

Is Ireland Embracing the Mobile Application Paradigm Shift?

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university. I 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.

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Abstract

Smart device applications available for download from App Stores have exploded exponentially. Small downloadable software packages on Smartphone, Tablet, Phablet or iPad, commonly known as 'an app', have become an integral part of life for numerous users throughout many countries, with varying levels of usage and functionality.

With ubiquitous app availability for Ireland, this study examines user acceptance and usage of Smart device apps for users over 18 years of age. The purpose was to gain an understanding regarding the potential impact and level apps play in the context of Irish daily life in 2015.

The study examined: Is Ireland Embracing the Mobile Application Paradigm Shift?

The study was conducted using a Pragmatism methodology, with a deductive approach adopted. A Survey (i.e. Interviews and Questionnaire) strategy was implemented to provide relevant feedback from app teams and users today. Interviews with Irish app development companies were completed. A survey on a sample of the Irish population was also undertaken to allow deeper understanding.

Quantitative and qualitative primary data was gathered via the interviews and the online survey. Findings were enhanced by examining existing literature (secondary data) to ascertain comparisons concerning acceptance and interactions for app usage in Ireland. The study applied the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model (i.e. consumer-focused constructs and key moderators) as the chosen research driver on a shorter time frame.

Findings describe how Ireland does appear to be embracing the "Download the app..." culture with high levels of app usage reported. But study results suggest challenges remain to be resolved for greater acceptance. The results show a high percentage of usage exists in Ireland, but fewer users perform meticulous tasks or in-app purchases using apps. Therefore, high influence from trusted sources (e.g. family or friends) may be necessary for superior user adoption.

Table of Contents

List of Tables.....	vii
List of Figures.....	viii
Abbreviations	ix
Glossary of Terms.....	x
Construct Definitions	xi
Statistical Symbols	xii
1 INTRODUCTION.....	1
1.1 Study Background	2
1.2 Research Question	3
1.3 Importance of the Study.....	3
1.4 Beneficiaries of the Study	5
1.5 Study Scope and Boundaries.....	5
1.6 Dissertation Route Map	5
2 LITERATURE REVIEW	
2.1 Overview.....	6
2.2 Introduction.....	6
2.3 Application Stores.....	10
2.4 Ecosystem Challenges	12
2.5 M-Commerce Diffusion	13
2.6 Monetization Opportunities	15
2.7 Theoretical Acceptance Concepts.....	17
2.8 Theoretical Models and User Acceptance.....	19
3 METHODOLOGY AND FIELDWORK	
3.1 Introduction.....	24
3.2 Research Philosophy	25
3.3 Approach and Distribution.....	26
3.4 Instruments and Data Collection	28
3.5 Study Hypotheses and Constructs	30
3.6 Conclusion.....	31

4 FINDINGS AND ANALYSIS	
4.1 Introduction.....	31
4.2 Demographics.....	31
4.3 Simple Analysis	33
4.4 Reliability Analysis	39
4.5 Descriptive Statistics.....	41
4.6 Hypotheses Explored.....	43
4.7 Interviews Summary	45
4.8 Survey Summary	48
5 CONCLUSIONS AND FUTURE WORK	
5.1 Introduction.....	53
5.2 New and Interesting Findings.....	53
5.3 Research Sub-Questions Implications for Ireland	57
5.4 Sample Calculations and Generalisability	58
5.5 Limitations, Challenges and Lessons.....	60
5.6 Possible Future Research Proposals	60
5.7 Conclusion.....	61
References.....	63
Bibliography	75
Appendices	
Appendix A: Acceptance Models and Theories.....	79
Appendix B: Research Strategies Summary Table	80
Appendix C: Information Sheet and Question Set.....	81
Appendix D: Acceptance Survey Results Table	86
Appendix E: Interview Transcriptions Key Points	88

List of Tables

	PAGE
TABLE 2.1 - Native App versus Web App: Side-by-side Comparison	9
TABLE 2.2 - Worldwide 2010-2017 App Store Downloads (in Millions)	16
TABLE 2.3 - 40 iOS and Android Mobile Monetization Strategies.....	16
TABLE 2.4 - Characteristics of Technology Segments (Demirci and Ersoy 2008, p. 3) ...	20
TABLE 3.1 - De Villiers (2005) Methods and Strategies Table	26
TABLE 3.2 - Study Hypotheses and Constructs Table	30
TABLE 4.1 - Demographics Gender Profile Percentages	31
TABLE 4.2 - Demographics Age Range Profile Percentages	33
TABLE 4.3 - Operating System of Choice by Gender	34
TABLE 4.4 - Apps Used in the Preceding 7 Days by Gender	35
TABLE 4.5 - Past Interactions Performed by Gender	36
TABLE 4.6 - Top 10 Most Frequently Downloaded Categories.....	37
TABLE 4.7 - Top Reasons for Discontinuation of App Use	38
TABLE 4.8 - Constructs Total Variance Percentages	39
TABLE 4.9 - Reliability Statistics Internal Consistency	40
TABLE 4.10 - Construct Inter-item Correlation Matrix.....	40
TABLE 4.11 - Descriptive Statistics per Construct.....	41
TABLE 4.12 - Descriptive Statistics per Item	41
TABLE 4.13 - Cross-tabulation Analysis on Behavioral Intention by Gender	42
TABLE 4.14 - Construct Hypothesis Verification Results.....	44
TABLE 5.1 - Census 2011 Republic of Ireland Population (Census 2011b).....	58

List of Figures

	PAGE
FIGURE 1.1 - Desktop versus Mobile Users (in Millions) (ComScore 2014).....	3
FIGURE 2.1 - Mobile and Desktop Applications Search Index (Abolfazli et al. 2013)	7
FIGURE 2.2 - Rich Mobile Apps Comfort Zones (Abolfazli et al. 2013).....	8
FIGURE 2.3 - Aldiko Book Reader App Ratings on Google Play.....	11
FIGURE 2.4 - Mobile Payments Framework (Mallat and Tuunainen 2008, p. 48)	14
FIGURE 2.5 - TAM Original Acceptance Model (Davis 1989).....	21
FIGURE 2.6 - UTAUT Organisational Model (Venkatesh 2003, p. 447).....	22
FIGURE 2.7 - UTAUT2 Consumer Model (Venkatesh 2012, p. 160)	23
FIGURE 3.1 - Study Normal Distribution Standard Curve Diagram	27
FIGURE 3.2 - Two-Tailed Tests Study Distribution Curve Diagram.....	30
FIGURE 3.3 - UTAUT2 Study Analysis and Hypotheses Constructs	31
FIGURE 4.1 - Demographic Male and Female Tornado Chart	33
FIGURE 4.2 - Operating System Percentages Pie Chart (Total % Shares)	34
FIGURE 4.3 - Past Interactions Total Percentages Column Chart.....	36
FIGURE 5.1 - Apps Used in the Preceding 7 Days Clustered Bar Chart.....	53
FIGURE 5.2 - Study Hypotheses Findings	61

