What are the key factors affecting Irish consumer's adoption of mobile banking technologies?

By

John Connolly
Emmet Dowling
Barry McDonnell
David Watson

23rd March 2015
DECLARATION

We declare that the work described in this dissertation is, except where otherwise stated, entirely our own work, and has not been submitted as an exercise for a degree at this or any other university. We further declare that this research has been carried out in full compliance with the ethical research requirements of the School of Computer Science and Statistics. This work is being carried out as part fulfilment of the requirements for the BSc. (Honours Degree) in Information Systems within Trinity College Dublin.

Signed: _____________________________
John Connolly

Signed: _____________________________
Emmet Dowling

Signed: _____________________________
Barry McDonnell

Signed: _____________________________
David Watson
We agree that the School of Computer Science and Statistics, Trinity College Dublin, may lend or copy this dissertation upon request.

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David Watson
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To all the respondents who took part in our survey and helped us to gather the information that we required for our research, we are eternally grateful.

We would also like to thank our families and friends for their patience, understanding, support and encouragement over the last four years.

Signed: _____________________________
John Connolly

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Emmet Dowling

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Barry McDonnell

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David Watson
The purpose of our paper is to explore and describe the key factors affecting Irish consumer’s adoption of mobile banking technologies.

A mixture of exploratory and descriptive research was undertaken through the use of a literature review into research approaches based on the Technology Acceptance Models and an online questionnaire was distributed in order to gather quantitative data. Analyses from the responses would suggest that there are four main constructs of our model that effect Irish consumer’s adoption to mobile banking technologies. These are ease of use, usefulness, compatibility and facilitating conditions. Those surveyed were largely technology literate and are likely to use mobile and online banking services. The results of the study suggest that convenience, knowledge, suitable phones and ease of use are the most influential factors to users of mobile banking. These particular areas are worthy of further research by banks or other service providers aiming to develop or expand their mobile self-service offerings.
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<td>AIB</td>
<td>Allied Irish Banks</td>
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<tr>
<td>ATM</td>
<td>Automated Teller Machine</td>
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<td>BOI</td>
<td>Bank of Ireland</td>
</tr>
<tr>
<td>BPFI</td>
<td>Banking &amp; Payments Federation Ireland</td>
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<tr>
<td>CO</td>
<td>Compatibility</td>
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<td>EE</td>
<td>Effort Expectancy</td>
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<td>FC</td>
<td>Facilitating Conditions</td>
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<td>IDT</td>
<td>Innovation Diffusion Theory</td>
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<td>OB</td>
<td>Observability</td>
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<td>PE</td>
<td>Performance Expectancy</td>
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<td>Perceived Ease of Use</td>
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<td>Perceived Risk</td>
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<td>Perceived Security</td>
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<tr>
<td>PU</td>
<td>Perceived Usefulness</td>
</tr>
<tr>
<td>RA</td>
<td>Relative Advantage</td>
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<tr>
<td>RBS</td>
<td>Royal Bank of Scotland</td>
</tr>
<tr>
<td>SI</td>
<td>Social Influence</td>
</tr>
<tr>
<td>SME</td>
<td>Small Medium Enterprise</td>
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<td>TAM</td>
<td>Technology Acceptance Model</td>
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<td>TPB</td>
<td>Theory of Planned Behaviour</td>
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<tr>
<td>TR</td>
<td>Trialability</td>
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<td>TRU</td>
<td>Perceived Trust</td>
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<tr>
<td>TTF</td>
<td>Task Technology Fit</td>
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<tr>
<td>UTAUT</td>
<td>Unified Theory of Acceptance and Use of Technology</td>
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DEFINITIONS

**Online Banking** – “Online banking covers all online banking activity conducted via a web browser, irrespective of the device used by the customer, when the customer logs on to the bank's personal online banking service. It does not include mobile banking services, text or e-mail alerts, or general interaction with the bank's websites or social media accounts” (BPFI, 2014).

**Mobile Banking** – “Mobile banking covers all banking activity conducted through a dedicated smartphone or tablet app, which is available from the bank, as well as any text-based transaction banking available from the bank. It does not include any banking activity conducted via a web browser on a mobile device. It does not include phone banking via the bank's dedicated phone banking number or service. It does not include text or email alerts, or general interaction with the bank's websites or social media accounts” (BPFI, 2014).

**Likert Scale** – “A psychometric response scale primarily used in questionnaires to obtain participant's preferences or degree of agreement with a statement or a set of statements. Likert scales are a non-comparative scaling technique and are one-dimensional (only measure a single trait) in nature. Respondents are asked to indicate their level of agreement with a given statement by way of an ordinal scale” (Bertram, none).
CHAPTER ONE: INTRODUCTION

"If you owe your bank a hundred pounds, you have a problem. But if you owe a million, it has"

- John Maynard Keynes

RESEARCH QUESTION

The study seeks to answer the question “What are the key factors affecting Irish consumer’s adoption of mobile banking technologies?”

Online banking usage in Ireland has grown significantly over the last 7 years, for example, in 2008 Irish consumers accessed their bank account via online banking 116.1 million times; by 2013, this figure had grown to over 200 million. Similarly, the usage of smartphones has also grown to its present state where 59% of phones in Ireland are smartphones. With this in mind, it is surprising to learn that the Banking & Payments Federation of Ireland, who have recorded statistics on online banking since 2007, did not consider mobile banking as a separate service channel until 2014. It is in this context that we seek to answer the research question stated above.

RATIONALE

As mobile internet access becomes more available in many countries, the factors affecting consumers adoption of mobile services, such as e-commerce has become a popular topic for analysis. While much research has been conducted on the topic of mobile banking adoption, very little exists in relation to Irish consumers. At present, research in the area of mobile banking adoption appears to be weighted toward users in developing countries or users in East Asia (Shaikh & Karjaluoto, 2015). We feel that the lack of research specific to Ireland, coupled with Irish consumer’s high levels of smart phone ownership and increasing usage of online banking offers an opportunity to add valuable insights into the collective knowledge on mobile banking adoption.

We hope that the outputs from this research will be valuable in terms of:

- Validation or otherwise of existing research findings on this subject
- Provide useful insights for Banks looking to improve their mobile banking offerings and increase customer adoption

ROADMAP OF DOCUMENT

CHAPTER ONE - INTRODUCTION: This chapter will define the research question and the rationale. In addition it will provide a brief overview of the history of banking in Ireland.

CHAPTER TWO - LITERATURE REVIEW: This chapter investigates the current research literature around the subject of mobile banking adoption. It will look at the literature from a number of angles. First we look at the basis for trust and understanding of risk that an individual perceives. We will discuss the current research on internet banking and how it relates to our question. We will then
move onto the popular theories and models used in assessing mobile banking adoption and the key factors that influence the adoption of technology.

**CHAPTER THREE - METHODOLOGY:** This chapter identifies the research philosophy, methodology, characteristics of the approach and statistical analysis path chosen to undertake the definition, quantification and analysis of our exploratory research.

**CHAPTER FOUR - FINDINGS AND ANALYSIS:** This chapter will provide an in-depth analysis of our findings based on our research methodology, tying it back to our literature review.

**CHAPTER FIVE - CONCLUSIONS:** This is the final chapter in the paper and it is where the reader will be presented with the conclusions of the project and recommendations for future research.

**A HISTORY OF BANKING IN IRELAND**

Banks have been around for many centuries, with Venice being the original hub of banking in Europe due to the commercialisation of the state. A state cannot remain commercial for long unless the right of private property is well secured. And commercialism and liberty give rise to banking. Banks are primarily used to take in funds from depositors and then lend to those who need funds. Banks are established to grant facilities to trade; and if there is no trade, there will be no banks (Gilbarth, 1836).

La Touche Bank was one of the first banks in Ireland, being established in 1710 in Cork Hill in Dublin. It was set up by the La Touche family who immigrated to Ireland from Holland. La Touche Bank stayed in operation well into the late 1800's, closing in 1870. By 1920 BOI had 75 branches and over the next 60 years, BOI made a number of acquisitions, buying up other banks and merging with them to form the Bank of Ireland Group. In 1980, the first PASS ATM machine was launched by BOI. Visa cards were first introduced by the BOI in 1990 with Banking 365 telephone banking being launched in 1996. Less than one year after their telephone banking was launched, BOI launched their Banking 365 Online Banking service. Since 2000, there have been many more acquisitions and joint ventures by BOI culminating in the 2009 €3.5 billion recapitalisation of Bank of Ireland Group from the Irish government (2015).

Since BOI set up in Ireland, and due to the growing economy, there was the need for more financial institutions on the island. The next main bank that opened its doors in Ireland was Ulster Bank in Belfast which opened in 1836. It wasn’t until 1862 that Ulster Bank opened its first branch in Dublin. Ulster Bank continued to grow steadily for the next number of years until once again it was hit with difficulties, this time due to the Wall Street Crash of 1929. Growth stagnated for a number of years (as it did for many banks throughout the world). Then to compound the issue, World War II broke out in 1939 which resulted in more limitations from the government for a number of years. Ulster Bank opened Ireland’s first drive-in bank in 1961 and it was also the first bank to introduce ‘cash dispensers’, known to everyone nowadays as ATM’s. During the Troubles in the 1970’s a number of branches were damaged by bombings throughout Belfast city. In this 10 year period, Ulster Bank
also introduced credit card facilities and was the first to introduce mobile banking (not as we currently know it) for rural areas with a security van that could visit places where there were no branches.

Figure 1 - Ulster Bank Mobile Banking - 1970's (Ulster Bank Ltd, 2014)

In 1983, Ulster Bank also produced another first for Ireland - they were the first bank to have all their branches networked by computers for accounting purposes. Since then they have become part of the Royal Bank of Scotland Group (RBS). They merged with First Active during the downturn in the Irish economy to better manage the business (Ulster Bank Ltd, 2014).

The next main bank to open its doors on Irish soil was Allied Irish Banks (AIB) in 1966. It was actually the amalgamation of three previously running banks on the island - the Munster and Leinster Bank Limited (established 1885), the Provincial Bank of Ireland Limited (established 1824) and the Royal Bank of Ireland Limited (established 1836). The bank was recapitalised to the tune of €3.5 billion from the Irish government during the banking crisis in 2008/2009 (Allied Irish Banks, 2014).

In 1447 an act was passed banning clipped money - or O'Reyle's money as it was also known (this is the process that dilutes the amount of solid metal in coins, therefore undervaluing them) and it was also the year that an act was passed levying a tax on silver bullion that was exported. In 1634 another act was passed to restrict usury - the act of charging exorbitantly high interest rates on money borrowed (Gilbarth, 1836). Many more amendments to the above acts were passed in order to make small changes to the way that banking was conducted in Ireland. Some were made in order to change the limit that could be charged for interest; others where the forging of banker’s notes or bills of exchange above a certain value was deemed a felony. Some of the banks that were in existence for a number of years were named after the managing partners. For example, Benjamin Burton, Samuel Burton and Daniel Falkiner, which was in existence for 33 years from 1700. Embezzling money to the value of £50 became a felony after an act was passed in 1755. Some of the banks, like the one William Lennox and George French founded, was only around for a few years, from 1751 to 1755, as the owners absconded with the deposits. Subsequently, another act was passed to counteract this happening in the future. A bank owned by John Wilcocks and John Dawson operated only for a period of 7 years due to the dishonesty of its cashier, Richard Brewer. A number of acts were passed as amendments to some of the previous acts. In 1759, the Bankers’ Act was passed. This was the basis of regulation of the bankers in Ireland - no onus was placed on the banking institutions themselves at this stage. The chief objects of the act were to prevent fraud and to fix the mode of winding up their affairs when they stop payment among other rules. When BOI was originally set up in 1783, it was given capital of £600,000 of which it could not exceed. By 1791,
this capital was increased to £1,000,000 and by 1797 this was again increased to £1,500,000. It was again increased to £2,500,000 in 1808 and in 1821 it was increased again to £3,000,000. In 1799, a law was passed confining the issue of notes and by 1803 this led to over 50 new banks being set up in various towns and counties throughout the island of Ireland. In 1804, the concept of stamp duty came into being in Ireland.

The Provincial Bank of Ireland was formed in 1824 and it was this bank, along with the Munster and Leinster Bank and the Royal Bank of Ireland that joined together to make AIB in 1966. The capital of the Provincial Bank of Ireland was set at £2,000,000. In 1825, an act was passed to assimilate the currencies of Ireland and Great Britain so that the note denominations and the coins would be the same, but that the value to the notes and the coins would be slightly higher in Great Britain. The pound would be divided into twenty shillings and the shillings into twelve pence, but in Great Britain, if that money was to be used in Ireland, they would receive 13 pence in exchange for their twelve pence. In 1835, the last non-Dublin private bank stopped payment. From all the banks that were set up over the years to the 1830's, only a handful of them were left - partly due to the continual passing of various acts to change the way banks can operate, but also partly due to the greedy nature of the proprietors of the banks. In 1836, prospectuses were sent forward to the government to set up 5 new banks.

**BANKING IN IRELAND**

Since the advent of online banking in the last 25 years, first in the United States and the UK and then gradually moving into Ireland, the uptake has grown steadily over time. Online services started in the United States with a number of banks offering “videotext” in the early 1980’s; this was later brought to Ireland in the late 1980’s by eircom (then Telecom Eireann) based on the French system.

Online banking as we know it today is somewhat different to the “videotex” method. It consists of using the internet for banking services. Wells Fargo was one of the first banks to introduce online and internet banking in 1995 (2010). This was quickly followed by other banks in the United States and then Europe. However, it took into the 2000’s for Irish banks to follow in the footsteps of their European and American counterparts. In the last number of years with the growth of the smartphone and mobile broadband market, consumers are now able to bank “on-the-go”. There is no need to be sitting at a computer anymore – consumers can bank while they are on the move, from travelling on the bus or train to being abroad as all they need now is an internet connection and an app.

Banking within Ireland has changed dramatically in recent years with the most severe financial crises to hit the state in 2008 changing the banking industry substantially with all Irish banks suffering catastrophic losses. One bank in particular, Anglo Irish Bank had to cease trading while four other banks - Allied Irish Banks plc, Bank of Ireland, National Irish Bank Ltd and Permanent TSB needed financial bailouts by the government. Technological advances in the retail-banking sector have undergone significant changes in the past decade. With the Internet causing major
delivery channel changes the sector has gone from relatively interpersonal orientated encounters to high-tech interactions (Chanaka Jayawardhena, 2000).

