011	.017	.690
TechTrust←Employment	.012	.053	.006	.044
TechTrust←Age	-.018	-.034	.016	.260
PEOU←TechTrust	.696	.582	.049	***
PU←TechTrust	.749	.551	.047	***
PU←Technology	.036	.050	.018	.049
PEOU←Employment	-.017	-.066	.007	.013
PEOU←Age	-.048	-.074	.019	.014
PU←Education	.022	.054	.010	.027
PEOU←Education	.029	.083	.009	***
PEOU←Mbanking	-.114	-.099	.031	***
PU←Mbanking	-.157	-.120	.035	***
PU←Employment	-.013	-.043	.008	.094

<b>Variable relationships</b>	<b>Standardised Estimates</b>	<b>Unstandardized estimates</b>	<b>S.E.</b>	<b>P</b>
PU←Marital	-.041	-.048	.023	.077
PEOU←Technology	-.009	-.015	.016	.574
PEOU←Phone	-.368	-.057	.169	.029
PU←Phone	-.198	-.027	.189	.294
PU←Bank	.117	.016	.183	.522
PEOU←Bank	.174	.028	.164	.289
PU←Gender	-.020	-.015	.031	.530
PEOU←Gender	.021	.019	.028	.454
PU←Ethnicity	.007	.013	.013	.589
PEOU←Ethnicity	-.001	-.001	.012	.964
PEOU←Marital	-.025	-.034	.021	.215
PU←Age	-.005	-.007	.022	.805
IU←TechTrust	.344	.236	.060	***
IU←PEOU	.166	.137	.042	***
IU←PU	.537	.502	.042	***
IU←Mbanking	-.216	-.154	.033	***
IU←Education	-.022	-.052	.009	.016
IU←Technology	.004	.005	.017	.807
IU←Phone	-.177	-.022	.174	.308
IU←Bank	-.011	-.001	.168	.949
IU←Gender	.010	.007	.029	.739
IU←Ethnicity	-.001	-.002	.012	.935



<b>Variable relationships</b>	<b>Standardised Estimates</b>	<b>Unstandardized estimates</b>	<b>S.E.</b>	<b>P</b>
IU←Marital	-.017	-.019	.021	.423
IU←Employment	-.004	-.013	.007	.560
IU←Age	.011	.014	.020	.579
INT←TechTrust	1.000	.900		
NONR←TechTrust	.987	.728	.053	***
BBP←TechTrust	1.033	.873	.054	***
AUTH←TechTrust	1.003	.703	.057	***
CONF←TechTrust	1.231	.746	.060	***
ACC←TechTrust	1.025	.744	.056	***
AU←IU	.337	.303	.027	***
AU←Technology	.083	.097	.016	***
AU←Education	.009	.019	.008	.292
AU←Mbanking	-.874	-.559	.040	***
AU←Marital	.063	.063	.020	.001
AU←Employment	-.001	-.002	.007	.910
AU←Age	-.018	-.020	.018	.330
AU←Phone	.197	.022	.160	.219
AU←Bank	.015	.002	.155	.921
AU←Gender	.063	.041	.027	.018
AU←Ethnicity	.002	.002	.011	.893
INT16←INT	1.000	.642		
INT15←INT	1.184	.677	.052	***

<b>Variable relationships</b>	<b>Standardised Estimates</b>	<b>Unstandardized estimates</b>	<b>S.E.</b>	<b>P</b>
INT14←INT	1.251	.745	.052	***
NON19←NONR	1.000	.745		
NON18←NONR	1.128	.549	.061	***
NON17←NONR	.861	.632	.042	***
BBB60←BBP	1.000	.632		
BBB55←BBP	.972	.665	.044	***
BBB36←BBP	1.128	.678	.051	***
BBB27←BBP	.922	.647	.043	***
AUTH25←AUTH	1.000	.722		
AUTH24←AUTH	1.053	.762	.050	***
ACC27←ACC	1.000	.720		
CONF13←CONF	1.000	.809		
CONF12←CONF	.938	.809	.029	***
CONF11←CONF	.926	.703	.032	***
IU37←IU	1.000	.758		
IU36←IU	1.175	.820	.039	***
PU35←PU	1.000	.838		
PU34←PU	.868	.695	.036	***
PEOU31←PEOU	1.000	.614		
PEOU32←PEOU	1.199	.781	.057	***
PEOU33←PEOU	.997	.642	.051	***
AU38←AU	1.000	.660		