Abbreviations

<i>API</i>	Application Programming Interface
<i>B2C</i>	Business to Consumer
<i>BYOD</i>	Bring Your Own Device
<i>CSO</i>	Central Statistics Office
<i>DAE</i>	Digital Agenda for Europe
<i>DSL</i>	Damn Small Linux
<i>GPS</i>	Global Positioning System
<i>HTML</i>	Hyper Text Mark-up Language
<i>HTTPS</i>	Hypertext Transfer Protocol Secured
<i>ICT</i>	Information and Communications Technology
<i>IDE</i>	Integrated Development Environment
<i>IoE</i>	Internet of Everything
<i>MAC</i>	Media Access Control (Address)
<i>MIS</i>	Management of Information Systems
<i>NBS</i>	National Broadband Scheme
<i>REST</i>	Representational State Transfer
<i>ROI</i>	Return on Investment
<i>RMA</i>	Rich Mobile App
<i>SDK</i>	Software Development Kit
<i>SDLC</i>	Software Development Lifecycle
<i>SNS</i>	Social Networking Sites
<i>SSL</i>	Secure Sockets Layer
<i>STD</i>	Standard Error
<i>TAM</i>	Technology Acceptance Model
<i>TCO</i>	Total Cost of Ownership
<i>ToU</i>	Terms of Usage
<i>TLS</i>	Transport Security Layer (formerly known as SSL)
<i>URL</i>	Uniform Resource Locator
<i>WTP</i>	Willingness to Pay

Glossary of Terms

<i>"Anomaly"</i>	"Something that deviates from the what is standard, normal or expected" (Oxford Dictionary 2015)
<i>"Evaluation"</i>	"Study of a research artefact (here: modelling methods) to determine its usefulness, effect, or impact" (Recker 2005, p. 5)
<i>"Factor"</i>	"Latent (unmeasured) variable that expresses itself through its relationship with other measured variables" (The Analysis Factor 2014)
<i>"Hermeneutics"</i>	"An art or study of interpretation. Based on the assumption that the peculiarities of the subject, requires a specific method" (Ulrich 2006, p. 25)
<i>"Hypothesis"</i>	"A testable proposition about the relationship between two or more concepts" (Gray 2009, p. 17)
<i>"Instrument"</i>	"A tool or implement, especially one for precision work" (Oxford Dictionary 2015)
<i>"Paradigm"</i>	"A typical example or pattern of something; a model" (Oxford Dictionary 2015)
<i>"Phenomenon"</i>	"A fact or situation that is observed to exist or happen, especially one whose cause or explanation is in question" (Oxford Dictionary 2015)
<i>"Protocol"</i>	"An agreed-upon set of 'formatted rules' that facilitates the exchange information between two computers or devices" (Oxford Dictionary 2015)
<i>"Theory"</i>	"Set of interrelated constructs (concepts), definitions and propositions (statements) presenting a view of phenomena by specifying relations in variables" (Clarke 2005)

TABLE SOURCE: Various (2014-2015)

Construct Definitions

<i>"Attitude"</i>	"Individual's positive or negative feeling about performing the target behaviour (e.g. using a system)" (Yenkatesh 2015)
<i>"Behavioral Intention"</i>	"The degree to which a person has formulated conscious plans to perform or not perform some specified future behaviour" (Yenkatesh 2015)
<i>"Effort Expectancy"</i>	"The degree of ease associated with the use of the system" (Yenkatesh 2015)
<i>"Facilitating Conditions"</i>	"The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Yenkatesh 2015)
<i>"Performance Expectancy"</i>	"The degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Yenkatesh 2015)
<i>"Perceived Ease of Use"</i>	"The degree of ease associated with the use of the system" (Yenkatesh 2015)
<i>"Perceived Enjoyment"</i>	"The extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use" (Yenkatesh 2015)
<i>"Perceived Usefulness"</i>	"The degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Yenkatesh 2015)
<i>"Social Influence"</i>	"The degree to which an individual perceives that important others believe he or she should use the new system" (Yenkatesh 2015)
<i>"Subjective Norm"</i>	"Person's perception that most people who are important to him think he should or should not perform the behaviour in question" (Yenkatesh 2015)

TABLE SOURCE: Yenkaresh (2015)

Statistical Symbols

α (<i>alpha</i>)	“Level of Significance for p-value to be Measured Against (e.g. 0.01%, 0.05% and 0.10%)”
df	“Degrees of Freedom (formula $df = n - 1$)”
Md (<i>medium</i>)	“Middle Value of the Numbers List”
Mo (<i>mode</i>)	“Occurs Most Frequently in the Numbers List”
n	“Number of Items in a Set”
p	“Proportion”
p -value	“Level of Statistical Significance”
SD	“Standard Deviation”
$var(X)$ (<i>variance</i>)	“Average Squared Distance to Mean”
\bar{x} (<i>x-bar</i>)	“Sample Mean/Average”
z or <i>z-score</i>	“Signed Number of Standard Deviations above the Mean”
θ (<i>theta</i>)	“Unknown Value”
σ (<i>sigma</i>)	“Standard Deviation (Commonly known as SD)”
μ (<i>mu</i>)	“Population Mean/Average”
Σ (<i>sigma</i>)	“Sum of Values”

TABLE SOURCE: Various (2015)

1 INTRODUCTION

Smart device applications available for download from Application Stores have exploded exponentially. Market Analysis (Monno and Xiao 2014; Forrester Research 2015) predicts increases in the ubiquitous usage of apps globally. Small downloadable software packages on Smartphone, Tablet, Phablet or iPad, commonly known as ‘an app’, have become an integral part of life for numerous users throughout many countries, with varying levels of usage and functionality being recorded. Reports indicate Android and iOS device users spent 80% of the time on apps, with web browsing accounting for 20% (Forrester Research 2015). Apps continue to dominate innovative thinking patterns and methodologies throughout the ICT sphere. Sources report global downloads of 75 BN in 2011 (Gartner Inc. 2011), 102 BN in 2013 (Gartner Inc. 2013) and 200 BN by 2017 (Monno and Xiao 2014).

In Ireland, “Get the app”, “Download the app”, “Download on...” prominent signage on advertising material is ever-present. Sectors such as Finance (e.g. Bank of Ireland, Allied Irish Bank), Retail (e.g. Zara, and IKEA), Travel (e.g. Aer Lingus, Dublin Bus, and Bus Éireann), Sports and Entertainment (e.g. GAAGO, Sky Go, Netflix, YouTube), as well as Tourism, Lifestyle, Health, Fitness, Navigation, Education and Language Tuition, provide applications through the App Stores in a rapidly advancing ecosystem.