Ireland has quite a high volume of cash use compared to other member countries. "Irish people withdraw almost twice the amount the average European does from ATMs every year. Ireland is also one of the few remaining EU member states that still use cheques on a regular basis - of the major European countries, only France use more cheques per capita than Ireland. Further, Ireland has relatively high levels of financial exclusion, including in the payments area" (Central Bank of Ireland, 2014).

Due to changes in competition, economic growth, customer expectations, and their technological capabilities banks must dramatically innovate and transform themselves to meet these new challenges. Banks across the globe view attracting new customers as one of their main challenges over the next two years and enhancing customer service their number one investment priority.

Today the internet is enabling many aspects of banking to move online and reducing the need for traditional branches. Given their high costs, banks have already begun to reduce staff and close branches. In 2012 Danske was the first to close its entire 27-branch network allowing customers to access cash and cheque lodgement services through An Post's 1200 outlets (2013). AIB planned to close 70 of its 270 branches. It also controls EBS, which has 84 branches. Ulster Bank is to close up to 40 of its branches. Permanent TSB is to close up to 25 branches out of a total of 92. National Irish Bank is to close all of its 27 branches (Department of Finance, n.d.) PriceWaterhouse Coopers believe that “Branches will remain, but take many forms, from flagship information, advisory and engagement hubs (offering education, financial advice, full-service capabilities and community offerings) to smart kiosks (offering service, sales, cash and video contact with a range of specialists)” (“Evolution Revolution,” 1976). This is already evident in the Irish market with some banks closing their cashier counter earlier to provide self-service only banking within the branch and others going completely cashless (Danske Bank Group, 2013).

In 2011, Ireland was the country that experienced the fastest growth (8 points) of regular internet use (European Commission, 2012). ComReg reported that the number of broadband subscribers has risen from 1,471,503 in Q1 2010 to 1,693,400 Q3 2014 (ComReg, 2014) - this is evident by the “28 million online and mobile banking payments in the first six months of 2014 – equating to about 1.1 million payments per week (Bpfi, Topics, Assist, & Events, 2015).

Online and mobile banking are two different aspects to banking and for the purpose of this dissertation they will be treated as two separate concepts. It should be noted however that Banking Payments & Federation Ireland only made this distinction from Q1 2014 where they have separated out online and mobile banking statistics.

There has been a huge jump in the number of Irish users of online and mobile banking over the years since statistics were introduced in this area in 2007. The Banking & Payments Federation Ireland (BPI) keep quarterly statistics on the usage of users of online and mobile banking along with the
number of payments made. They also produce publications on the housing market in Ireland, the mortgage market, the mortgage approvals market and the SME market (BPFI, 2015).

In 2010, there were some 2.7 million customers registered for online banking. This figure is up 3.8% during the same period in 2009. It is important to note here that the number of banks participating in this information gathering and sharing exercise actually decreased in the same period. In 2012, there were 1.9 million customers who were active users of online banking, which is up 16.6% on 2011. In 2013, this figure jumps to 2.2 million customers, which is a 16.5% increase on the previous year. This figure jumps again as at the end of Q2 in 2014, there were 3.4 million active users of online and mobile banking, an increase of 54%, but it is important to note here that some of the online banking users are likely to be mobile banking users, but even taking into consideration an average 16.5% increase, this figure would still hit over 2.5 million users, which is a lot for a country with a population of around 4.6 million people (BPFI, 2015).

There has been a huge rise in the number of times that customers accessed their accounts over the last number of years. In 2008, customers accessed their accounts 116.1 million times. This increased by over 17% to 136.1 million in 2009 and by the end of 2013 this figure surged over the 200 million mark reaching 204.9 million. Over the course of 6 years, that equates to an increase of over 75% (BPFI, 2015).

![Times Customers Access Accounts](image)

**Figure 2 - Times Customers Access Accounts (m)**

It’s not just the account accesses that have increased over the last number of years; it’s the number of payments that has increased also. In 2008, there were 30.7 million payments made through online banking. In 2009, this figure increased to 34.4 million (an increase of 12%), it increased again in 2010 and 2011 reaching 44.8 million payment transactions. In 2012 this figure stayed roughly on a par to 2011 with 44.9 million payments but the figure started to drop in 2013 to 42.6 million payments. This is a decrease of 5% in the number of payments being made through online banking (BPFI, 2015).
It should be noted here that the number of online payments in Q2 2013 was 10.5 million and this figure decreased to 10 million in Q1 2014 and then decreased again to 9.5 million in Q2 2014. This was due to the separation of online banking and mobile banking for statistical analysis. Mobile banking payment numbers were first recorded in Q1 2014 and this number was 4.2 million. It then increased to 4.8 million for Q2 2014, an increase of 14%. The interesting figure is that the total number of payments made in Q2 2013 was 10.5 million but once mobile payments were also taken into consideration, the figure jumped to 14.1 million for Q1 2014 and to 14.2 million for Q2 2014 which is a total increase of 35.2%, which is quite significant. In 2014, when online and mobile payments were separated for the first time, mobile payments accounted for more than one-in-three of all the online and mobile payments (BPFI, 2015).

There has also been a jump in the number of customers who are registered for online banking in the last number of years. In 2008 there were 2.2 million registered customers and there were nearly 550,000 new registrations in the same period. The numbers of registered customers jumped to 2.6 million in 2009 which is an increase of 18.2% but the numbers of new registrations decreased to 433,000 which is a decrease of 20.7%. While the numbers of registered customers has steadily gone up since 2008, reaching a plateau of 3.4 million registered customers in 2012 (up to 2.7 million in 2010 and up again to 3 million in 2011, an increase of 3.8% for 2010 and 11.1% for 2011), the number of new registrations decreased again in 2010, going down to 415,000 (a decrease of 4.1%) but jumped again in 2011 to 458,000 (an increase of 10.4%) and then again in 2012 to 540,000 (an increase of 17.9%) (BPFI, 2015).
Banking in many developing countries has gone from a traditional brick and mortar model with customers queuing for long periods, especially in remote and rural areas to modern online and mobile banking. This can be attributed to the increased proliferation of smartphones and ease of access to the internet. It is estimated that 2.6 billion people worldwide do not have access to formal financial services. According to a report by e-Marketer smartphone use will rise to 1.75 billion in 2014 driven by markets in developing countries including Asia-Pacific and Africa (emarketer, 2014).

Over 60% of Africans now have mobile phone coverage, and there are now over ten times as many mobile phones as landline phones in use (Aker & Mbiti 2010). Online and mobile banking is noticeably popular in countries where much of the population is unbanked (people who do not have their own bank account). In many of these countries branches are sparse and banks can only be found in major towns and cities. Customers often have to travel hundreds of miles to their nearest bank. In countries such as Kenya, Pakistan and China, new users of mobile banking surged by 100% in 12 months (TNS, 2011) as banks changed their traditional service model to mobile. For example: the launch of Kenya's M-PESA (“M” for Mobile, “Pesa” for “Money” in Swahili) mobile phone application leads the world in mobile money systems. It is used by over 19.3m Kenyans (safaricom limited, 2014) to pay bills and transfer funds instantly, securely, and inexpensively through their mobile phones and has been launched in India, Tanzania and Afghanistan. This uptake is not limited to developing countries within Western Europe mobile penetration is as high as 103% in Ireland (ComregA, 2014).

MOBILE PHONE ADOPTION WITHIN IRELAND

As stated previously, there is little data available in relation to the factors that affect Irish Consumers adoption of Mobile Banking technologies; however we believe that Ireland and therefore Irish consumers make an ideal study group for the following reasons:

- Mobile Phone penetration within Ireland is currently at 103% (excluding Mobile Broadband and Machine to Machine subscriptions), of which, smartphones account for 57% of subscriptions (ComregA, 2014).
- This has seen an increase where in second quarter 2014 where smartphone penetration reached a record 59% per cent of the Irish mobile subscriber market, (ComReg, 2014)
- This places Ireland at 11th in the world in terms of smartphone penetration (Google 2014).

According to Comreg as of December 2013, the Irish electronic communications market, there were 5.6 million mobile phone subscriptions in Ireland (Comreg, 2013).
Due to the interactive nature of mobile banking, smartphone technology is key to its usability and usefulness and as such we are targeting our research towards smartphone users and the factors affecting their uptake of mobile banking technology.

It wasn’t until 2012 that smartphone technology made inroads into the Irish marketplace and was the year that Ireland was to “Get Smart” with a 43% penetration rate of the nascent technology. After this sudden spike in technology adoption, 2013 saw a slowdown in adoption levels but still at a healthy growth margin of a 14% increase on 2012 up to 57% of the Irish mobile subscriber market.

<table>
<thead>
<tr>
<th></th>
<th>Q4’13</th>
<th>Q4’12</th>
<th>Quarterly Change (Q3’13 – Q4’13)</th>
<th>Annual Change (Q4’12 – Q4’13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total active SIMs</td>
<td>5,626,398</td>
<td>5,460,507</td>
<td>+0.2%</td>
<td>+3.0%</td>
</tr>
<tr>
<td>Total 3G SIMs</td>
<td>4,449,580</td>
<td>4,344,765</td>
<td>-0.5%</td>
<td>+2.4%</td>
</tr>
<tr>
<td>Dedicated mobile broadband and Smartphone (SIMs)</td>
<td>3,107,347</td>
<td>2,941,688</td>
<td>+1.1%</td>
<td>+5.6%</td>
</tr>
<tr>
<td>Smartphone (SIMs)</td>
<td>2,607,507</td>
<td>2,387,125</td>
<td>+1.9%</td>
<td>+9.2%</td>
</tr>
</tbody>
</table>

Figure 5 - Comreg - Mobile Subscriptions including Smartphones (ComReg, 2014)

Figure 6 shows the smartphone penetration since Q4 2012 to the end of December 2013.
CHAPTER TWO: LITERATURE REVIEW

In this chapter, we review current research in the field of mobile banking adoption, with a view to identifying the most common influencing factors affecting it. We will also examine the most popular technology adoption theories used in the study of mobile banking adoption, in order to identify the most suitable model or combination of models to use as part of our research. We will also look in general terms, at how security, risk and trust are perceived by individuals.

PERCEIVED SECURITY

Perceived security and risk are major decision factors in the adoption of mobile banking. They weigh heavy and encompass the social and psychological basis that is considered when looking at product and service acceptance. Owing to this they are key extensions to consider when formulating theory constructs when analysing and mapping feedback taken from survey research. (Shaikh & Karjaluoto, 2015).

Security is perceived as a risk that creates “circumstance, condition, or event with the potential to cause economic hardship to data or network resources in the form of destruction, disclosure, modification of data, denial of service, and/or fraud, waste, and abuse” (Kalakota, 1997). This definition points out the real threats to mobile banking from data transaction attacks, network attacks, unauthorized account access via falsification of authentication details. It is the level of protection against these threats that customers perceive as security.

There are a number of risks also relating to these security issues around mobile banking. These risks are related directly to the initial authorization and authentication process and how the attacker could access account credentials and obtain data. The four primary categories of risk emerging are: shoulder surfing, network attacks, compromise of the device, and untrustworthy remote service providers (Koved, 2013).

Firstly, “shoulder surfing”, which denotes that the users actions can and will be observed. If the user’s authentication actions could be observed, the observer could impersonate the user on a different device. Secondly “Compromising the device” where the user’s device is stolen or lost will expose potentially sensitive information. Thirdly “Network Attacks” when the risk is from the possibility of a “man in the middle scenario”, where an attacker could capture the user’s authentication details allowing them access to the users sensitive information as if they were the user themselves.

Lastly, “untrustworthy remote service providers”; the feature of caching application passwords on mobile devices to improve its usability as entry of a strong password takes a large proportion of time the user takes interacting with the device. This feature reduced the security further allowing a competent attacker access to a cached password identity.
The negative perception of this security seems to be one of the main obstacles to mobile adoption experienced by the banking sector. Security has been widely recognised as one of the main obstacles to the adoption of electronic banking (Aladwani, 2001).

Experts in field of mobile banking security have estimated this negative perception arises from the use of “open networks” to undergo banking transactions leaving the sensitive personal account information open to fraudulent misuse via the internet. Non-experts think and respond to risk very differently than experts (Kauhneman, 1982). Experts use statistical reasoning to assess risk, whereas non-experts rely on affect (Egelman.S., 2008).

Research has suggested that customers need to be convinced about their concerns of security in electronic banking, as they believe that internet payment channels are not secure and can actually be intercepted (Jones, 2000). Owing to these concerns, we have seen rapid progress into the development of security in recent years and substantial contributions to the safeguarding of the internet for consumer use of mobile and electronic banking.

However many existing types of security such as password protection are not sufficient because passwords can be easily observed. There is no assurance that the user is who they say they are and new mobile devices are now caching their application passwords making it even easier for the attacker to exploit them.

It is therefore essential to have secure communication and trusted authentication to guard against these risks. Solutions to these issues come in many guises one being the introductions of a strong authentication method, which can interchange each time the user logs on. Another solution widely used currently on new smartphone devices is the multi-factor methodology authentication by the use of the phones built in camera; finger print identification, bio metric data and microphones.

These forms of on-device security are enabled from the user end of the mobile transaction but the banks side of the transaction the most common approach taken are proactive responses to the problem. The banking sector understands all too well the threats that exist from breaches in security that can affect their mobile transaction platform and the repercussions.

Security breaches essentially come in three categories. Serious breaches of criminal intent such as fraud, theft of sensitive personal and commercial financial data. Breach’s by hacker’s causing denial of service, web site defacement and monetary gain and breaches due to design flaws in the system that can lead to embarrassing transactional issues.

One of these new security technology developments in recent years is Cyber Security. Cyber security adds a new dimension to the mobile security. Currently cyber-attacks have seen high profile breaches in banking security which has further eroded stakeholder trust in information security. 71% of banking and capital market CEOs see cyber insecurity as a threat to their business, more than any other sector. A proactive response is vital (PWC, 2014). So to rebuild this trust Cyber security is vital.
to the fear and uncertainty surrounding information security and it plays a dominant role in safeguarding sensitive user account information.

Irish banks have also taken to the Encryption of transactional data to its security and is the most common approach to secure transactions undertaken through mobile banking. Incorporating 2048 bit RSA encryption key technology to web app browsers and mobile apps will keep user information secure and private as it navigates the internet. This and pairing with digital certification makes its identification easier and cheaper to use and it should suffice up to 2030, when RSA key length of 3072 bits will be used if additional security is required (EMC, 2014).