<b>Variable relationships</b>	<b>Standardised Estimates</b>	<b>Unstandardized estimates</b>	<b>S.E.</b>	<b>P</b>
AU39←AU	1.030	.747	.037	***
AU40←AU	1.609	.956	.051	***
ACC28←ACC	1.038	.791	.045	***
Note: S.E=Standard error; P=Significance value; ***=p<0.001				

Table 7:10: Structural model values with only significant control variables

<b>Variable relationships</b>	<b>Unstandardized estimates</b>	<b>Standardised estimates</b>	<b>S.E.</b>	<b>P</b>
TechTrust←Mbanking	-.326	-.337	.027	***
TechTrust←Technology	.069	.131	.013	***
TechTrust←Ethnicity	.020	.048	.010	.047
TechTrust←Employment	.015	.069	.005	.005
PEOU←TechTrust	.692	.578	.048	***
PU←TechTrust	.749	.552	.047	***
PU←Technology	.039	.054	.018	.030
PEOU←Employment	-.017	-.065	.007	.013
PEOU←Age	-.060	-.093	.017	***
PU←Education	.020	.051	.010	.034
PEOU←Education	.027	.077	.009	.002
PEOU←Mbanking	-.108	-.094	.031	***
PU←Mbanking	-.154	-.117	.035	***
PU←Employment	-.014	-.046	.007	.050
PU←Marital	-.046	-.055	.020	.021
PEOU←Phone	-.309	-.047	.157	.049
IU←TechTrust	.335	.231	.058	***
IU←PEOU	.171	.141	.041	***
IU←PU	.541	.506	.042	***
IU←Mbanking	-.216	-.154	.032	***
IU←Education	-.020	-.046	.009	.025
INT←TechTrust	1.000	.901		
NONR←TechTrust	.986	.728	.053	***
BBP← TechTrust	1.032	.873	.054	***
AUTH← TechTrust	1.002	.702	.057	***
CONF← TechTrust	1.231	.746	.060	***

<b>Variable relationships</b>	<b>Unstandardized estimates</b>	<b>Standardised estimates</b>	<b>S.E.</b>	<b>P</b>
ACC← TechTrust	1.023	.743	.056	***
AU←IU	.336	.301	.027	***
AU←Technology	.089	.104	.015	***
AU←Mbanking	-.876	-.560	.040	***
AU←Marital	.053	.052	.017	.002
AU←Gender	.070	.046	.026	.006
INT16←INT	1.000	.642		
INT15←INT	1.184	.677	.052	***
INT14←INT	1.252	.745	.052	***
NON19←NONR	1.000	.745		
NON18←NONR	1.129	.549	.061	***
NON17←NONR	.862	.632	.042	***
BBB60←BBP	1.000	.632		
BBB55← BBP	.972	.665	.044	***
BBB36← BBP	1.128	.677	.051	***
BBB27← BBP	.922	.647	.043	***
AUTH25←AUTH	1.000	.722		
AUTH24←AUTH	1.052	.762	.050	***
ACC27←ACC	1.000	.720		
CONF13←CONF	1.000	.809		
CONF12← CONF	.938	.809	.029	***
CONF11← CONF	.926	.703	.032	***
IU37←IU	1.000	.757		
IU36←IU	1.176	.820	.040	***
PU35←PU	1.000	.837		
PU34←PU	.871	.696	.036	***
PEOU31←PEOU	1.000	.616		
PEOU32←PEOU	1.191	.778	.057	***
PEOU33←PEOU	.996	.643	.051	***

<b>Variable relationships</b>	<b>Unstandardized estimates</b>	<b>Standardised estimates</b>	<b>S.E.</b>	<b>P</b>
AU38←AU	1.000	.661		
AU39←AU	1.030	.748	.037	***
AU40←AU	1.607	.956	.051	***
ACC28←ACC	1.038	.791	.045	***
Note: S.E=Standard error; P=Significance value; ***=p<0.001				



Technology competence:       Competent

Mobile phone:       Yes, I own a mobile phone       No, I do not own a mobile phone

Banking status:       Yes, I have a bank account       No, I do not have a bank account

Mobile banking:       Yes, I use mobile banking       No, I do not use mobile banking

### SECTION B: TECHNOLOGY TRUST AND MOBILE BANKING

In this section, your views on mobile banking are required. Please use the number ranking in the table below to provide your feedback on the statements thereafter.

STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
1	2	3	4	5

	1-5
I would feel totally safe providing personal privacy information over mobile banking	
I am convinced that mobile banking respects the confidentiality of the transactions received from me	
I feel safe about the privacy control of mobile banking	
I think mobile banking performs reliably and securely	
I think the operation of mobile banking is dependable	



I think mobile banking takes steps to make sure that the information in transit is accurate	
I think mobile banking provides me with some evidence to protect against its denial of having received a transaction from me	
I think mobile banking will not deny having sent me a message	
I believe mobile banking will not deny having participated in a transaction after processing it	
I think mobile banking provider is fair in customer service policies following a transaction	
Overall, I have confidence in legal framework that governs my interaction with mobile banking system	
Mobile banking service providers have the skills and expertise to perform transactions in an expected manner	
I think mobile banking provider makes good-faith efforts to address most customer concerns	
I believe that mobile banking is able to confirm the identity of the account holder before allowing me access	
I think mobile banking ascertains my identify before sending any messages to me	
I'm worried about using mobile banking because other people may be able to access my account	
Mobile banking database that contain my personal information are protected from unauthorized access	
Mobile banking devotes time and effort to preventing unauthorized access to my personal information	
Mobile banking services may not complete transactions because of network problems	

Mobile banking allows information to be readily accessible to me	
I would feel totally safe providing personal privacy information over mobile banking	
I am convinced that mobile banking respects the confidentiality of the transactions received from me	
I feel safe about the privacy control of mobile banking	
I think mobile banking performs reliably and securely	
I think the operation of mobile banking is dependable	
I think mobile banking takes steps to make sure that the information in transit is accurate	
I think mobile banking provides me with some evidence to protect against its denial of having received a transaction from me	
I think mobile banking will not deny having sent me a message	
I believe mobile banking will not deny having participated in a transaction after processing it	
I think mobile banking provider is fair in customer service policies following a transaction	
Overall, I have confidence in the legal framework that governs my interaction with mobile banking system	
Mobile banking service providers have the skills and expertise to perform transactions in an expected manner	
I think mobile banking provider makes good-faith efforts to address most customer concerns	

I believe that mobile banking is able to confirm the identity of the account holder before allowing me access	
I think mobile banking ascertains my identify before sending any messages to me	
I'm worried about using mobile banking because other people may be able to access my account	

Mobile banking database that contain my personal information are protected from unauthorized access	
Mobile banking devotes time and effort to preventing unauthorized access to my personal information	
Mobile banking services may not complete transactions because of network problems	
Mobile banking allows information to be readily accessible to me	
I think that interaction with mobile banking does not require a lot of mental effort	
I think that it is easy to use mobile banking to accomplish my banking tasks	
I think learning to use mobile banking is easy	
I think mobile banking would enable me to accomplish my tasks more quickly	
Overall, I think mobile banking is useful	
I intend to use mobile banking for my routine banking transactions	
I intend to use mobile banking in the future	

How many hours do you spend using mobile banking every month?

- Less than 1 hour
- 1-3 hours
- 4-6 hours
- 7-9 hours
- Greater than 10 hours

How many times do you use mobile banking in a week?

- Less than 1 time

- 1-3 times
- 4-6 times
- 7-9 times
- Greater than 10 times

How frequent is your use of mobile banking?

- No use
- Not very frequent
- Frequent
- Slightly frequent
- Very frequent

## **9 COPYRIGHT STATEMENT**

1. The author of this thesis (including any appendices and/or schedules to this thesis) owns any copyright in it (the “Copyright”) and s/he has given The University of Huddersfield the right to use such Copyright for any administrative, promotional, educational and/or teaching purposes.
2. Copies of this thesis, either in full or in extracts, may be made only in accordance with the regulations of the University Library. Details of these regulations may be obtained from the Librarian. This page must form part of any such copies made.
3. The ownership of any patents, designs, trademarks and any and all other intellectual property rights except for the Copyright (the “Intellectual Property Rights”) and any reproductions of copyright works, for example graphs and tables (“Reproductions”), which may be described in this thesis, may not be owned by the author and may be owned by third parties. Such Intellectual Property Rights and Reproductions cannot and must not be made available for use without the prior written permission of the owner(s) of the relevant Intellectual Property Rights and/or Reproductions