The study was undertaken to explore usage profiles of the people of Ireland between 18 and 80 years of age, to gain an understanding regarding the impact of the application (henceforth referred to as app) in the context of Irish daily life. In the instant data access arena of mobility, research indicates users are shifting towards the use of apps as opposed to desktops as usage levels surge (Portio Research 2013; ComScore 2014).

The study attempts to evaluate if any gaps exist in the use of apps today in Ireland and if improvements can be made to close such gaps at the present level of app quality. Irish users can be at varying different usage levels on a daily, monthly or even yearly basis. Understanding app acceptance and usage may allow for a higher quality standard of inferences to be drawn regarding potential app behaviour in Ireland for the future.

In this study, interviews with Irish app development companies’ professionals were completed. An online survey on app acceptance and usage on a sample of the Irish population was also undertaken. The study explored app interaction that the user had chosen to install from one of the App Stores only. Pre-installed apps by the operating system provider were not considered for analysis during this study.

1.1 Study Background

As the world strives for ubiquitous connectivity (Anderson and Rainee 2014), the impact of the app is clearly evident. Operating systems are now designed with an app user interface (UI) and touch screen, as well as inbuilt 'Continuum' features (i.e. idea that apps work seamlessly across devices). Multiple sources indicate software and hardware each have an active role in the shaping of future mobility (Irish Independent 2015).

Nicholas summarises this study investigative ideology when saying:

"Mobile revolution constitutes another massive round of disintermediation and migration. We are not so much talking about the mobile phone, but the smartphone and tablet"
(Nicholas 2013, p. 43)

The Smart device is defined to include Smartphone, Tablet, Phablet or iPad in this study. Market infiltration is boosted by a combination of ever-expanding data allowances and enticing offers, reduced operational costs, market saturation, and enhanced platform knowledge using device APIs (e.g. Apache Cordova) or development tools (e.g. Intel® XDK), as well as do-it-yourself toolkits (e.g. Mendix, Xamarin). Good standards and essential accessibility practices, developed by the W3C and associates, are brought to app development. Enthusiastic budding next-gen developers and professionals alike have a wide selection of tools available. All of the above are likely contributing factors to app growth (both free and paid) and help aid a potential real-time app paradigm shift. Various contributors (ABI Research 2014; Ghose and Fellow 2014; Monno and Xiao 2014) attain findings that imply a move to the Smart device app has been in progress since 2004. A figure of 37 downloads globally per user was suggested for 2014 (Brennan 2014).

A highly regarded philosopher of science, Thomas Kuhn, explained the theory of a Paradigm Shift. In the acclaimed book 'The Structure of Scientific Revolutions', the Kuhn Cycle explored how an accumulation of ignored developed anomalies lead to a fluctuation and instability stage, followed eventually by acceptance of the new paradigm to resolve the crisis (i.e. Paradigm Shift) and finally a return to normal science (Kuhn 1962).

The Kuhn Cycle may provide some explanation of the Irish app culture when combined with further analysis of app usage through the use of acceptance models. Understanding user acceptance (UA) of the Smart device app topology within the Irish market could be paramount as lines blur between OS, app and device, as well as the expected Ubertnet (ubiquitous online) of 2025 (Bonet 2013). Usage of the user acceptance model as a catalyst may provide insights to determine if users are indeed moving from desktop to the app and if a new Paradigm Shift is indeed in progress for Ireland.

1.2 Research Question

The main research area being examined is the Research Question (RQ):

Is Ireland Embracing the Mobile Application Paradigm Shift?

The study will also attempt to answer eight related Sub-Questions:

- *Sub RQ 1: What are the Operating Systems of Choice for Smart Devices in Ireland?*
- *Sub RQ 2: What is the App Access Rate in Ireland for the Preceding 7 Days?*
- *Sub RQ 3: Which Interactions are performed using Apps in Ireland?*
- *Sub RQ 4: What are the Most Frequently Downloaded App Categories in Ireland?*
- *Sub RQ 5: What are the Top Deterrents of Continued Use for an App in Ireland?*
- *Sub RQ 6: What Types of Charges are App Users in Ireland Willing to Pay?*
- *Sub RQ 7: Does Social Influence and Habit Exist for App Users in Ireland?*
- *Sub RQ 8: Does User Acceptance Challenges Exist for App Users in Ireland?*

1.3 Importance of the Study

Portio Research (2013) and ComScore (2014) predictions indicate world traffic for the total number of downloads by the end of 2017 will be a staggering 200 BN. Statistics for the world population by the US Census Bureau suggest that the population is currently 7.2 BN in 2015 and will be just over 7.4 BN by 2017 (US Census Bureau 2015).

Therefore, apps could play a role for the world population, in both the present and future of ICT. Remarkably, ComScore (2014) provides a line graph (Figure 1.1 below) depicting the 2013-2014 intersection crossing point of desktop versus mobile, and volume of predicted global users of 2015. The graph shows the upward progression trend of the rise in apps globally. ComScore says the crossover of Desktop and Mobile occurred in 2014.

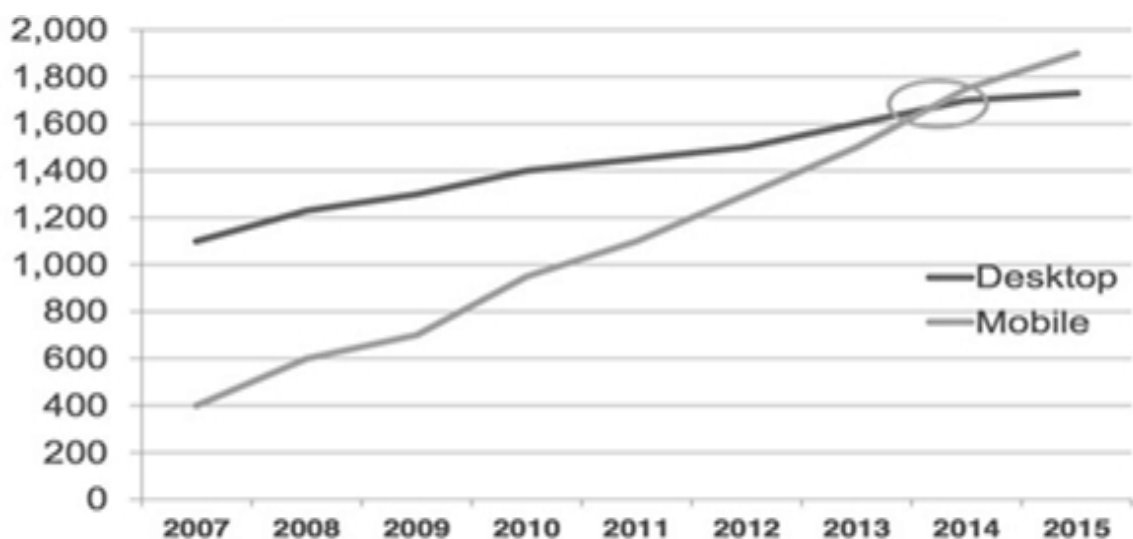


FIGURE 1.1 - Desktop versus Mobile Users (in Millions) (ComScore 2014)

Downloaded apps in Ireland are performing a host of beneficial time-saving services in finance, entertainment, retail, transport and others. In June 2012, the Irish Independent newspaper reported over 200,000 AIB Mobile Banking App (launched October 2011) and 65,000 Bank of Ireland App (launched May 2012) downloads had occurred in the first months of launch on the Apple and Android platforms (Irish Independent 2012).