Unfortunately these forms of security, authorization and authentication development can be complex and lengthy, which are in direct contrast to what the users typical expectations are when interacting with a mobile device. This is why it is essential to inform the user of the authentication demands or the user may avoid or reject these methods and directly affect adoption of the application. Willingness to perform actions for security purposes is strongly determined by the costs to the individual and perceived benefit (Sasse, 2001).

PERCEIVED RISK AND TRUST

To understand consumer confidence in mobile banking you must look at the basis for trust and understanding of risk that the individual perceives. Without risk the individual would have no need for trust as actions would be taken with thorough confidence and there would also be no need for security. Risk has been called the element that gives the trust dilemma its basic character (Johnston-George, 1982). This is no different when it comes to mobile banking adoption and in fact it is very prominent. When end-users’ perceptions of risk are not aligned with those on which the system is based, there is a mismatch in perceived benefit, leading to poor user acceptance of the technology (Beautement, 2008). Traditional banking sees little or no perceived risk in comparison to its electronic counterpart.

Perceived risk is commonly thought of as an uncertainty regarding possible negative consequences of using a product or service. It has formally been defined as the combination of uncertainty plus seriousness of outcome involved (Bauer, 1967).

Since the idea of risk is difficult to conceive the notion of perceived risk, which in the context of mobile banking is defined here as “the potential of loss in the pursuit of a desired outcome from using electronic banking services” (Youssafzai, 2003). This is particularly true in relation to mobile and electronic banking where the distances between bank and customer are vast and the probability of something going wrong along the way have a much higher risk level and are very difficult to monitor successfully.

Websites can be counterfeited, online identities can be forged and electronic documents can be falsified (Ba, 2001). The customer perception of security is clouded by the fact that their personal
and sensitive information could be violated and used without their prior knowledge or consent and used for fraudulent purposes.

It is this distance that the market believe the banks are taking advantage of, this and the impersonal nature of mobile banking. Consumers believe that banks are acting opportunistically because of the government inabilities to secure and monitor all transactions successfully. This opportunistic behaviour has seen the misuse of advertising, misrepresentation of product and services, leaking of private information and fraudulent misuse of funds that were particularly evident in the years leading up to the global downturn that subsequently lost the markets trust of the banking sector.

It is this trust that has been associated with reduced perceived risk in inter-organisational exchanges (Doney, 1997). Trust in mobile and electronic banking will reduce the customer uncertainty in transactions and the risk associated with the banks recent behaviour. It has been stated in numerous studies that the greatest challenge to the electronic banking sector will be winning the trust of customers over the issues of privacy and security (Furnell, 1999; Bestavros, 2000).

Once the banks can be trusted again to show magnanimity, integrity and capability only then will the customer feel that there is much less risk involved with banking transactions driving the adoption of mobile banking.

MOBILE BANKING ADOPTION

While significant volumes of research exist into Internet Banking (which can also be referred to as online banking), there is relatively little research focusing on mobile banking, either via dedicated mobile banking applications or mobile phone web browser’s (Yu, 2012) (Puschel, et al., 2010). During our search for relevant material, we discovered 2 specific papers, which guided our research. The first paper was titled Mobile Banking Adoption: A literature review (Shaikh & Karjaluoto, 2015), in which the authors conducted a review of existing literature relating to mobile banking adoption, with the intention to summarise existing studies and to map the most frequently used theories to predict users intentions re: mobile banking adoption. In terms of scope, the researchers searched 33 journals, across the fields of Information Systems, Marketing and Business Administration, for related articles, between the periods of 2005 and 2014. Their search yielded 55 relevant publications, which formed the basis of the study (Shaikh & Karjaluoto, 2015, p. 132).

In their analysis of research methodologies used, Shaikh & Karjaluoto state:

“Quantitative research was the most popular method: of 55 studies, 45 (82%) used a quantitative (survey) method to collect data, and only three (5%) employed qualitative methods such as interviews. In addition, five studies (9%) used both qualitative and quantitative methods, and two studies were conceptual in nature” (2015, p. 133).

With regard to the most popular acceptance models, Shaikh & Karjaluoto identified that Technology Acceptance Model (TAM), Innovation Diffusion Theory (IDT) and Unified Theory of Acceptance and
Use of Technology (UTAUT) were the most popular models used by researchers. (2015, p. 136). In addition to identifying the most frequently used adoption theories used, Shaikh & Karjaluoto’s research also identified the most frequently examined determinants of mobile banking adoption, finding a total of 88 unique factors examined across the 55 studies they examined. The top ten factors by frequency were: Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Trust (TRU), Social Influence(SI), Perceived Risk (RIS), Self-efficacy (SE), Compatibility (CO), Facilitating Conditions (FC), Cost (COS) and Credibility (CRE) (2015, p. 139).

These findings suggested to the team that; (1) quantitative research should be considered as the research method for our study, as using such a method would mean that the findings of our study would be more easily comparable to the majority of existing research (2) TAM, IDT and UTAUT or a hybrid of one or more of them, could be a suitable technology adoption theory for our study to use and more detailed research into this area would be required and (3) existing research in this area focused heavily on specific constructs, such as PU and PEOU, therefore the team determined that these factors should form the basis of our study, as it would allow for easier comparison of our findings against existing research.

The second key piece of literature which informed our study was a paper by Yousafzai (2012) which examined 9 theoretical models of internet banking adoption, including TAM, UTAUT and IDT. While the literature was focused on internet banking, rather than mobile banking, what was of interest to us was the more general comparison of the various theories and observations about the usefulness or otherwise of each of the theories. With regard to comparison of theories, the most relevant finding made by Yousafzai in relation to our study was the fact that studies using IDT, TAM or UTAUT usually extended the model with additional constructs to address perceived gaps in each of the models. In addition, it was noted that TAM was the most frequently used model in the study of internet banking adoption (Yousafzai, 2012, p. 223). Yousafzai also noted that constructs such as Relative Advantage (RA) and Complexity (CP) from IDT, Performance Expectancy (PE) and Effort Expectancy (EE) from UTAUT were essentially addressing the same principles as PU and PEOU from TAM i.e. does the user perceive the technology as useful and does the user perceive the technology as being easy to use.

The findings of Yousafzai appeared to confirm the findings of Shaikh & Karjaluoto (2015) in relation to the popularity of TAM as a technology adoption theory, the perceived gaps within TAM, IDT and UTAUT and the focus on ‘usefulness’ and ‘ease of use’ as key factors in mobile banking adoption.

To further validate the findings of Yousafzai (2012) and Shaikh & Karjaluoto (2015) the team undertook a review of a number of papers cited by those authors. This research is summarised below.

A 2003 survey into mobile banking adoption in South Africa by Brown et al, through the use of innovation diffusion theory (IDT) and decomposed theory of planned behaviour, identified that
perceived risk, had a significant influence on individuals intentions to adopt mobile banking (Brown, et al., 2003)

In 2005, Luarn and Lin (Luarn & Lin, 2005) conducted a survey on mobile banking adoption in Taiwan, which received 180 responses. They employed an extended version of the technology acceptance model (TAM), and discovered that financial cost, ease of use and usefulness positively influenced an individual’s intentions to adopt mobile banking. In a similar survey, Amin et al (2008) extended TAM to five constructs, perceived ease of use, perceived usefulness, perceived credibility, amount of information and normative pressure. Their survey of 158 respondents in Malaysia found that perceived ease of use and perceived usefulness had a positive effect on an individual’s intentions to adopt mobile banking.

An empirical study by Puschel et al (2010) carried out in Brazil, amalgamated 3 theories of adoption, TAM, Theory of Planned Behaviour (TPB) and IDT to assess the primary factors that influence mobile banking adoption. They found that relative advantage and compatibility had a significant impact on an individual’s attitude towards mobile banking. They also found that attitude had a significant impact on intention to adopt mobile banking. Koenig-Lewis (2010) merged TAM and IDT in a survey looking at mobile banking adoption for German consumers aged between 18-35 and identified that perceived usefulness, compatibility and risk had significant impacts on intention to adopt mobile banking, while trust, ease of use and credibility were not significant factors in intention to adopt mobile banking. Sripalawat et al (2011) employed a research model using both TAM and TPB, collecting 195 respondents and identified subject norms and perceived usefulness as the most influential factors in mobile banking adoption, in that order. In an empirical study of 275 subjects, Hsu et al (2011) employed extended TAM to include perceived security, perceived cost and subjective norms constructs to explain mobile banking adoption behaviours. They found that perceived usefulness, attitude and subjective norms were the most significant factors effecting mobile banking adoption.

Tan et al (2010) employed the unified theory of acceptance and use of technology (UTAUT) framework to look at the factors influencing mobile banking adoption in Malaysia. From 184 respondents, they found that perceived usefulness, perceived ease of use, convenience, self-efficacy and security were key factors influencing mobile banking adoption. Yu, (2012) carried out an empirical study into factors affecting individuals intentions to adopt mobile banking, utilising UTAUT, sampling 441 respondents. Yu concludes that individual intention to adopt mobile banking is significantly influenced by social influence, perceived financial cost, performance expectancy and perceived credibility. The study also found that gender and age had significant moderating effects on performance expectancy, perceived financial costs, and perceived self-efficacy.

Lin (2011) employed IDT with additional knowledge based trust constructs, in a survey to examine the impact of perceived relative advantage, ease of use, compatibility, perceived competence, perceived benevolence and perceived integrity on attitudes towards mobile banking adoption by users and potential users of mobile banking. The survey found that perceived relative advantage,
ease of use, compatibility and integrity significantly influenced attitude, which in turn impacted on intention to adopt mobile banking.

This review confirmed to the team that the findings of Yousafzai (2012) and Shaikh & Karjaluoto (2015) were indeed valid and were suitable foundation on which structure our study.

POPULAR THEORIES IN MOBILE BANKING ADOPTION STUDIES

A significant number of theories and models have been developed since the 1960’s as to the key factors that influence the adoption of technology (Yousafzai, 2012). Due to the number of theories available, the first requirement for this study is to determine the most appropriate theories/models to use in relation to Mobile Banking adoption.

A literature review of Mobile Banking adoption theories, carried out by Shaikh and Karjaluoto (2015) identified that, of 55 studies reviewed, 23 (42%) utilised the Technology Adoption Model (TAM), as developed by Davis (1989). The second most used model was Innovation Diffusion Theory, developed by Rogers (1995), which was used in 9 (16%) of the studies. The third most used model was the Unified Theory of Acceptance and Use of Technology, developed by Venkatesh at al. (2003).

TECHNOLOGY ADOPTION MODEL (TAM)

According to Yousafzai (2012, p. 218) “TAM was one of the first research models to specifically study how an individual’s perceptions about the usefulness, ease of use and attitude toward the use of a specific technology affects its eventual use.” Davis’ visual representation of the model can be seen in Figure 7.

![Figure 6 - TAM (Davis, 1989)](image)

With regard to Perceived Usefulness (PU), Davis defined this as “the degree to which a person believes that using a particular system would enhance his or her job performance” (1989)

Describing Perceived Ease of Use (PEOU), Davis defines it as “the degree to which a person believes that using a particular system would be free from effort” (1989).
In terms of the general effectiveness of TAM, Yousafzai (2012) states that, the utilitarian and technological focus of TAM, while being an advantage, can result in factors such as the users social and psychological perceptions being overlooked. Yousafzai (2012) cites research by Gounaris and Koritos (2008) by way of example.

A second common criticism of TAM is the failure of the model to acknowledge the individual differences of users, such as age, gender and other personal characteristics (Agarwal & Prasad, 1999), which can all have a bearing on the user’s intention to use.

To address some of the perceived limitations of the original TAM, an extension of TAM (TAM2) was proposed by Venkatesh and Davis (Venkatesh & Davis, 2000). TAM2 identifies and theorises that social influence (SI) (subjective norm and image) and cognitive instrumental processes (relevance to job, output quality, result demonstrability (RD) and PEOU) are determinants of PU.

In addition, the users experience and voluntariness were added as moderators to this model.

![Figure 7 - TAM2 (Venkatesh and Davis, 2000)](image)

Venkatesh and Bala (2008) proposed a 3rd iteration of TAM (TAM3) which combined TAM2 with additional determinants of PEOU (Computer self-efficacy, computer anxiety, computer playfulness) which were suggested in a separate study by Venkatesh (2000).
Figure 8 - TAM3 (Venkatesh and Bala, 2008)

USE OF TAM IN MOBILE BANKING ADOPTION STUDIES

TAM is a popular model for the study of mobile banking adoption (Shaikh & Karjaluoto, 2015); however, as the model excludes demographic, economic and external variables, it would appear to have a limited use in fully explaining user attitudes and intentions towards mobile banking adoption (Venkatesh & Davis, 2000).

This point is reiterated and expanded upon by Yousafzai, when noting the limitations of TAM, stating that: “The original TAM does not take into account prior experience, age, gender and many other personal characteristics, for example innovativeness, that may influence attitudes towards technology, which in turn influence intention to use.” (2012, p. 219).
To further emphasise this limitation, several studies on mobile banking adoption have extended the TAM framework to include other constructs such as perceived risk, perceived cost (Hanafizadeh, et al., 2012), perceived security (Hsu, et al., 2011) relative advantage and personal innovativeness (Chitungo & Munongo, 2013).

The findings of both Yousafzai (2012) and Shaikh & Karjaluoto (2015) suggest that the basic TAM framework is, by itself, not sufficient to provide a detailed analysis of mobile banking adoption and should be used with additional constructs such as perceived risk and perceived security to increase the effectiveness of the model.

### INNOVATION DIFFUSION THEORY (IDT)

Innovation diffusion theory (IDT), seeks to explain why, and how fast new technologies are adopted. The theory was developed by Everett Rogers in his book, Diffusion of Innovations. Rogers proposes that 4 key elements determine the adoption of a new technology (or idea), the innovation itself, communication, time and social systems. (Rogers, 1995).

These elements are defined as follows:

**INNOVATION**
- Any idea, practice or object that is perceived to be new by an individual, group or organisation can be classed as an innovation, subject to study via IDT.

**COMMUNICATION**
- The communication channels through which information is transferred between individuals or organisations. These are essential for diffusion to occur.

**TIME**
- Time is a necessary factor for the adoption of innovation; no innovations are instantly adopted by all potential users.

**SOCIAL SYSTEM**
- The combination of external influences, such as mass media and internal influences, such as the social relationships of the potential users. These have an impact on the intention to adopt by a user.

In relation to the innovation itself, Rogers proposes that the adoption of any innovation is influenced by 5 specific characteristics of the innovation itself: relative advantage (RA) compatibility (CO), complexity (CP), trialability (TR) and observability (OB) (1995). These are explained below:

- RA relates to the perception that the particular innovation is better than what it replaces.
- CO relates to how the user perceives that the innovation is consistent with their values, needs and past experience.
CP relates to the users perception of how difficult the innovation is to use and understand
TR is the degree to which the innovation can be trailed or experimented
OB is the degree to which both the innovation and its results are visible to the user

As with the original TAM, IDT is criticised for the lack of incorporation of individual differences (age, gender) and social issues into the IDT framework (Black, et al., 2001). In addition, the perceived risk of an innovation is also absent from the framework, which has proven to be an important factor in explaining adoption of services such as Internet Banking (Black, et al., 2001).

USE OF IDT IN MOBILE BANKING ADOPTION STUDIES

In relation to the use of IDT to analyse mobile banking adoption, research by Yousafzai shows that RA, CO and CP are the most significant factors to adoption behaviour, while TR and OB appear to be the least significant (2012).

In contrast to this, research by Al-Jabri & Sohail (2012) indicated that CP was an insignificant factor in mobile banking adoption. As the majority of respondents (72.7%) were between 18 and 25, Al-Jabri & Sohail (2012) suggest that this explains this unexpected finding, implying that younger users would be quicker to adapt to new innovations, therefore CP had no impact on their decision to adopt mobile banking.

Similarly to comments on the use of TAM (Yousafzai, 2012), Al-Jabri & Sohail (2012) point out that the inclusion of determinants such as self-efficacy and moderating factors like age and experience would provide more insight to the findings of future studies.

As with TAM, these findings suggest that IDT, if being used, requires extension and inclusion of additional factors when used to assess mobile banking adoption.

UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY (UTAUT)

UTAUT, as developed by Venkatesh et al (2003) is based on the comparison and integration of multiple technology adoption theories, including TAM and IDT to produce a unified technology adoption theory, with Intention and Use as the main dependant variables (Yousafzai, 2012).
As per figure 4, UTAUT identifies Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI) and Facilitating Conditions (FC) as the key determinants of usage intention or usage behaviour.

- PE relates to the perceived improvement that comes from use of the technology i.e. greater effectiveness or efficiency.
- EE relates to the users perception of how easy the technology is to use.
- SI reflects the options of family, friends and colleagues reading the use of the technology.
- FC relates to the individuals perception that the required knowledge, skills and resources are available to support the technology

UTAUT applies the moderating factors of Gender, Age, Experience and Voluntariness of Use to the above determinants.

Although UTAUT attempts to provide one single model for technology adoption, by incorporation of so many existing models, it has attracted criticism for being overly complex. Bagozzi pointed out that UTAUT provides 41 variables for predicting intention and at least 8 variables for predicting behaviour and states that it has contributed to the study of technology adoption reaching a state of chaos (Bagozzi, 2007).
USE OF UTAUT IN MOBILE BANKING ADOPTION STUDIES

UTAUT was employed as the framework for a study on mobile banking adoption in Taiwan by Yu (2012). The study sampled 441 respondents and concluded that intention to adopt mobile banking was significantly influenced, in order of importance, by social influence, perceived financial cost, performance expectancy and perceived credibility.

The study also concluded that the moderating effects of gender and age were significant; with gender significantly moderating the effects of performance expectancy and perceived financial cost. Age has a considerable moderating the effect of facilitating conditions and perceived self-efficacy on adoption behaviour (Yu, 2012).

Yu notes that UTAUT does not address constructs such as perceived credibility and financial cost, which were included by Yu as important determinants in the adoption of mobile banking (Yu, 2012).

Research by Zhou et al (2010) integrated UTAUT with the Task Technology Fit (TFF) model, to examine mobile banking adoption in China. Based on 250 respondents, the study found that performance expectancy, social influence and facilitating conditions had significant effects on user adoption (Zhou, et al., 2010).

As with research by Yu (2012), Zhou et al identified the need to incorporate additional constructs into UTAUT to provide a more detailed view of mobile banking adoption intention. (Zhou, et al., 2010).

CONCLUSION ON ADOPTION MODELS

From the above analysis of 3 of the most commonly used models in assessing mobile banking adoption (Shaikh & Karjaluoto, 2015), a number of conclusions can be reached.

In each study that was examined as part of this literature review, the authors of those studies felt it necessary to extend their initial adoption model with additional constructs, such as:

- TAM - extension of TAM to include perceived risk (Hanafizadeh, et al., 2012) or perceived security (Hsu, et al., 2011)
- IDT – inclusion of moderating factors such as gender and age (Yousafzai, 2012)
- UTAUT – extension of UTAUT to include perceived credibility and financial cost (Yu, 2012)

From this, it can be concluded that working within 1 single model or framework may limit the effectiveness or usefulness of a study on mobile banking adoption, therefore our study should use a hybrid or extended acceptance model. As TAM appears to be the most common model used in the study of mobile banking adoption, (Shaikh & Karjaluoto, 2015), the team concluded that it should form the basis of the a hybrid model, used to support this proposed study, as it would allow for a common frame of reference with the majority of existing research.
CHAPTER THREE: METHODOLOGY

The purpose of this study is to identify the key factors affecting consumer’s adoption of mobile banking technologies. In this chapter, we will describe the selected research approach, research framework and survey structure, and our justification for our choices in each area.

RESEARCH APPROACH

The first step in defining our research methodology, was determining which research philosophy or philosophies were most relevant to our topic.

Research philosophy refers to the development of knowledge including previously thought of theories and understandings of the nature of that knowledge. Research philosophy guides how the research is conducted with appropriate use of methodology. For the purpose of this study we looked at different research approaches and due to the nature of the question we are adopting an exploratory/descriptive approach based on a positivist philosophy.

This study reflects positivism as a methodological paradigm. Positivist researchers collect general information and data from a large social sample instead of focusing on details of research. It is an objective approach to data collection where the researchers own beliefs have no influence on the research study. The philosophical approach is mainly related with observations and experiments to collect numerical data. (Kasi, 2009)

A shortcoming of positivist research is that inaccuracy in scientific data may alter the end results of the hypothesis due to participants not providing authentic answers. The research must abide by these findings. As Johnson points out “Positivists see things as they are and tend to disregard unexplained phenomenon” (2014). Some argue that positivist research seems to ignore the complexity of human life and the researcher remains objective and detached from the people with who the research is been carried out on (Penny Mukherji, 2014).

Positivism has been successfully associated with the physical and natural sciences. Alavi and Carlson (1992) found that in a review of 902 information system research articles that empirical studies were all carried out with a positivist approach. It is therefore germane to our study since it is the case that our research is dealing with the interaction of people and technology. Questionnaires are used to produce and collect reliable data that can be checked and verified by others repeating the research. The use of questionnaires is considered to be of the social sciences rather than the physical sciences.

To understand and clarify this data the team conducted an exploratory study of existing literature. ‘An exploratory study is a valuable means of finding out what is happening; to seek new insights; to ask questions and to assess phenomena in a new light’ (Saunders, 2009). Exploratory research is conducted using qualitative approaches such as literature searches, interviews and conducting focus groups. It is often used when a topic or issue is new and data is difficult to collect. The main findings
of this research are covered in Chapter 2, but what is relevant to this chapter is the research approaches used in previous studies. As previously described in Chapter 2, research carried out by Shaikh and Karjaluoto (2015) relating to mobile banking adoption showed that, of the 55 publications reviewed, 48 (82%) used a quantitative (survey) method to collect research data.

**RESEARCH FRAMEWORK**

According to Malhotra (Malhotra, 2007), quantitative research is useful where a research wants to examine relationships and to test hypotheses. As our study on mobile banking adoption is primarily driven by the testing of hypotheses, such as “perceived ease of use has a positive impact on mobile banking adoption” it appeared that a quantitative approach would be the most relevant to our research. Another factor in choosing a quantitative approach was the fact that the majority of current research in the area of mobile banking adoption was quantitative. By utilising a similar method for our research, it was felt that any findings we made would be more easily integrated into the growing body of knowledge on this topic. For the above reasons, we decided that a quantitative research method should be used in our study.

**CHosen Quantitative Method - Online Survey**

As an extension of the exploratory study we also incorporated descriptive research. Descriptive research is used to answer who, what, when and where characteristics of a population without answering the questions about how, when or why those characteristics occurred. This area of research is about describing people who take part in a study. It is also referred to as statistical research for this reason it involves statistical data and statistical analysis of this data to show and summarize it in a meaningful manner.

The three main methods of descriptive research are case-study methods, observational methods and survey methods. The purpose of a survey is to produce statistics that are quantitative descriptions about some aspects of the study population (Saunders, 2009). Due to limited resources and time constraints of this course it was decided not to use case-studies or interviews. For this study a questionnaire was chosen as part of the survey strategy as the primary source of data. Before selecting this method the team looked at the advantages and drawbacks of using the survey method as shown below.

**ADVANTAGES:**

- They are one of the fastest ways of collecting large amounts of information quickly from respondents compared to the other survey methods.
- Quick deployment and real-time results
- Low cost with most providers offering a free limited service
- Provides a high level of convenience. Respondents can answer the questionnaire at their own pace and chosen time.
- Built-in custom reporting. Results can then be exported to third party statistical tools.
- Responses are anonymous and confidential
- Respondents have a variety of ways to access the questionnaire including mobile devices, tablets, laptops, desktop computers, etc.

**DISADVANTAGES:**
- Results can be invalidated because a respondent misinterpreted a question and answered in a way that was no intended.
- Due to ethics regulations questions could not be compulsory, therefore it is possible for respondents to skip single questions.
- Due to having no interviewer present the dropout rate is higher than other survey methods
- Technical glitches may arise that stop the respondent from completing the survey

Having considered the above advantages and disadvantages the team decided that a survey, delivered via the internet, was the most suitable method of data collection. This decision was based on a number of factors, primarily the fact an online surveys offer a fast and simple method for collecting data from a large group of respondents. As part-time students, with full time jobs, team members did not have the necessary free time to carry out surveys in person.

**RESEARCH MODEL – EXTENDED TAM**

Having researched a number of technology acceptance models, we determined that the most suitable model for our project was an extended version of Technology Acceptance Model (TAM) (Davis, 1989). TAM was chosen for 2 main reasons. Firstly, research has shown that TAM (including extended TAM) was the most popular model used when investigating mobile banking adoption (Shaikh & Karjaluoto, 2015). While popularity is not necessarily an indicator of quality, it was felt that by using TAM as the foundation for our research model, any findings from this study could be more easily compared with existing research, should anyone wish to do so. Research has shown that the core TAM constructs of Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) were the most frequently referenced determinants of mobile banking adoption (Shaikh & Karjaluoto, 2015) and that constructs utilised by UTAUT (Performance Expectancy and Effort Expectancy) and IDT (Relative Advantage and Complexity) address the same basic point i.e. that users intention to adopt a specific technology can be determined by their perception of how useful that technology is and their perception of how easy to use the technology is.

The second reason for selecting extend TAM as a research model was due to the relative simplicity of the model compared to the other models researched. As this was the our first exposure to the concept of technology acceptance models, it was felt that picking a simpler, proven model, would give the team a greater chance for producing a valid research model. As referenced in chapter 2, research by both Yousafzai (2012) and Shaikh & Karjaluoto (2015) suggests that the basic TAM is, by itself, not sufficient to provide a detailed analysis of mobile banking adoption and should be extended with additional constructs, however Yousafzai also highlights that both IDT and UTAUT are typically extended with additional constructs when used to study mobile banking adoption (2012).
As it was clear to the team that some form of customised model would be required, it was agreed that TAM was the best choice, as its relative simplicity allowed us to add extra constructs without impacting the core model, as it only contains the 2 constructs of PE and PEOU.

**RESEARCH MODEL – CONSTRUCTS AND RESEARCH QUESTIONS**

Having decided upon an extended TAM as the core of our research model, we then had to determine the full set of constructs to be included in our model and the questions they would address. The constructs we selected are as follows:

**PERCEIVED EASE OF USE (PEOU)**

Perceived ease of use, as defined by Davis, is “the degree to which a person believes that using a particular system would be free from effort” (1989) and is a core construct of TAM.

Research by Lin (2011) has shown that perceived ease of use has a significant effect on attitudes towards mobile banking adoption. Lin states that “Perceived ease of use contributes to a positive evaluation of mobile banking, especially by more experienced customers” (2011, p. 258). In a study of mobile banking adoption in Iran (Hanafizadeh, et al., 2012) found that perceived ease of use had a positive impact on mobile banking adoption, but found that ranked 5th after compatibility, trust, perceived usefulness and credibility.

**RESEARCH QUESTION 1: DOES PEOU HAVE A SIGNIFICANT POSITIVE IMPACT ON ADOPTION OF MOBILE BANKING TECHNOLOGY?**

**PERCEIVED USEFULNESS (PU)**

Davis defines perceived usefulness as “the degree to which a person believes that using a particular system would enhance his or her job performance” (1989) and it is a core construct of TAM. Research has shown that customers who have positive understanding of the usefulness of mobile banking had a more favourable attitude towards adoption of mobile banking (Lin, 2011).

This finding is echoed in the research of Al-Jabri & Sohail (2012), in their study of mobile banking adoption in Saudi Arabia, in which they conclude that customers who believe that mobile banking is a useful, efficient and effective method for managing their finances, will tend to adopt it. (Al-Jabri & Sohail, 2012)

Hanafizadeh et al (2012) identified perceived usefulness as having a positive impact on user’s adoption intentions, identifying it as the 3rd most important determinant after compatibility and trust.

**RESEARCH QUESTION 2: DOES PU HAVE A SIGNIFICANT POSITIVE IMPACT ON ADOPTION OF MOBILE BANKING?**
COMPATIBILITY (CO)

The compatibility construct, taken from IDT, relates to how the user perceives that the innovation is consistent with their values, needs and past experience. Research by Yousafzai has shown that CO is a significant influencer of mobile banking adoption (2012). According to Hanafizadeh et al, CO has a significant impact on a user’s intention to adopt mobile banking (2012).

RESEARCH QUESTION 3: DOES CO HAVE A SIGNIFICANT POSITIVE IMPACT ON ADOPTION OF MOBILE BANKING?