The news and sports broadcasting company, Sky plc, released figures for the Sky Ireland App had surpassed 2 M downloads by June 2013 (uSwitch 2013). A report by UPC (Ireland) on Irelands Digital Future stated the number of downloads (112,272) of the UPC TV Horizon App has been growing consistently since April 2013 (UPC Ireland 2014).

RTÉ's app digital service is also expanding, according to the national broadcaster, with a reported on average 2.2 M unique international browsers every month (RTÉ 2015).

RealTime Transport App (real-time transport information for Ireland) downloads was calculated at 91,255 (average 7,604 downloads per month) since launch in June 2013, as it continues to improve the mobile service quality (Transport for Ireland 2014).

Contributing factors to further app growth in Ireland:

- *Horizon 2020: European Commission's €80 BN (EUR) idea realisation research and innovation programme 2014-2020 (EU Commission 2014)*
- *Digital Agenda for Europe (DAE): Digital Agenda contains 101 actions to allow the European Union to achieve greater benefit from digital technologies*
- *Two specific goals of the DAE to include broadband subscriptions in Ireland over 100 Mbps in Ireland by 2020 (UPC Ireland offering 240 Mbps in 2015)*
- *European Union: Initiatives for app development to aid all citizens to provide real-time information in the language of the EU consumer*
- *Strong ICT workforce and continued support from Enterprise Ireland, IDA Ireland*
- *Ireland's long-running success with indigenous software development production and funding initiatives*
- *Large multinational presence in Ireland (Microsoft, IBM, Oracle and others)*
- *OPENi Cloud Services: Development of cloud-based services for the European Union*
- *Mobile Speeds: EU Business (2014) confirms that the EU signed an agreement with South Korea in June 2014, to allow research and advancement of 5G for Europe*
- *National Broadband: The National Broadband Scheme rollout completed in 2010*
- *High-speed ultra-broadband (fibre) service providers such as Eircom and UPC*
- *Abolishment of European roaming charges by 2017 (EU Commission 2013a)*
- *Skilled English speaking IT workforce in Ireland*

1.4 Beneficiaries of the Study

Beneficiaries of the study may include:

- *Industry Professionals, Information Technology and Business Students*
- *Educational Institutes and Training Facilities Future Course Material*
- *Software Companies Understanding of the Present Workings and Failings*

1.5 Study Scope and Boundaries

This research will include analysis of Smart device apps usage by users over 18 years of age in Ireland, on any Smart device, on any App Store, running on any Platform.

Linux, Ubuntu or Windows operating systems, cross-platform development tools usage (e.g. Microsoft Visual Studio), Integrated Development Environments (IDEs), API's (Soap or REST) will not be explored as part of this study. Scripting languages such as JavaScript or JQuery will also not be discussed in detail. Gaming apps and the gaming industry will not be explored. The use of apps is examined from a personal usage perspective and participants are invited to give personal experience only.

1.6 Dissertation Route Map

The research is divided into the following areas:

Chapter 1: Introduction - Provides a background overview as to why the study will be beneficial and to whom. It outlines the Request Question and related Sub-Questions.

Chapter 2: The Literature Review - Explores relevant research findings and previously conducted studies on Smart devices and apps. The previous research material of existing knowledge is examined. Theoretical Acceptance Concepts, Models and Theories are explored to help choose the final User Acceptance Model for analysis.

Chapter 3: Methodology and Fieldwork - Ideologies are presented here to form a methodological and structured path of guidance for the direction of the Research Question analysis.

Chapter 4: Findings Analysis - Interview Responses and Questionnaire Survey findings will be analysed with the use of software to give the research improved and correlated results. These results will be presented in this chapter in tabular and chart formats to aid understanding and clarity.

Chapter 5: Conclusions and Future Work - This final chapter will attempt to draw conclusions from the conducted data analysis from the Interviews and Questionnaire Survey results, and explore future work that may be undertaken.

2 LITERATURE REVIEW

2.1 Overview

To aid greater understanding of Smart device application acceptance and usage within the context of Ireland, previous publications, instruments, findings and theoretical models were all examined and considered to help aid the exploration of the Research Questions. This chapter is broken into each of the following sections for examination:

2.2 Introduction from Primitive Beginnings of the Smart device App to Today

2.3 Application Stores and the Ratings, Reviews, Privacy and Controversies

2.4 The Ecosystem Challenges including Cross-Platforms, Device OS and Content

2.5 M-Commerce Diffusion regarding Shopping Experiences, Adoption, and Payments

2.6 Examination of the Monetization Opportunities and Advertising Strategies

2.7 Theoretical Acceptance Concepts and Theories of Cultural and Human Behaviour

2.8 Examination of Theoretical Models and App User Acceptance Components

2.2 Introduction

In 2013, Nicholas declared that a revolution has arrived, far greater than anything ever previously seen (Nicholas 2013). Nicholas was referring to the age of Smartphone and tablet, as abundant global users become increasingly technically sophisticated. In a growing multi-billion dollar multi-device industry (Ghose and Fellow 2014), the Economist reported corporations have now repositioned themselves from time trusted strategic models to be device aligned (The Economist 2014). App Store dominance, primarily by Google Play and Apple Store, provided lowered market entry costs to facilitate greater acceptance (Bresnahan et al. 2013). Statista (2014) reported 75 BN apps had been downloaded from the Apple Store alone by mid-2014. Global free app downloads to 2014 accounted for 93 BN and purchased downloads reached 9 BN (Statista 2014).

David Nicholas (2013) confirmed in his study of 150,000 each of PC versus mobile users, the mobile device is part of the daily routine as part of the second wave of mobility. Mobile interactions were found to be different from PC (Nicholas (2013). They are lighter and more frequent, with less content consumed and less time spent on the device per interaction. This increasing proliferation of apps in a short number of years exhilarated the need to understand the growing interest (Arhipainen and Tähti 2003; Nicholas 2013).