PERCEPTION OF TRUST (TRU)

Perception of Trust, as a construct, does not exist in TAM, UTUAT or IDT, but was the 3rd most utilised construct in researching mobile banking adoption, according to (Shaikh & Karjaluoto, 2015, p. 139). Research by Kim et al, concluded that TRU has a significant impact on consumers intention to adopt mobile banking (2009). Luo et al, in a study of both trust and risk in initial acceptance of emerging technologies, concluded that trust has a significant impact in a user’s intention to adopt mobile banking, however they also noted that that the users existing trust of their particular bank did not carry over into acceptance of mobile banking. (2010, p. 231)

RESEARCH QUESTION 4: DOES TRU HAVE A SIGNIFICANT POSITIVE IMPACT ON ADOPTION OF MOBILE BANKING?

PERCEPTION OF RISK (RIS)

As with Trust, Perception of Risk, as a construct, does not exist in TAM, UTUAT or IDT; however research has shown that it is the 5th most utilised construct when creating research models for mobile banking adoption (Shaikh & Karjaluoto, 2015, p. 139). Research shows that RIS has a significant impact on mobile banking adoption, for example Wessels & Drennan, investigating consumer acceptance of mobile banking, found that perceived risk has a significant negative impact on mobile banking adoption (2010). Wu and Wang also found a significant relationship between RIS and use of mobile banking (Wu & Wang, 2005)

RESEARCH QUESTION 5: DOES RIS HAVE A SIGNIFICANT NEGATIVE IMPACT ON ADOPTION OF MOBILE BANKING?
SOCIAL INFLUENCE (SI)

The Social Influence construct, taken from UTAUT, relates to how the opinions of friends, family and colleagues influence a user’s decision to adopt a specific technology. According to Shaikh & Karjaluoto, SI is the 4th most frequently utilised construct when researching mobile banking adoption (2015, p. 139). Research by Zhou et al found that SI has a significant effect on user adoption of mobile banking. (2010) Research into the moderating effect of gender in the adoption of mobile banking has shown that SI has a significant effect on mobile banking adoption and the effect of SI was more prominent amongst females than males (Riquelme & Rios, 2010).

RESEARCH QUESTION 6: DOES SI HAVE A SIGNIFICANT IMPACT ON ADOPTION OF MOBILE BANKING?

FACILITATING CONDITIONS (FC)

Taken from UTAUT, the construct of Facilitating Conditions relates to the individuals perception that the required knowledge, skills and resources are available to support the technology. Zhou et al, state that FC has a significant impact on users adoption of mobile banking (2010) With regard to knowledge and resources required to use mobile banking, research has also shown that mobile phone penetration rates in Ireland for Q3 2014 are at 106.5% (ComReg, 2014) which suggests that Irish consumers should respond positively in relation to FC impact on mobile banking adoption.

RESEARCH QUESTION 7: DOES FC HAVE A SIGNIFICANT IMPACT ON ADOPTION OF MOBILE BANKING?

MODERATING FACTORS – GENDER/AGE/EXPERIENCE

Research has shown that a user’s, age, gender and experience can have a moderating effect on the impact of constructs listed above (Yousafzai, 2012) (Riquelme & Rios, 2010) (Shaikh & Karjaluoto, 2015). Based on this research, the following research questions were created.

RESEARCH QUESTION 8: DOES GENDER HAVE A MODERATING EFFECT ON PEOU, PU, CO, TRU, RIS, SI AND FC?

RESEARCH QUESTION 9: DOES AGE HAVE A MODERATING EFFECT ON PEOU, PU, CO, TRU, RIS, SI AND FC?

RESEARCH QUESTION 10: DOES EXPERIENCE HAVE A MODERATING EFFECT ON PEOU, PU, CO, TRU, RIS, SI AND FC?
The above research model is illustrated in Figure 11 below.

**SURVEY STRUCTURE**

Having defined a suitable research model, we then set about defining the structure of the survey. The survey was divided into distinct sections, representing the determinants of mobile banking adoption identified in our research model, with additional sections to capture data relating to the identified moderating factors of gender, age and experience.

**SECTION 1 – USER PROFILE DATA**

The first section of the survey focused on collecting data around a participant’s age, gender and experience. This information was requested as per the research model, where gender and age were shown to have moderating effects on the factors that influence mobile adoption. Also contained in this section, were questions relating to the participants banking behaviours, including who the participant banks with, their attitude toward their bank and whether or not they had previously used mobile banking. The data gathered in this section related to the following research questions:
RESEARCH QUESTION 8: DOES GENDER HAVE A MODERATING EFFECT ON PEOU, PU, CO, TRU, RIS, SI AND FC?

RESEARCH QUESTION 9: DOES AGE HAVE A MODERATING EFFECT ON PEOU, PU, CO, TRU, RIS, SI AND FC?

RESEARCH QUESTION 10: DOES EXPERIENCE HAVE A MODERATING EFFECT ON PEOU, PU, CO, TRU, RIS, SI AND FC?

SECTION 2 – TECHNOLOGY

The second section of the survey contained questions related to the participant’s general levels of technical awareness e.g. ownership of a mobile phone, how often they access the internet, via what means and a self-assessment of technical competence i.e. how proficient the user thought they were in the general use of computers. The data gathered in this section related to the following research questions:

RESEARCH QUESTION 7: DOES FC HAVE A SIGNIFICANT NEGATIVE POSITIVE IMPACT ON ADOPTION OF MOBILE BANKING?

RESEARCH QUESTION 10: DOES EXPERIENCE HAVE A MODERATING EFFECT ON PEOU, PU, CO, TRU, RIS, SI AND FC?

SECTION 3 – INFLUENCING FACTORS

The third and final section of the survey related to the determinants of mobile banking adoption identified in our research model. Each determinant was given a specific subsection and appropriate questions were added to each subsection such as, under PU “Mobile Banking provides me with greater control over my finances – agree or disagree” or, in relation TRU “I trust my mobile phone service provider to provide secure access to mobile banking services – agree or disagree”. The data gathered in this section related to the following research questions:

RESEARCH QUESTION 1: DOES PEOU HAVE A SIGNIFICANT POSITIVE IMPACT ON ADOPTION OF MOBILE BANKING TECHNOLOGY?

RESEARCH QUESTION 2: DOES PU HAVE A SIGNIFICANT POSITIVE IMPACT ON ADOPTION OF MOBILE BANKING?

RESEARCH QUESTION 3: DOES CO HAVE A SIGNIFICANT POSITIVE IMPACT ON ADOPTION OF MOBILE BANKING?

RESEARCH QUESTION 4: DOES TRU HAVE A SIGNIFICANT POSITIVE IMPACT ON ADOPTION OF MOBILE BANKING?
RESEARCH QUESTION 5: DOES RIS HAVE A SIGNIFICANT NEGATIVE IMPACT ON ADOPTION OF MOBILE BANKING?

RESEARCH QUESTION 6: DOES SI HAVE A SIGNIFICANT NEGATIVE IMPACT ON ADOPTION OF MOBILE BANKING?

RESEARCH QUESTION 7: DOES FC HAVE A SIGNIFICANT NEGATIVE / POSITIVE IMPACT ON ADOPTION OF MOBILE BANKING?

SURVEY QUESTIONS DESIGN

With regard to the types of questions to be used in the survey, a mixture of dichotomous, multiple choice and scale based questions were used. Dichotomous and multiple choice questions were used primarily in sections 1 and 2 of the survey. Dichotomous questions were used either to capture specific, non-subjective data such as participant gender or to allow for decision points within the survey, such as branching the survey flow based on whether or not a participant stated they had used mobile banking. With regard to section 3, questions were designed based on the Likert scale, which according to Malhotra (2007) are used as measurements of attitudes, which are each to construct and understand. When using Likert questions, an individual is presented with a statement. The individual is then asked to indicate the level to which they agree or disagree with the statement. A 5 point Likert scale was used for all questions in section 3, for example:

“I find mobile banking easy to use – Strongly Agree – Agree – Neutral- Disagree – Strongly Disagree”

For the purposes of this survey, the distance between each interval is considered to be equal i.e. the distance between Strongly Agree to Agree is equal to the distance between Disagree to Strongly Disagree.

TESTING THE SURVEY

Having created the survey questions, a draft questionnaire was created by the team, using the KwikSurvey.com online survey tool. This draft questionnaire was distributed to 10 friendly users, who are asked to complete the questionnaire and respond with any feedback they had in relation the content, style or any other element of the survey. Feedback was received from all friendly users, highlighting a number of basic errors (spelling, grammar etc.) along with some fundamental flaws within the draft survey, specifically the fact that if a respondent indicated that they did not use mobile banking; we did not offer an option for the participant to state why they chose not to use the service. In addition, friendly users highlighted a number of logical breakpoints within the flow of the questionnaire e.g. where a respondent answered a dichotomous question but was still required to answer follow up questions which had been rendered irrelevant by their initial answer.

A second draft of the questionnaire was generated; addressing the feedback received and was reviewed within the team. A second round of friendly user testing was not feasible due to time constraints and the team accepted that lack of further testing might impact on number of valid
survey responses, however it was deemed more important that the survey was issued by a specific date, in order to give the team sufficient time to analyse the data received.

ETHICAL CONSIDERATIONS

Trinity College requires their students in information systems undertaking an exploratory study to apply for approval from the ethics committee within the school of computer science and statistics. There were a number of issues that the committee needed to consider before offering approval. These included the instruments of recording and measurement of data that were to be used; in what way we would publish the collected data and the detachment of commercially sensitive or misleading information. These issues would have to be approved before we could proceed.

To ensure that the respondents remained anonymous we did not email them individually but instead created an anonymous, public, online survey, which could be accessed by any person with access to the internet and had the specific URL of our survey. Once accessing the survey the respondents would be presented with a declaration of intent stipulating that ethics approval was gained by the research team and with the backing of the college. The potential participant then had the option to exit the survey at the point, or to begin the survey process. In addition, to satisfy the ethical requirements of Trinity College, all questions were made non-mandatory and participants had the option to exit the survey at any time, resulting in any data entered up to that point from being excluded from the survey.

ISSUING THE SURVEY

As we are implementing an exploratory research project, the logical approach to gathering quantitative data was to implement a survey. As the survey would be delivered via the internet and data would be collected anonymously, we decided to utilise a snowball sampling approach to recruit participants. When using snowball sampling, a survey is sent to an initial group or participants, who are then requested to forward the survey to anyone they feel would be interested in completing it. This approach would allow us to spread the survey ‘virally’ to a large number of people in a very short space of time. The final survey was constructed on Kwiksureveys.com and was active from the 17th of February 2015 to 3rd March 2015. We initially targeted the following groups of people:

- Class members in the fourth year BSc (Hon) Degree in Information Systems, TCD
- Social Media Contacts
- Work colleagues

We estimate that over 200 – 300 initial survey invitations were send out between the 4 team members, however, Kwiksureveys.com does not natively support recursive invitations, so while we included an request to forward our survey to any interested parties in the survey invite, we have no way to verify the total number of participants invited to take the survey.
DATA ANALYSIS

All data was taken from KwikSurveys (www.kwiksurveys.com). There are many online survey options and they all offer pretty much the same thing, but the one thing that KwikSurveys offered that many of the others didn’t was a student plan. This enabled us to access all the features of the fully paid site but at less than half the price. Some of the features of the site are a full results export, a powerful report builder, customisable questions and layout, answer logic, complete anonymity and secure, confidential data. Upon the completion and the closing of the questionnaire when the analysis was starting, it was noticed that the reporting capability was not as sophisticated it was expected to be. Reports could be produced for each question, producing bar charts or pie charts that could be customised with different themes, but the information gathered couldn’t be cross-tabulated incorporating data from more than one question. This was seen as the main failing as most of our analysis would come from the cross-tabulation of questions and their corresponding answers.

Since time was of the essence to get the analysis done and as the team had no experience in sophisticated statistical analyses through college or our professions we adopted a simplified statistical approach. This resulted in the information being exported in a .csv file format to Excel. There are two options to export the data from KwikSurveys – either in text format, or numerical format. Text format exports the data with full text values, so if a question was “Do you have a smartphone? – Yes, No”, then the responses that would be exported would be the Yes and No. Sometimes this can make it harder to do an analysis of the data. With numerical format exporting, each answer is given a coding, so for the sample question above, Yes would be given a code of 1 and No would be given a code of 2. This can make it easier when doing a count of certain results to find the number of occurrences of a certain value e.g. those with a smartphone.

Excel was then used as the repository for all the data. Each question and answer option was given a separate column and every response was given a separate row. Through the use of COUNTIFS statements, it was possible to make a count of certain results, but also, by using multiple COUNTIFS statements in the one cell, it was possible to cross-tabulate the results from many questions where only the results that match each COUNTIFS statement are displayed. This enabled us to get quality statistical data and corresponding percentages.

LIMITATIONS

The limitations of the ethics approval process were restrictive to the survey. Approval depended on the context and on the type of exploratory study undertaken. In our case this hindered the survey and subsequently may have skewed the results. We had other minimal administrational issues with the process which did hold up the process. It was also noted by the team that the ethics approval would only be granted upon including no mandatory questions in the survey. This we thought could impact on the quality of data collected, as it would allow respondents to skip questions.

An additional limitation we found was our use of the Likert questioning scale. We implemented Likert’s original scale which was bipolar, involving five points from one extreme to another running
through a neutral position. These ranged from ‘Strongly Agree’ to ‘Strongly Disagree’ offering four degrees of opinion and no opinion at all.

There are problems with Likert Scaling in this way, firstly having an opinion of neutrality allows the person being surveyed to ‘sit on the fence’ and not have any informed opinion leading to a wasted response with no discernible answer. The opinion of being neutral also allows the person an easy way out of answering a question if they feel they have no opinion on.

Outside of the neutral response a problem and issue may also occur where person being surveyed has answered strongly in one opinion several time in a row, they may be influenced in the way they have answered successively and continue the pattern without deliberating the question or in the deliberately changing their opinion to break the pattern of consecutive responses on a question they would normally have contrary opinion on, thus leading either way to a spoiled answer.
A questionnaire was used as the method for gathering primary data for the research topic and was left open for a period of two weeks. Upon closing the survey there were responses from 146 individuals. The research question revolves around consumer’s adoption of mobile banking technologies, but having completed the initial research, there was very little information in the public domain relating to Ireland and the uptake of mobile technologies in this country. It was then decided that the research question would concentrate on responses from Ireland alone, so 23 of the 146 responses were eliminated leaving 123 total responses for Irish people. All of the following statistics and analysis are based on this figure.

From the data received, the male / female split was quite even with a total of 63 male and 60 female responses. In terms of the age range a total of 3 (2.44%) ranged in age from 18 – 24, 80 in the 25 – 39 age group giving 65.04% of the total respondents. For the next age group, 40 – 49, there were a total of 31 making up 25.2% of the total. There were 9 over 50; 6 aged between 50 – 59 (4.88%) and 3 over 60 (2.44%).

Of all the Irish responses, 96 of them (78.05%) put down Dublin as their location, while the remaining 27 responses (21.95%) were from ‘outside’ Dublin.

From the number of respondents, a total of 116 (94.3%) said that they have a smartphone, while only 1 (< 1%) said that they didn’t have a smartphone, meaning that there were 6 no responses to this question. It turns out that from our survey Apple iOS is by far the most popular operating system with nearly 60% of respondents (69) saying they have an iPhone and 39 saying that they have an Android (33.62%). The remaining 8 were using Windows, Blackberry or unknown operating systems.

**PERCEIVED USEFULNESS**

The first construct examined in the survey was that of Perceived Usefulness (PU), which appeared as question 26 in the survey. Existing research indicates that PU has a significant positive impact on mobile banking adoption (Al-Jabri & Sohail, 2012) (Hanafizadeh, et al., 2012). Question 26 contained 4 statements in relation to PU:

- Q26.1 Mobile Banking is a convenient way to manage my finances
- Q26.2 Mobile Banking provides me with greater control over my finances
- Q26.3 Mobile Banking provides me with all of the banking services I require to manage my finances
- Q26.4 Mobile Banking reduces the need for me to visit a bank branch
Table 1 - Question 26: Results

With reference to table 1 above, the highest scoring statement in this section was 26.1, with a weighted average score of 4.45. 94% of respondents either that mobile banking was a convenient way to manage their finances. The next highest scoring statement was 26.4, with a weighted average score of 4.15; 86% of respondents agreed that mobile banking reduced the need for them to visit a bank branch. The third highest scoring statement was 26.2, with a weighted average score of 4.11; 81% of respondents agreed that mobile banking provides greater control over their finances. The lowest scoring statement was 26.3, with a weighted average score of 3.26. Only 50% of respondents agreed that mobile banking provides all the services required to manage their finances.

Cross tab analysis of Question 26 against Question 33 “When you have banking to do, how likely are you to use mobile banking?” was carried out, to determine how a positive response to question 26 might impact overall likelihood to use mobile banking in the future. Analysis shows that 84% of respondents who agreed/strongly agreed with statement 26.1 also stated they were likely/very likely to use mobile banking when they next had banking to do. 85% of respondents who agreed/strongly agreed with statement 26.4 stated they were likely/very likely to use mobile banking. For statement 26.2, 87% of respondents who agreed/strongly agreed with the statement were also likely/very likely to use mobile banking in the future. Finally, 86% of respondents that agreed/strongly agreed with statement 26.3 also indicated that they were likely to use mobile banking in the future. For context, it should be noted that only 50% of respondents agreed that mobile banking provides all the services they need.

The above results appear to confirm the findings of Al-Jabri (2012) & Hanafizadeh et al (2012) that PU has a positive effect on mobile banking adoption, with respondents highlighting convenience and control as the most significant factors. However, respondents were also in agreement that mobile banking did not offer all of the services they require. This would suggest that banks looking to drive increased adoption of mobile banking should focus on increasing the range of services available via mobile banking.
The second construct examined in the survey was that of Perceived Ease of Use (PEOU), which appeared as question 27 in the survey. Existing research indicates that PEOU has a significant positive impact on mobile banking adoption (Lin, 2011). Question 27 contained 3 statements in relation to PEOU:

- Q27.1 I find using Mobile Banking easy to use
- Q27.2 Learning how to use Mobile Banking is easy
- Q27.3 Mobile Banking has sufficient safeguards to prevent me from making mistakes

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Table 2 - Question 27: Results

The highest scoring statement in this section was 27.1, with a weighted average score of 4.45. 92% of respondents agreed with the statement that mobile banking was easy to use. The next highest scoring statement was 27.2, which had an average score of 4.15. 88% of respondents agreed that it is easy to learn how to use mobile banking. The lowest scoring statement was 27.3, with a weighted average score of 3.79. 71% of respondents agreed mobile banking has sufficient safeguards to stop them from making mistakes. It is worth noting that statement 27.3 had a significant number (17) of responses which were neutral in comparison to statements 27.1 and 27.2, indicating that some users may not be aware of exactly what features of mobile banking the statement refers to as ‘safeguards’.

Cross tab analysis of Question 27 against Question 33 “When you have banking to do, how likely are you to use mobile banking?” was carried out, to determine how a positive response to question 27 might impact overall likelihood to use mobile banking in the future. The findings indicate that 90% of respondents who agreed that mobile baking was easy to use are likely to use mobile banking in the future. 89% of respondents who agreed that it was easy to learn mobile banking also agreed that they were likely to use mobile banking again. Finally, 93% of respondents who agreed that mobile banking has sufficient safeguards against mistakes also agreed that they would use mobile banking for any future banking activity.

The above results would appear to confirm the findings of Lin (2011) that PEOU is a significant positive factor in user’s adoption of mobile banking. More specifically, users who find mobile banking easy to use and easy to learn are highly likely to adopt and continue to use mobile banking for future banking needs. These finding suggest that banks wishing to increase repeat usage of
mobile banking should focus on making their service as easy to use as possible, as these findings show a clear relationship between how easy a user finds mobile banking and their likelihood to use mobile banking for their future banking needs.

**COMPATIBILITY**

The third construct examined in the survey was Compatibility (CO), which appeared as question 28 in the survey. Existing research indicates that CO has a significant positive impact on mobile banking adoption (Hanafizadeh, et al., 2012) (Yousafzai, 2012). Question 28 contained 3 statements in relation to CO:

- 28.1 Mobile Banking suits the way I like to manage my finances
- 28.2 Mobile Banking works well on my current mobile phone
- 28.3 When dealing with any service provider, I prefer to use self-service technology if possible

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Table 3 - Question 28: Results

As illustrated by table 3 above, the highest scoring statement in this section was 28.2, “Mobile Banking works well on my current mobile phone” with an average score of 4.17. 87% of respondents agreed that mobile banking worked well on their current phone. Suitability (28.1) was the next highest scoring statement, 82% of respondents agreed that mobile banking suited the way they like to manage their finances. Preference for self-service (28.3) received the lowest average score, at 3.69. Only 62% of respondents agreed that they have a general preference for self-service technology. While this figure still represents more than half of the respondents, it is significantly down on the average scores of 28.1 and 28.2.

Cross tab analysis of Question 28 against Question 33 “When you have banking to do, how likely are you to use mobile banking?” was carried out, to determine how a positive attitude to CO might impact overall likelihood to use mobile banking in the future. This analysis indicates that people who find that mobile banking works well on their current mobile phone were likely to continue to use mobile banking, with 92% of those who agreed with statement 28.2 also stating they were likely/very likely to use mobile banking when they next had banking to do. A similar result was found for suitability (28.1), whereby 90% of respondents who agreed that mobile banking suited how they like to manage their finances also indicated that they would use mobile banking for their future banking activity. Finally, 94% of respondents who agreed with statement 28.3 (preference to self-serve) also indicated they would continue to use mobile banking in the future.
Some additional cross tab analysis was carried out, with reference to statement 28.2 and the stated operating systems of respondents. 72% of iPhone users agreed that mobile banking was easy to use on their phone, compared to 51% of respondents who use Android phones.

Based on the above analysis, it appears that CO has a positive effect on mobile banking adoption, confirming the findings of Hanafizadeh (2012), with handset compatibility and compatibility with lifestyle as the key influencing factors. The data also indicates that type of handset is a moderating factor in CO, with a higher proportion of iPhone users believing that mobile banking works well on their phone, as compared with users of Android phones. Importance of device type to the user’s perception of CO suggests that a bank or indeed any service provider who wishes to offer self-service via mobile device should ensure that their services are fully tested and optimised for a wide range of devices, to maximise the likelihood of user adoption.

**PERCEIVED TRUST**

The fourth construct examined in the survey was that of Perceived Trust (TRU), which appeared as question 29 in the survey. Existing research indicates that TRU has a significant positive impact on mobile banking adoption (Luo, et al., 2010). Question 29 contained 4 statements in relation to TRU:

- Q29.1 I trust my mobile phone service provider to provide secure access to mobile banking services
- Q29.2 I trust my bank to keep my mobile banking data secure
- Q29.3 When accessing mobile banking via Wi-Fi, I trust internet service providers to keep my mobile banking data secure
- Q29.4 I trust my mobile phone manufacturer to provide a device which is suitable to conduct mobile banking

<table>
<thead>
<tr>
<th>Question</th>
<th>Answers</th>
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<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Average Score</th>
<th>% Agree</th>
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<td>17</td>
<td>40</td>
<td>15</td>
<td>3.77</td>
<td>70</td>
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</table>

Table 4 - Question 29: Results

With reference to table 4 above, the highest scoring statement in this section was 29.2, with a weighted average score of 3.90. 76% of respondents agreed that their bank could be trusted to keep their mobile banking data secure. The next highest scoring statement was 29.4, with a weighted average score of 3.77. 70% of respondents agreed that they trusted their mobile phone manufacturer to provide a device which was suitable for mobile banking. The third highest scoring
statement was 29.1, with a weighted average score of 3.71 and 67% of respondents agreed that their mobile phone service provider could be trusted to provide secure access to mobile banking services. The lowest scoring statement was 29.3, with a weighted average score of 3.42, with only 50% of respondents agreeing that they trusted internet service providers to keep their data secure, when accessing Wi-Fi.

Cross tab analysis of Question 29 against Question 33 “When you have banking to do, how likely are you to use mobile banking?” was carried out, to determine how respondents attitudes to TRU might impact overall likelihood to use mobile banking in the future. The findings show that 94% of people who agreed/strongly agreed that they could trust their mobile phone service provider (29.1) also stated they were likely/very likely to use mobile banking in the future. 92% of respondents who agreed that they could trust their bank (29.2) also agreed that they would use mobile banking in the future. 95% of respondents who stated they trusted internet service providers (29.3) also indicated that they were likely to use mobile banking in the future. Lastly, 93% of respondents who agreed that they trust their mobile phone manufacturer stated that they were likely to use mobile banking for future banking activity.

In general, it appears that TRU has a moderately positive influence on adoption of mobile banking, with trust in banks and phone manufacturers as the most prominent factors. It is worth noting that a significant number of respondents provided neutral answers, rather than disagreeing, which could be an indication that some users are not sufficiently aware of the security measures taken by the banks, service providers and ISP’s to keep users data secure.

**PERCEIVED RISK**

The fifth construct examined in the survey was that of Perceived Risk (RIS), which appeared as question 30 in the survey. Existing research indicates that RIS has a negative impact on mobile banking adoption (Wu & Wang, 2005) (Shaikh & Karjaluoto, 2015). Question 30 contained 4 statements in relation to RIS:

- Q30.1 My phone could be lost or stolen
- Q30.2 Mobile malware or viruses could steal my data
- Q30.3 My data could be intercepted by a third party over a mobile network
- Q30.4 Issues with mobile phone coverage may leave me unable to access mobile banking when I need it
In this question, respondents were asked to rate the significance of a number of potential risks, in relation to their decision to use mobile banking. Data theft via mobile malware (30.2) was rated by respondents as the most significant risk, followed closely by interception of data over mobile networks (30.2), with an agreement rate of 49% and 47% respectively. Inability to access mobile banking due to mobile coverage issues (30.4) was the 3rd highest scoring risk, with an agreement rate of 44%. The lowest scoring risk was loss or theft of phone (30.1), to which only 31% of respondents considered this to be a significant risk factor in their decision to use mobile banking. In general, all 4 statements had an agreement rate of less than 50%, with a significant percentage of respondents stating a neutral opinion.

Cross tab analysis of Question 30 against Question 33 “When you have banking to do, how likely are you to use mobile banking?” was carried out, to determine how perception of risk might impact overall likelihood to use mobile banking in the future. Analysis shows a minimum of 88% of respondents who agreed that the stated risks were significant factors in their decision to use mobile banking also stated that they were likely to use mobile banking in the future. This suggests that even though the respondents considered these risks to be significant, they were deemed significant enough to prevent the majority of respondents from continuing to use mobile banking.

Based on the above analysis, it appears that, contrary to extant research (Wu & Wang, 2005) RIS appears to have a negligible effect on mobile banking adoption for Irish consumers; however additional data is needed to verify this result. The question did not address how likely respondents thought these risks were i.e. the “risk is real, but is unlikely to happen to me”. Without this additional data, the findings in relation to RIS appear somewhat contradictory and further analysis is recommended.
SOCIAL INFLUENCE

The sixth construct examined in the survey was that of Social Influence (SI), which appeared as question 31 in the survey. Existing research indicates that SI has a significant impact on mobile banking adoption (Zhou, et al., 2010). Question 30 contained 3 statements in relation to SI:

- Q31.1 The people who influence my behaviour think that I should use mobile banking
- Q31.2 The people who are important to me think that I should use mobile banking
- Q31.3 Bank's advertising influences me to use mobile banking

<table>
<thead>
<tr>
<th>Question</th>
<th>Answers</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Average Score</th>
<th>% Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.1</td>
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<td>30.3</td>
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<td>28</td>
<td>10</td>
<td>2</td>
<td>2.48</td>
<td>15</td>
</tr>
</tbody>
</table>

*Table 6 - Question 31: Results*

With reference to table 6 above, the level of agreement for all 3 statements was very low, with statement 30.1 scoring the lowest agreement rate of just 14%. Statement 30.3 was the next highest, with an agreement rate of 15%, with statement 30.2 receiving the highest level of agreement, at 18%. It is clear that the majority of respondents indicated that they either disagreed with the statements or had a neutral opinion. These findings suggest that SI has no significant positive impact on mobile banking adoption.

Cross tab analysis of Question 31 against Question 33 “When you have banking to do, how likely are you to use mobile banking?” was carried out, to determine how attitudes to SI might influence mobile banking adoption. The analysis shows that respondents who disagreed that they are influenced by others in relation to mobile banking usage were just as likely to use mobile banking in the future as those we agreed that they were influenced by others. For example, in relation to statement 30.1, 91% of respondents who agreed with the statement also stated that they would use mobile banking in the future, however 90% of respondents who were neutral or disagreed with the statement also indicated that they were likely to use mobile banking in the future. This finding was replicated across all 3 statements.