Abolfazli et al. (2013) put forth the following graph, demonstrating the trend of Smart device versus desktop since 2004 (Abolfazli et al. 2013). Measured by the company's data analytics integration capabilities, the Google Trend (Figure 2.1 below) plots an ever steady rise in the number of device queries over desktop applications since 2004. Google Inc. says the graph justifies that a demand exists for mobile apps in the international marketplace (Abolfazli et al. 2013). The Trend graph clearly shows that since 2004, Apps have been steadily outnumbering their desktop counterparts.

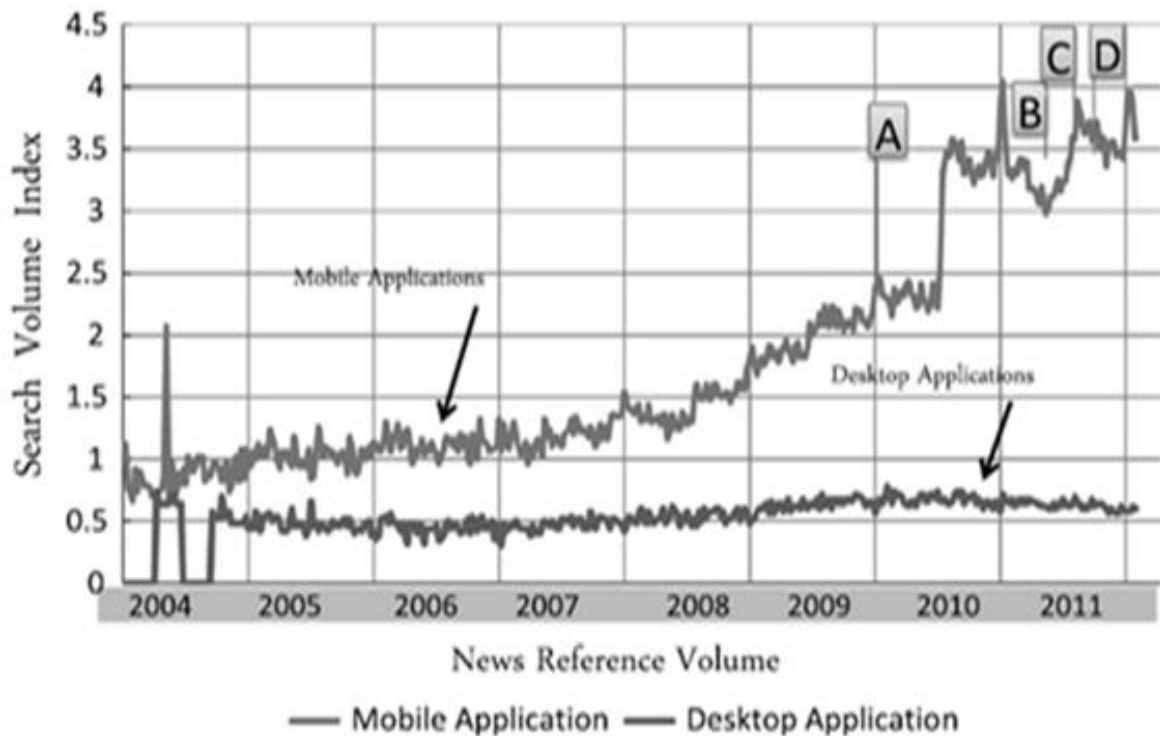


FIGURE 2.1 - Mobile and Desktop Applications Search Index (Abolfazli et al. 2013)

Download rates, varying levels of social influence, prices and associated enjoyment, intertwined with moderators of gender, age and experience, are all factors for usage and user acceptance for apps (Venkatesh 2012). However, capturing varying interaction levels in a time snapshot and documenting accurately is extremely difficult and complex, with time a central constraint (Jara et al. 2014).

Ahmet and Mattila (2011) confer social influences to use a particular mobile service may come from family, friends, colleagues or even emotion based occasionally. Ahmet and Mattila (2011) highlighted viral messages (includes good recommendations) about a service, may lead to larger user adoption for that service (Ahmet and Mattila 2011). The researchers believe Word-of-Mouth influences can occur, and the purpose of any viral message is to spread to one person, who then passes the message onto another. This 'spread the word' strategy can be extremely effective (Ahmet and Mattila 2011).

Software architectures and (open) web standards for device development have been progressing through numerous evolutionary stages, e.g. WAP or Proprietary Platform (Clark 2012). At present, apps are said to be part of a Rich Mobile App stage (Abolfazli et al. 2013). Rich Mobile Apps (RMAs), a concept put forth by Abolfazli et al. (2013), provide an immersive experience with a higher degree of app functionality and quality. RMAs not only consider the user interactions, but also the ease of use comfort zones of 'Easy, Reach, and Medium' (Figure 2.2 on right). As app developer's battle with text content and optimised image use on a device screen, it may get forgotten user comfort can be enforced by the device itself and operating system (Abolfazli et al. 2013). Both 'Medium to Reach' zones will degrade user experience as accessing content in these areas is not comfortable (Abolfazli et al. 2013).



FIGURE 2.2 - Rich Mobile Apps Comfort Zones (Abolfazli et al. 2013)

The impact of apps in Irish life is heightened by rising user knowledge and understanding, with the ease of use for the online App Store repositories (Curran et al. 2015). A Digital Consumer 2014 Report on Ireland noted 76% of Irish adults are reported to regularly use apps (O'Leary 2014). Although a high percentage, challenges remain that are to be conquered (Dehlinger and Dixon 2013). But progress is being made to overcome such challenges (Cuadrado and Dueñas 2012; Bresnahan 2013).

It could be argued that Irish users could be considered technically cultured and understand high app quality, enhanced by good development practices. The O'Leary report indicated that in 2014, 86% of Irish adults possessed an internet ready device, with 75% possessing a smartphone while 54% possessed a tablet (O'Leary 2014). In February 2015, a research marketing agency in Ireland, Ipsos MRBI, in a survey of 1000 Irish account holders reported daily access (desktop versus app ratio breakdown not specified) of 70% for Facebook, 47% for Instagram, 37% for Twitter and 12% for LinkedIn (Ipsos MRBI 2015). Ireland's National Education & Research Network, HEAnet (2013), states app development is categorised into three types: Native, Mobile Web and Hybrid (HEAnet 21013). Native Apps are bound to an explicit mobile platform (HEAnet 2013). Web Apps display content on the web browser of the device. This cross compatibility provides world-wide scope and coverage (HEAnet 2013). Hybrid apps are just like native apps as they run on the phone, and also just like web apps, the source code is from web technologies (HEAnet 2013).

HEAnet (2013) points out native apps maintain cross-platform compatibility and an interop layer to allow JavaScript APIs to talk to the platform-specific hardware APIs (HEAnet 2013). Key differences between both Native and Web Apps are highlighted by HEAnet (2013) in Table 2.1 (below).