Contrary to existing research (Wu & Wang, 2005) it appears that SI has no significant effect (positive or negative) in relation to an Irish consumer’s adoption of mobile banking. This suggests that banks wishing to promote the use of mobile banking may focus on direct advertising to their customer.
The seventh construct examined in the survey was that of Facilitating Conditions (FC), which appeared as question 32 in the survey. Existing research indicates that FC has a significant positive impact on mobile banking adoption (Zhou, et al., 2010). Question 32 contained 3 statements in relation to FC:

- Q32.1 I have the necessary resources to use mobile banking
- Q32.2 I have the necessary knowledge to use mobile banking
- Q32.3 If I have difficulty using mobile banking there is adequate help available to me

<table>
<thead>
<tr>
<th>Question</th>
<th>Answers</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Average Score</th>
<th>% Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.1</td>
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<td>1</td>
<td>2</td>
<td>43</td>
<td>33</td>
<td>4.33</td>
<td>95</td>
</tr>
<tr>
<td>30.2</td>
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<td>1</td>
<td>2</td>
<td>34</td>
<td>41</td>
<td>4.43</td>
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<td>30.3</td>
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<td>26</td>
<td>35</td>
<td>8</td>
<td>3.46</td>
<td>54</td>
</tr>
</tbody>
</table>

Table 7 - Question 32: Results

With reference to table 7 above, Knowledge (32.2) was the highest scoring statement with an average score of 4.43. 95% of respondents agreed that they had sufficient knowledge to use mobile banking. Resource availability (32.1) was the next highest scoring statement, with an average score of 4.33. 95% of respondents agreed that they the necessary resources to use mobile banking. The lowest scoring statement was 32.3 “If I have difficulty using mobile banking there is adequate help available to me”, with an average score of 3.46. Only 56% of respondents agreed that there was sufficient help available if they have difficulty using mobile banking. This statement scored significantly lower than either 32.1 or 32.2, however out of 79 answers, only 10 respondents disagreed with the statement, with 26 selecting a neutral opinion. This would suggest that a large percentage of respondents are unaware of what help is available. When analysed against responses to statement 32.2 (Knowledge) it would suggest that many users have not required help in using mobile banking, therefore have a neutral opinion on the subject.

Cross tab analysis of Question 32 against Question 33 “When you have banking to do, how likely are you to use mobile banking?” was carried out, to determine how attitudes to FC might impact overall likelihood to use mobile banking in the future. 91% of respondents who said they had sufficient resources to use mobile banking also stated that they would use mobile banking in the future. 92% of respondents who agreed that they had sufficient knowledge to use mobile banking also agreed that they were likely to use mobile banking for their future banking needs. 95% of respondents who agreed that sufficient help exists for mobile banking users also agreed that they were likely to use mobile banking when they next had banking to do.
Based on the above analysis, it appears that FC has a significant positive effect on mobile banking adoption, confirming the findings of Zhou et al (2010), with knowledge and resources ranking highly. While availability of help (32.3) scored significantly lower, the large number of neutral opinions coupled with the fact that 88% of respondents who had a neutral position on 32.3 still stated that they were likely to use mobile banking reinforces the conclusion that the low ranking for this statement is driven by the fact that users have not required help and so can’t state whether or not sufficient help is available. This finding suggests that mobile banking users may also be likely to adopt mobile self-service tools from other service providers, given the fact that they consider themselves to have an above averages level of computer literacy and have the required resources (smartphones) needed to use such services.

MODERATING FACTORS

The survey captured respondent data in relation to Gender, Age and Experience, to assess how these variables might moderate the effects of the 7 key constructs of PU, PEOU, CP, TRU, RIS, SI and FC.

AGE

An insufficient spread of data was captured to allow detailed analysis of age as a moderating factor in mobile banking adoption. The survey sought to capture data from respondents in 4 age ranges, however 90% of respondents fell into 2 ranges (25-39: 65% of responses) and (40-49: 25% of responses), preventing any meaningful analysis of how age moderates the 7 key constructs covered in this study. This clustering of data was a result of the method by which the survey was issued. In circulating the survey ‘virally’ to friends and family, the age range of respondents was skewed to reflect the age range of the research team. This will be noted as a significant limitation of this survey method. With that constraint in mind, basic analysis of the data showed that respondents in the 25-39 age range had a more positive attitude to PU, PEOU, CO and FC when compared with all other age groups. Respondents in this age range were also more likely, on average, to use mobile banking for their future banking needs.

GENDER

Existing research indicates that Gender can have a significant moderating effect on attitude to mobile banking adoption (Riquelme & Rios, 2010) (Shaikh & Karjaluoto, 2015). Respondent’s answers to questions 26 – 32 were analysed by gender to determine what effect if any gender had on respondents answers. In relation to PU, more males agreed that mobile banking offered convenience and control, whereas more females agreed that mobile banking offered all of the services they require and that mobile banking reduces the need to visit a branch. There was no significant difference in the general scoring of PU between males and females. With regard to PEOU, male responded more favourably to all 3 elements (ease of use, easy to learn, safeguards against mistakes). In relation to SI, RIS, CO and TRU, no significant difference between male and females was found.
EXPERIENCE

In this survey, experience relates to the respondents general level of technical awareness, how often they access the internet, how they access the internet, if they shop online, general attitude toward their bank and their banking habits. The survey captured data in respect to all of the above areas and this data was than analysed against the respondents answers to questions 26 -32. This analysis yielded the following results; respondents who regularly shopped online had a more positive general attitude to adoption of mobile banking. This group also had a more favourable attitude to TRU than those who were not regular online shoppers e.g. 96% of respondents who regularly shopped online also agreed that they trust their mobile service provider and their bank to keep the personal data secure. Respondents who rated their general computer skills as above average had a more favourable attitude to PEOU. This group had high levels of agreement that mobile banking was both easy to use and easy to learn. Choice of phone had a significant impact on their attitude towards CO, e.g. 72% of respondents using iPhones agreed that mobile banking worked well on their phone, compared with 50% of those using Android phones. Experience appeared to have no significant effects on attitudes towards SI, FC or RIS.

CONSTRUCT RANKING BY SCORE

Having examined each construct individually, a weighted average score was calculated for each of the 7 key constructs examined in this study. Figure 12 below illustrates the findings.
Based on weighted average, FC was the highest ranking construct, followed by PEOU, CP, PU, TRU, RIS and SI.

Analysis of the top 10 highest scoring answers shows the following:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Question</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>PU</td>
<td>“Mobile Banking is a convenient way to manage my finances”</td>
<td>4.45</td>
</tr>
<tr>
<td>FC</td>
<td>“I have the necessary knowledge to use mobile banking”</td>
<td>4.43</td>
</tr>
<tr>
<td>FC</td>
<td>“I have the necessary resources to use mobile banking”</td>
<td>4.33</td>
</tr>
<tr>
<td>PEOU</td>
<td>“I find using Mobile Banking easy to use”</td>
<td>4.32</td>
</tr>
<tr>
<td>CO</td>
<td>“Mobile Banking works well on my current mobile phone”</td>
<td>4.17</td>
</tr>
<tr>
<td>PEOU</td>
<td>“Learning how to use Mobile Banking is easy”</td>
<td>4.15</td>
</tr>
<tr>
<td>PU</td>
<td>“Mobile Banking reduces the need for me to visit a bank branch”</td>
<td>4.15</td>
</tr>
<tr>
<td>CO</td>
<td>“Mobile Banking suits the way I like to manage my finances”</td>
<td>4.13</td>
</tr>
<tr>
<td>PU</td>
<td>“Mobile Banking provides me with greater control over my finances”</td>
<td>4.11</td>
</tr>
<tr>
<td>TRU</td>
<td>“I trust my bank to keep my mobile banking data secure”</td>
<td>3.90</td>
</tr>
</tbody>
</table>

Table 8 - Top 10 Answers

**SUMMARY OF FINDINGS**

In relation to which are the most significant factors in the adoption of mobile banking, our research indicates that FC, PEOU, CO and PU were the most significant, with TRU, RIS and SI being the least significant. FC relates to whether or not a person feels they have sufficient, knowledge, resources and support to use mobile banking. The high rating of FC in this survey is consistent with the general level of smartphone adoption in Ireland and the fact that 70% of survey respondents stated that their computer skills were advanced or expert. This finding suggests that Irish consumers, particularly those within the 25-39 age range are ideally placed to take advantage of not only mobile banking but mobile self-service across a number of service providers. Banks and other service providers wishing to initiate or grow their mobile self-service offering could see significant take up by focusing on the above demographic.

The high rating of PEOU could be seen to logically follow FC, given that the majority of respondents have already stated that they possess sufficient knowledge to use mobile banking. In addition, iPhone users had a more favourable attitude to PEOU and 60% of all respondents were iPhone users. The fact that all 3 examined aspects of PEOU scored highly suggests that banks have reached near optimal state in terms of usability and that further investments in enhancing usability may yield only moderate growth in adoption. Device type is equally important with regard to CO, which suggests that banks looking to promote mobile banking should, where possible, ensure that their mobile banking apps and websites are optimised for the most popular devices to increase chances of user adoption. In addition, the findings for CO, whereby users state that mobile banking suits their lifestyle, indicate that these users may also be prime candidates to adopt mobile self-service from other service providers. We believe this could warrant more detailed analysis, to assess how likely
Irish consumers are to adopt mobile self-service technologies or the propensity of mobile banking users to adopt other mobile self-service offerings.

PRU also appears to be a significant factor in mobile banking adoption, however the findings show that while a large majority valued the convenience and control offered by mobile banking, they did not feel that mobile banking offered all of the services they required. This suggests that repeat usage of mobile banking could be encouraged by banks, by surveying their customers to establish what additional services they would like to see offered. The findings also show that the overall perceived usefulness of mobile banking appear to outweigh the perceived lack of features.

TRU appears to have a moderate positive impact on mobile banking adoption and would appear to be less important to Irish consumers than would have been expected, based on the literature reviewed. The fact that even users who indicated that they did not necessarily trust banks to keep their data secure said they were likely to use mobile banking in the future. It may be the case that users feel the benefits of using mobile outweighs their lack of trust, however additional research is required to validate this theory.

The findings in relation to RIS appear to contradict existing research, in that perception of risk appeared to have no significant impact on mobile banking adoption for Irish consumers. This might suggest that similar to TRU, the benefits of using the service outweigh the perceived risks. The fact that the service in question is mobile banking might add to this perception, in that users may feel that if they are a victim of data theft where they were not at fault, their bank will ultimately compensate them for any loss. It may equally be true that users do not fully understand the risks and will use the service until such time as they are actually the victim of data theft. As a significant number of respondents had a neutral view on risk factors, the latter may be more likely, however more detailed research is required to properly establish user’s perception of risk.

SI would appear to have no impact on user’s adoption of mobile banking. Its relatively high level of importance in the findings of Shaikh & Karjaluoto (2015) could possibly be attributed to the specific locations in which the research they analysed took place. A majority of the studies they analysed were conducted in Asia and Africa, (2015, p. 133) where cultural norms differ significantly and the influence of peers and family may have a greater weight than they do for Irish consumers. The findings indicate that for Irish consumers, a bank wishing to drive adoption should focus on direct marketing to users.

Finally, analysis of the top ten highest scoring statements, as per Table 8 above, indicates that convenience, knowledge, suitable phones and ease of use are the most significant individual factors to users of mobile banking. This would suggest that these specific areas are worthy of focus for any bank or other service provider wishing to develop mobile self-service offerings.
LIMITATIONS

The following limitations must be considered, when reviewing the results of this survey:

- Limited sample size
  - All findings are based on data provided from 123 respondents.
- Incomplete data set
  - Trinity College policy required that all questions were optional. As a result, not all respondents answered every question. Where cross tab analysis has been carried out, it was based only on the number of respondents who answered the specific question(s) being analysed.
- Survey results impacted by community bias
  - As the survey was issued to friends and family of the research team members, via email and social media, the initial sample group was made up of people of a similar demographic to the research team themselves. This is most obvious in the case of respondent age range, with 65% of respondents in 25-39 age range. This cannot be considered a comprehensive sample of the population.
CHAPTER FIVE: CONCLUSION

The purpose of the study is to explore the key factors affecting Irish consumer’s adoption of mobile banking technologies. The study looks at the key theories around social, compatibility, facilitating, ease of use, risk, usefulness and trust factors that can influence people’s choices to use mobile banking today. During our search for relevant material, we found 2 specific papers relating to our topic which guided us in our research method and theoretical model. We found that a quantitative approach would be more beneficial to our topic (Al-Jabri & Sohail, 2012) as it would mean that the findings would be more comparable with existing research and when analysing the results.

For our approach to theoretical methods of analysis, we found that any one model on its own wasn’t enough to give us a conclusive picture of the best approach. We therefore based it on a number of different theoretical models it was decided that an extended model would be required which we based on the various models that we reviewed.

In the initial project plan it was also proposed that we would conduct interviews with banking representatives as some members of the team work in the financial services sector. It was later decided to abandon these interviews as we thought it would be more beneficial to gather quantitative results from consumers for our exploratory research.

Based on the findings from the literature review we developed a quantitative survey to examine the key constructs and the moderating factors which were based around the extended TAM model we adopted specifically for this research project. Having reviewed prior research on the uptake of mobile phone adoption it was noted that most of the other papers used quantitative research as their information gathering method. This leads to more defined answers and better analysis of the information (Yousafzai, 2012).

Our research findings indicate that usefulness, ease of use, facilitating conditions, and compatibility were the most significant adoption factors, whereas trust, risk and social influence were less significant than anticipated.

Perceived Usefulness, according to Al-Jabri (2012) & Hanafizadeh et al (2012), has a positive effect on mobile banking adoption. We found that 94% of people surveyed agree that it is a good way to manage finances but only 50% agree that mobile banking provides a complete listing of services. Therefore leading us to conclude that banks in Ireland could add more functionality and services to their mobile offerings in order to increase mobile transactions.

Lin (2011) concluded that Perceived Ease of Use has a significant positive impact on mobile banking adoption. We found that 92% of people agreed that mobile banking is easy to use; thereby agreeing with Lin, but 71% of respondents agreed that mobile banking has sufficient safeguards. Since there were a number of neutral answers in this section, we are concluding that some users may not be aware of what safeguards are in place. Some banks who want to increase usage of mobile banking
could focus on ease of use design for their mobile banking offerings as there is a clear link between the ease of use of an application and the intention to use it.