TABLE 2.1 - Native App versus Web App: Side-by-side Comparison

	Native	Web
“User Experience”	“Often more polished, faster”	“Opens up links from email”
“Reach”	“Limited to users of the platform you develop for”	“Works on most browsers and can be made work for all”
“Phone Integration”	“Full suite of available capabilities”	“Device orientation, location”
“Development”	“Each platform (e.g. iOS, Android) requires own language”	“Relies on web technologies and a server-side language”
“Discoverability and Distribution”	“Available for download via App Stores”	“Browser, can be linked directly to from web and SMS”
“Support and Maintenance”	“Users may not download latest so support multiple versions”	“Users have the latest version - only one version to support”
“Time-to-market”	“More expensive”	“Less costly”

SOURCE: HEAnet (2013, p. 26)

Device operating system providers, e.g. Android and iOS, offer Software Development Kits (SDKs) to enhance the service, acceptance and ease of integration (Curran et al. 2015). SDKs can be used for analytics usage tracking and gathering vital data, e.g. comScore (Bresnahan et al. 2013) and Google Analytics (HEAnet 2013). Accurately placed software lines of code provide data trends and investigative analytical information to research agencies (Bresnahan et al. 2013). SDKs, such as MoSync SDK, provide faster product integration. HEAnet warn there are still some issues on tracking app data when using an SDK, as original web browser style reporting of ‘pageviews’ are not appropriate for device apps (HEAnet 2013). The SDKs can provide platform support, architectural capabilities, 3rd party API Integration and OAuth support (Hernández et al. 2013; Koch and Kerschbaum 2013).

Various cross-platform toolkits have emerged in recent years. Licensed toolkits such as PhoneGap™, Titanium Mobile™, Rhodes and RhoSync allow for cross-platform APIs integration, as well as HTML5, CSS3 and JavaScript support (Hernández et al. 2013). Coding toolkits, such as Mendix and Xamarin, may also be used in the creation of cross-platform compliant apps (Den Haan 2013; Dickson 2013).

2.3 Application Stores

App repositories, known as 'Stores', have been growing consistently since the launch of Google Play (formerly Android Market) in October 2008 (Bresnahan et al. 2013; Portio Research 2013). Pratap and Srivastava (2011) outlined that better interconnection between convergence of Smart devices (includes Smart TV) is a contributing factor for the growth. App availability in the online repositories may also be due to acquisitions (Microsoft 2014) and emerging markets (Samsung 2015). By the end of 2014, Android Apps availability for download was a sizable 1.3 M, with Apple Store storing 1.2 M and Windows 300,000 apps (Statista 2014). Although, a 3% drop (30% to 27%) of developers targeting the Windows Platform occurred in Q1 of 2015 (Vision Mobile 2015). This loss, combined with the Microsoft decision to effectively write off the Nokia \$7.2 BN 2013 acquisition, may push Android and iOS further out of sight. Apple Store saw the most cumulative downloads of 85 BN by July 2014 (Statista 2014).

In 2014, users were downloading 37 apps globally (Brennan 2014). A report in 2014 published by the Youth Communications Agency in Ireland, ThinkHouse.ie, conducted a survey of 800 young Irish people between 15-35 year olds. The report showed 94% of respondent's daily access was under 10 apps while 63% favoured beneficial or productive apps (Thinkhouse.ie 2014). More than one-third (37%) of the group also favoured entertainment type apps (Thinkhouse.ie 2014). Such statistics may be due progressively to the continuing rise of global device sales (Gartner 2013). Gartner Inc. reported that in 2013, just over half (52%) of total global handset shipments were Smartphones. By 2016, this figure is expected to be as high as 78% (Gartner Inc. 2013). Providers of devices recognise App Stores as an opportunity is a 'win-win' situation (Pratap and Srivastava 2011).

App Store platforms allow users to provide essential feedback by using ratings and reviews (Pagano and Maalej 2003). Feedback is valuable to new potential users in helping to decide if the app contains the required functionality (Pagano and Maalej 2003). Pagano and Maalej (2003) added that for paid apps, the Utility category received the majority of reviews (9.89%) and Medical the least (0.91%). Users are recommended to give an informed opinion of the app, to understand what is working or not. This can help improve the quality of subsequent versions. The user feedback may be in comment form or stars appraisal (Pagano and Maalej 2003). The user is expected to review the comments and ratings of previous interactions (Dillon and Morris 1996; Pagano and Maalej 2003). The United States and South Korea based study by Song et al. (2013) on 'Determinants of User Satisfaction', demonstrated that an app with satisfactory or higher user reviews would perform better on the download scale.

The App Store study by Pagano and Maalej (2003) indicated the Social Networking category received the majority of reviews (7.73%) and Catalogs the least (1.42%) for free apps. An example app store rating can be seen for the Aldiko Book Reader App on Google Play as of 1st June 2015 (Figure 2.3 below). The Book Reader received 4.2 out of 5 from over 174,800 user ratings since publication to the App Store.

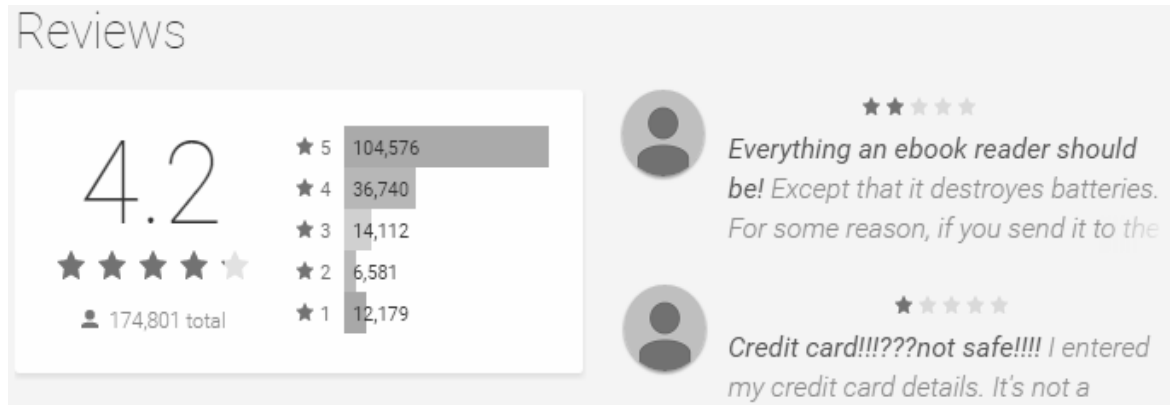


FIGURE 2.3 - Aldiko Book Reader App Ratings on Google Play

Data Privacy is a concern for app users (Rooney 2013). Also, shared resources of Photo Galleries, Contacts, Email and SMS/MMS are at risk when accepting third-party app installations (Rooney 2013). In May 2014, as part of a global Mobile Privacy sweep, the Office of the Data Protection Commissioner of Ireland found nearly half (43%) of the data privacy notices did not scale well to devices (GPEN 2014). Also in 2014, a high profile app attack was described by the Business Insider Publication. An external client of Snapchat had been storing every photo and video that had been ever uploaded. Hackers could access nearly 13GB of library content that users believed had been deleted (Business Insider 2014). The Data Protection Acts of 1988 and 2003 provide protection in Ireland, with the creator (data controller) responsible for ensuring compliance with the DPAs acts (Brennan 2014). Dedicated data controllers maintain a responsibility to be transparent about all data collected, processed and deletions, with privacy communications outlined in the terms of usage (ToU) before installation (Rooney 2013).

The App Store innovation story has not been without controversy. Curran et al. (2015) also drew attention to the controversy involving in-app purchases. In 2014, a legal settlement between the United States Federal Trade Commission and Apple related to charges regarding underage consumers who made in-app purchases on the Apple App Store without parental consent (Curran et al. 2015). A refund of in excess of £20 M (GBP) was paid to parents of children made purchases without consent (Curran et al. 2015). Apple was declared responsible to ensure that any payments relating to the Apple App Store are protected and secure from intruders and minors (Curran et al. 2015).

2.4 Ecosystem Challenges

In 2013, Dehlinger and Dixon (2013) estimated that 1.6 BN Smart device users existed worldwide, as compared to 2 BN for PC. Pratap and Srivastava (2011) highlighted device users normally require information access or completion of a basic task. However, app innovation may be hampered by “slower device CPUs, slower scripting engines, memory constraints” (Zakas 2013) and “limited input modalities, limited connectivity and higher power consumption rates” (Harrison 2013). Joorabchi et al. (2013) also highlight the issue for many developers in maintaining the high number of changes associated with software development kits (SDKs) (Joorabchi et al. 2013). A clean, uncluttered user interface (UI) with minimal interaction may encourage users to return to the app time and time again. Important decisions must be made, such as whether to develop generic apps with web-based technologies or native apps, for all available platforms for complete compatibility (Dehlinger and Dixon 2013).

Cross-platform development (write once, deploy on all) brings both rewards and challenges (Hernández et al. 2013, Joorabchi et al. 2013). It can be expensive in both resource time and financial terms. Joorabchi et al. (2013) outlined results showed a total of 76% of the 188 developers had experienced cross-platform challenges. Perchat et al. (2013) highlighted that currently, each platform remains responsible for the standards of the architecture so the apps built may be limited or restricted in ways, and move away from the original design plan. Chae, in 2004, as part of a controlled study of screen size on user behaviours, discovered the combination of information structure and screen size had an adverse effect on the end-user (Chae 2004). Chae highlighted that consideration must be given to the search capabilities and text size during design. Legibility of the context must be ensured (Chae 2004).

Ease of use for an app requires content to be neatly displayed on each of the various screen sizes and resolutions available, from tablets of 10.1" (1280x800) and 7" (1024x600), to 3.2" (480x360) (Binvisions 2015). Vision Mobile (2014) concluded HTML remains the widest used technology globally (42%) and Java remains second (38%). For iOS, Java remains most popular (26%) followed by Objective-C (17%). Importantly, energising the next generation of coders to build the apps and platforms of the future remains a top priority for many educational institutions (Sykes 2014). Xamarin, the C# building toolkit bridge to Android and iOS, also offer a free version to students (Xamarin 2015). Sykes (2014) research study exposed students to an iPhone App Development Course, who had never previously undertaken any form of programming. According to Sykes (2014), the students involved, with an average age of 21, said they found the course to be enjoyable (73%), useful (73%) and beneficial (80%) and a positive exercise.

2.5 M-Commerce Diffusion

Retailers of varying sizes acknowledge the value of providing the consumer the habit of being able to purchase a product from the in hand device, in a well-designed and secured app (Kumar and Mukherjee 2013). Kumar and Mukherjee (2013) points out in this retail channel type, 97% of shoppers abandon the sale at the transaction age on Smart devices. Online shoppers account for only 47% globally overall (Kumar and Mukherjee 2013). Even though a minority have accepted the Smart device as a valid method of shopping, they estimate that only one-tenth of purchases are made on a device itself and it remains a challenge for retailers (Kumar and Mukherjee 2013; Venkateswaran 2013).

Kumar and Mukherjee (2013) believe even though consumers who shop online must be completing the payment transaction on the PC, devices and apps still contribute greatly to sales volumes in the alternative retail methods (Kumar and Mukherjee 2013). They believe that the Smart device and app culture is leading to completed transactions, even by product browsing. Consumers research products, compares online prices, view's store location and confirm product availability as the self-service task of a 'direct purchase', as termed by Kumar and Mukherjee (2013), remains off the device. In self-service, the banking and airlines sectors have been leading the way for many years using designated kiosks (Castro et al. 2010). Castro et al. (2010) highlights self-service is efficient and convenient to both the industry and user, with apps now a continuance of that trend.

Kumar and Mukherjee (2013) had used a TAM and TRI model combination, which were able to deduce that individual personalities, who are general technology users, continue to play a part in the emergence of mobile shopping (Kumar and Mukherjee). But the study by Venkateswaran (2013) showed mobile purchases still generate billions annually. Venkateswaran (2013) confirmed North America as first in the world for mobile commerce regarding sales. Projected spending for 2013 was estimated at \$231 BN (USD) (Venkateswaran 2013), closely followed by China with \$181 BN (USD) (Venkateswaran 2013). Third highest for m-commerce spending was the United Kingdom with \$141 BN (USD) (Venkateswaran 2013, p. 91).

Such figures represent a portion of a calculative figure that Venkateswaran states could be as high as \$1.2 TR (USD) for mobile global purchases in 2013.

Apps offer 24/7/365 open store access and are accepted by new consumers each year (Venkateswaran 2013). More retailers, large and small, continue to focus on connection for the online retail service integration to existing inventory control, SOP processing, transaction processing, warehouse management control, postage and package and audit control, backend processing and data warehouse systems (Mallat and Tuunainen 2008).

In Ireland, Irish shoppers are adopting the mobile shopping experience at a slower rate. In 2014, only 26% of online shoppers completed a purchase from a tablet device. This figure does, however, represent a rise from 16% in 2013 (O’Leary 2014). Adoption rates for m-commerce vary from country to country, and although Ireland is steadily increasing in mobile sales, the Irish consumer still values also the traditional shopping experience (O’Leary 2014). Results highlighted that over 58% attain information on the Smart device but complete the payment transaction on an alternative solution (i.e. desktop or in store) (O’Leary 2014). Two critical success factors were highlighted during a mobile payment adoption study on Germany, Greece and Finland by Vrechopoulos et al. (2002). The study found bad service (56% of responses agreed) and inadequate security (53% of responses agreed) were factors in the low or null m-commerce adoption within the EU (Vrechopoulos et al. 2002). Many would hope that significant progress has been achieved since 2002.