Facilitating Conditions have a significant positive affect on the impact of mobile banking adoption according to Zhou et al, 2010. We found a significantly high percentage of people feel they have both the necessary resources and knowledge to use mobile banking (and this could be down to the age of the respondents being in the 24-39 range) but only 54% feel there is enough help available. This could be because users are not aware of the help or haven't actually needed it before. So, while banks themselves may not need to improve their mobile banking technologies and the help available, it could be a prime opportunity for other service companies like utility services to provide similar services to users.

We confirmed the findings of Hanafizadeh (2012) that Compatibility did have a positive effect on the adoption of mobile banking. Nearly 90% of people agree that it works well on their current device but of the iPhone users, 71% agreed that mobile banking was easy to use on their phones, whereas with Android users, that percentage was only 50%. This could encourage banks to develop more simplified and design centric Android applications to make the mobile banking experience more enjoyable and easy to use to bring it in line with the iOS.

In terms of Social Influence, we were surprised that it came across with the lowest rating score as Irish respondents don’t seem to have any influence in using mobile banking from their peers. This is contrary to research from Zhou et al, 2010. As a marketing strategy, this could push banks to market direct to customers or adopt a different marketing strategy as only 15% of people agreed that bank’s advertising influences people to use mobile banking.

We were again surprised that the findings relating to risk and trust were the least significant factors in adoption of mobile banking. Existing research indicates that TRU has a significant positive impact on mobile banking adoption (Luo, et al., 2010). We found that trust had a moderately positive impact, which could be construed that trust is not or no longer an issue for a retail banking customer when dealing with their preferred bank. These findings could reassure the banking sector that their public relations technics are adequate and consumer confidence is high. It was noted though that a high number of respondents were neutral in their answer. This could be interpreted that the user was not aware of the security measures that banks had in place. Banks could take from this that they needed to make their customers more aware of the security measures they have in place to protect their data.

In relation to the consumer’s attitude to risk as a determining factor, we again found that it was less than significant as an influencing factor and had a negligible effect on mobile adoption. Our analysis found that 88% of respondents agreed that risk was a factor, but also answered that they would likely use mobile banking in the future suggesting that risk would not be an influencing factor in their adoption. Our findings were again contrary to existing research that indicated RIS has a negative impact on mobile banking adoption (Wu & Wang, 2005) (Shaikh & Karjaluoto, 2015). We felt that
our questioning around risk did not contribute to a conclusive finding and recommend further
research and analysis into risk as an influencing factor in mobile adoption.

LIMITATIONS OF THE STUDY AND SUGGESTIONS FOR OTHER RESEARCH

The use of an online survey as the method of data collection is likely to have influenced the type of
responses received, in terms of age and general technical literacy. Also, the uses of ‘snowball
sampling’ as the method of survey distribution appeared to result in a community bias effect,
whereby the majority of respondents fell into the same demographic range as the research team
themselves. This may have also contributed to the smaller than desired final sample size of 123
respondents. As a result of these factors, the true demographic range of mobile banking users may
not be reflected in this study.

By using 7 influencing factors and 3 moderating factors, the survey contained over 30 questions. As
a result, the survey questions could only address very high level issues, and did not allow for detailed
questioning in relation to any single influencing factor.

This study also raised a number of interesting findings, which we believe warrant further
investigation:

(1) Existing research suggested that a user’s perception of risk was a significant factor in the
adoption of mobile banking, with several studies finding it to have a negative impact on a user’s
likelihood to adopt mobile banking. However, the results of our research appear to show that
perception of risk was not a significant factor in Irish consumer’s adoption of mobile banking, even
for users who stated that they considered risks such as data theft to be very significant to their
adoption decision. We believe that a more detailed study into mobile banking users perceptions of
risk would provide useful additional data on why some users continue to use mobile banking in spite
of the significant risks they perceive.

(2) Research into the impact of social influence on mobile banking adoption suggests that it has a
significant impact on users adoption of mobile banking, but the results of our research find the
opposite to be true for Irish consumers. Social influence i.e. the opinions of ones friends, family and
peers, appears to have no effect on adoption. As the majority of the research referenced in our
study was conducted outside of Europe, any future studies in relation to Irish consumers may find it
valuable to consider the wider cultural values of the sample group, as this possibly moderates the
strength of social influence.

Finally, due to the continuing growth of smartphone adoption and banks’ willingness to move
towards self-service and cashless banking, we feel that the general topic of mobile banking adoption
in Ireland merits further research, ideally sampling a significantly larger and more diverse group
than the one covered in this study, to validate or challenge the findings contained in this report.


Bott, J. and Milkau, U (2014) ‘Mobile Wallets and Current account, Friend or Foes?’ Journal of Payments and Strategies Vol.8, No.3 (June 2014)


Towns, S., (2012)’The Interaction of Man and Machine’. 1st Interview with Paul Steinberg, CTO Motorola for eRepublic Inc,. Vol. 10 Issue 4, p32
APPENDICES

Information For Participants

This page contains information which explains the purpose of the study, its duration and your rights as a participant.

TRINITY COLLEGE DUBLIN
INFORMATION FOR PARTICIPANTS

BACKGROUND OF RESEARCH: This research aims to identify what are the factors affecting consumer's adoption of mobile banking technologies.

PROCEDURES OF THIS STUDY: Participants will be asked to access and complete an anonymous online survey and answer a series of questions relating to the research topic.

DURATION OF THIS STUDY: This survey will be open to participants from Tuesday 17th February 2015 to 3rd March 2015.

DURATION OF ONLINE SURVEY: This survey will take between 5 - 10 minutes to complete.

RISKS OF THIS SURVEY TO PARTICIPANTS: None. All information supplied is anonymous.

PARTICIPATION: Participation in this survey is voluntary. All participants retain the right to exit the survey at any point or to omit responses.

QUESTIONS: Each question in this survey is optional. Feel free to omit a response to any question; however we would be grateful if all questions are responded to.

Continue
Exit the survey
TRINITY COLLEGE DUBLIN
INFORMED CONSENT FORM

LEAD RESEARCHERS: Barry McDonnell, Emmet Dowling, John Connolly, David Watson

BACKGROUND OF RESEARCH: What are the factors affecting the consumer's adoption of mobile banking technologies

PROCEDURES OF THIS STUDY: This survey aims to ascertain what affects people's attitudes towards the adoption of mobile banking technologies in Ireland. The survey will be open a maximum of two weeks and participation is voluntary. The information given will not be held and used for any other purpose other than what is intended. Users can opt-out at any time.

PUBLICATION: The results of this survey will be analysed and presented to Trinity College Dublin. The results will remain the property of TCD and may be accessed upon request via the School of Computer Science and Statistics.

DECLARATION:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I understand that I may stop electronic recordings at any time, and that I may at any time, even subsequent to my participation have such recordings destroyed (except in situations such as above).
- I understand that, subject to the constraints above, no recordings will be replayed in any public forum or made available to any audience other than the current researchers/research team.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- <If the research involves viewing materials via a computer monitor> I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
- I have received a copy of this agreement.

Statement of investigator’s responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.
RESEARCHERS CONTACT DETAILS: Barry McDonnell (mcdonnba@tcd.ie)

TRINITY COLLEGE DUBLIN

Do you wish to continue?
Yes
No

About You
Each question is optional. Feel free to omit a response to any question; however we would be grateful if all questions are responded to

Please tell us a little about yourself...

1) Are you male / female?
   Male
   Female

2) Please select your age...
   18 - 24
   25 - 39
   40 - 49
   50 - 59
   60+

3) Which country do you currently reside in?

4) If Ireland, which county do you live in?
## Technical Literacy

Please tell us a little about your technical literacy

5) How would you consider yourself regarding your computer skills?
- Basic
- Intermediate
- Advanced
- Expert
- Other (Please Specify)

6) Do you own one or more of the following? (Please tick all that apply)
- Desktop PC
- Laptop
- Mobile Phone
- Tablet

7) If you have a mobile phone, is it a smart phone?
- Yes
- No

8) If you answered yes to Q7, which operating system does your phone use?
- Android
- Windows
- Blackberry
- I don't know
- Other (Please Specify)

## Browsing Habits

Please tell us a little about your browsing habits

9) How often do you access the internet via each of the following?

<table>
<thead>
<tr>
<th>Device</th>
<th>Never</th>
<th>1-2 times per week</th>
<th>At least once per day</th>
<th>2-3 times per day</th>
<th>more than 3 times per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop PC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laptop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile Phone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tablet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10) Do you make purchases online?
- Yes
- No

## Online Habits
Please tell us a little about your online purchasing habits

11) How often do you shop online?
- Once per year
- 2 - 3 times per year
- Monthly
- Weekly
- More often

12) Which of the following have you used to make an online purchase?
- Desktop PC
- Laptop
- Mobile Phone
- Tablet

13) Which of the following do you use most often when making an online purchase?
- Desktop PC
- Laptop
- Mobile Phone
- Tablet

14) If you do not make purchases online, please state why...
- Fears about security
- Prefer high street shopping
- Other
- Other (Please Specify)
**Banking Habits**

Please tell us a little about your banking habits

15) Do you bank with any of the following? (Please tick all that apply)

- Allied Irish Bank
- Bank of Ireland
- UlsterBank
- Permanent TSB
- KBC
- RaboBank
- An Post
- EBS
- Other (Please Specify)

16) How often do you visit a bank?

<table>
<thead>
<tr>
<th>Less than once per month</th>
<th>1 - 2 times per month</th>
<th>3 - 4 times per month</th>
<th>More than 4 times per month</th>
</tr>
</thead>
</table>

17) Overall, how satisfied are you with your bank?

<table>
<thead>
<tr>
<th>Very Unsatisfied</th>
<th>Unsatisfied</th>
<th>Neutral</th>
<th>Satisfied</th>
<th>Very Satisfied</th>
</tr>
</thead>
</table>

**Mobile Bank**

Do you use mobile banking?

18) Do you access banking services on your mobile phone?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
**Mobile Banking**

Please tell us about your experience with mobile banking

<table>
<thead>
<tr>
<th>19) How do you access these banking services on your mobile device? (Please tick at least one)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Via web browser</td>
</tr>
<tr>
<td>Via mobile app</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>20) How do you <strong>prefer</strong> to access banking services on your mobile device?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Via web browser</td>
</tr>
<tr>
<td>Via mobile app</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>21) If you use a mobile banking app, how long have you been using it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 6 months</td>
</tr>
<tr>
<td>6 - 12 months</td>
</tr>
<tr>
<td>1 - 2 years</td>
</tr>
<tr>
<td>2 - 3 years</td>
</tr>
<tr>
<td>3 - 4 years</td>
</tr>
<tr>
<td>&gt; 4 years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>22) Do you use any of the following services when banking on your mobile device?</th>
</tr>
</thead>
<tbody>
<tr>
<td>View balance</td>
</tr>
<tr>
<td>Pay bills</td>
</tr>
<tr>
<td>Transfer funds</td>
</tr>
<tr>
<td>Mobile top-ups</td>
</tr>
<tr>
<td>View statements</td>
</tr>
<tr>
<td>Other (Please Specify)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>23) How often do you use mobile banking?</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least once a month</td>
</tr>
<tr>
<td>At least once a week</td>
</tr>
<tr>
<td>At least once a day</td>
</tr>
<tr>
<td>More often</td>
</tr>
</tbody>
</table>
Usefulness
Please tell us how useful mobile banking is to you

24) Please review the statements below and indicate whether or not you agree with them.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Banking is a convenient way to manage my finances</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile Banking provides me with greater control over my finances</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile Banking provides me with all of the banking services I require to manage my finances</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile Banking reduces the need for me to visit a bank branch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ease of use
Please tell us if you find mobile banking easy to use

25) Please review the statements below and indicate whether or not you agree with them.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I find using Mobile Banking easy to use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning how to use Mobile Banking is easy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile Banking has sufficient safeguards to prevent me from making mistakes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Compatibility

Please tell us how compatible mobile banking is with your lifestyle

26) Please review the statements below and indicate whether or not you agree with them.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Banking suits the way I like to manage my finances</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile Banking works well on my current mobile phone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When dealing with any service provider, I prefer to use self-service technology if possible</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Trust

Please tell us about your trust levels for banking

27) Please review the statements below and indicate whether or not you agree with them.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I trust my mobile phone service provider to provide secure access to mobile banking services</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I trust my bank to keep my mobile banking data secure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When accessing mobile banking via Wi-Fi, I trust internet service providers to keep my mobile banking data secure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I trust my mobile phone manufacturer to provide a device which is suitable to conduct mobile banking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Risk

Please tell us about any risks you perceive with mobile banking

28) Please indicate how significant the following risks are, in relation to your decision to use mobile banking

<table>
<thead>
<tr>
<th>Risk</th>
<th>Very Significant</th>
<th>Insignificant</th>
<th>Neutral</th>
<th>Significant</th>
<th>Very Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>My phone could be lost or stolen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile malware or viruses could steal my data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My data could be intercepted by a third party over a mobile network</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Issues with mobile phone coverage may leave me unable to access mobile banking when I need it</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Social Influence

Please tell us of any social influences regarding mobile banking

29) Please review the statements below and indicate whether or not you agree with them.

<table>
<thead>
<tr>
<th>Social Influence</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The people who influence my behavior think that I should use mobile banking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The people who are important to me think that I should use mobile banking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank's advertising influences me to use mobile banking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Facilitating Conditions

Please tell us of any facilitating conditions for mobile banking

30) Please review the statements below and indicate whether or not you agree with them.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have the necessary resources to use mobile banking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have the necessary knowledge to use mobile banking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If I have difficulty using mobile banking there is adequate help available to me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Likelihood of Adoption

How likely are you to adopt mobile banking?

31) Please review the statement below and indicate whether or not you agree with them.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Very Unlikely</th>
<th>Unlikely</th>
<th>Neutral</th>
<th>Likely</th>
<th>Very Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>When you have banking to do, how likely are you to use mobile banking?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reasoning

Please indicate from the list below your reason for not choosing to use mobile banking

32) Please choose from the list below your reasons for not choosing to use mobile banking.

I believe...

... that mobile banking is unsafe
... that my data is not secure
... that I don't have the technical knowledge to use it
... that I prefer to visit physical branches
... that my data is at risk
... that I prefer phone banking

Thank You