The study by Mallat and Tuunainen (2008) explored mobile payment systems for travel agent companies and concluded reduced costs and facilitated anywhere, anytime sales for merchants were suggested reasons for mobile payment services adoption. Only 149 out of 1549 acceptable responses were returned and the low response rating could infer a low acceptance level of interest for agents (Mallat and Tuunainen 2008). Based on the empirical study results, a suggested framework (Figure 2.4 below) was put forth by Mallat and Tuunainen (2008) that contained three main groups of mobile adoption:

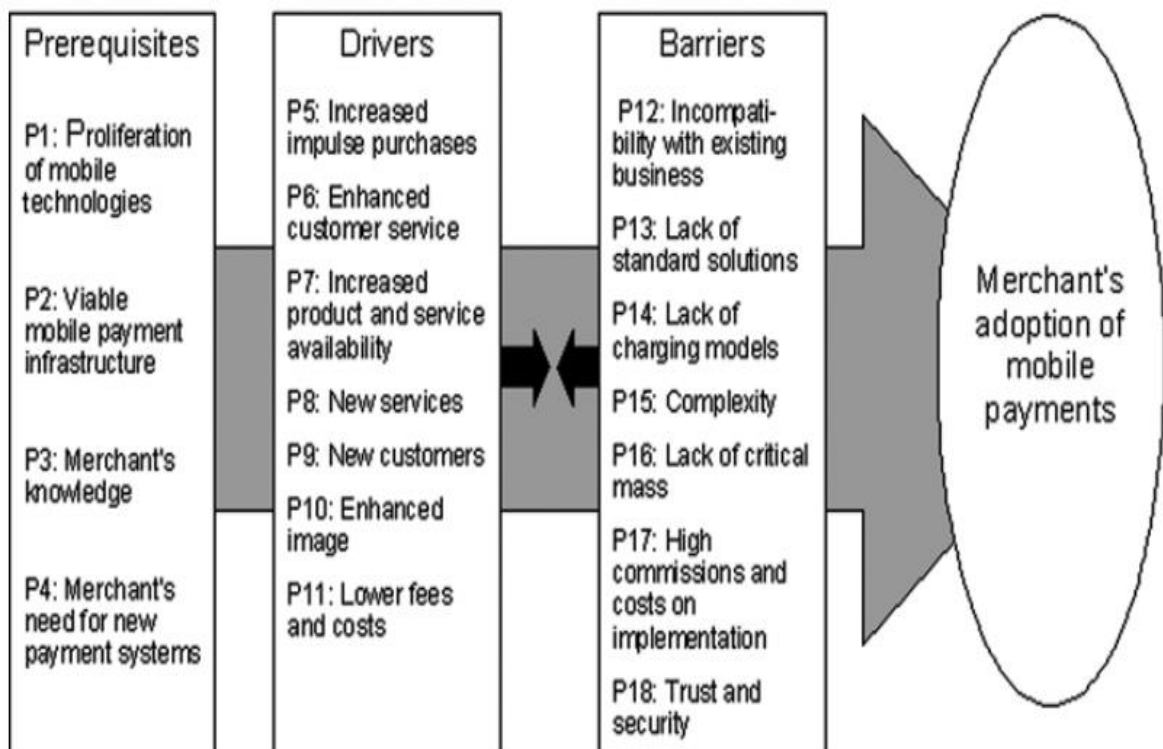


FIGURE 2.4 - Mobile Payments Framework (Mallat and Tuunainen 2008, p. 48)

2.6 Monetization Opportunities

Global mobile app revenue reached \$26 BN (USD) in 2013 (Gartner Inc. 2013) and \$35 BN (USD) in 2014 (Statista 2014). Although, Ghose and Fellow (2014) maintain app revenue generated will be realistically closer to \$25 BN (USD) in 2017. Platforms generate revenue in a pre-agreed split ratio from app repository purchases e.g. Apple maintains a 30-70% split of each app sale (Curran et al. 2015). Mengru et al. (2013) outlined each charging mode can be determined by the value provided to advertisers and end users. Knowledge (intrinsic) versus wealth (extrinsic) motivation may also be a consideration, according to Koch and Kerschbaum (2013). Koch and Kerschbaum (2013) found from a study of 113 app developers surveyed on job satisfaction throughout the world, the main motivation was not financial but to acquire new skills while having fun (Koch and Kerschbaum 2013). The March 2015 International Data Corporation (IDC) market report highlighted it is vitally important for each company to choose the correct business model, based on the target audience. The IDC (2015, Slide 7) also reported the business model may include:

- *“In-App Advertising: Contains ads (banner ads, video ads and more)”*
- *“Freemium: Free download with in-app purchases”*
- *“Paid: Paid download with no in-app purchases”*
- *“Paidmium: Paid download with in-app purchases included”*
- *“Dynamic: Business model shifts depending on certain factors (app shifts to an ad-supported model if the user does not make in-app purchases)” (IDC 2015)*

The IDC report stated Freemium and In-App Ads both consolidated strong positions between 2013 and 2014 (IDC 2015). In-App Advertising (+71%) and Freemium (+72%) increased dynamically as Paid (-19%) and Paidmium (-24%) declined heading towards 2018 (IDC 2015). In-app advertising is present in Ireland on apps targeting Irish users (O’Leary 2014). AppFlood (2013) says in-app advertising is easy to implement and mostly includes: target an ad network of choice, install operator SDK and deploy the ad with traffic monetization.

In 2015, the free app popularity is extremely high at 93% versus 7% for paid (Gartner Inc. 2013). Gartner Inc. (2013) estimates free apps will be 94.5% of total downloads in 2017. However, free sometimes involves a non-monetary cost, occurring greater annoyance unlike paid. Banner ad interruptions, delays of service, unprofessional user interface, and irrelevant information display can add to frustration (O’Leary 2014). O’Leary found of all the ad formats in Ireland, banners are most familiar for mobile. But 61% found them annoying and only 22% of users have clicked directly on such an ad (O’Leary 2014).

Gartner Inc. (2013) outlined the global downloads from the period of 2012 to 2017 (Table 2.2 below), with a total increase of 4.9% between 2012 and 2017 (projected figures).

TABLE 2.2 - Worldwide 2010-2017 App Store Downloads (in Millions)

App Store	2012	2013	2014	2015	2016	2017
Free Downloads	57,331	92,876	127,704	167,054	211,313	253,914
Paid-for Downloads	6,654	9,186	11,105	12,574	13,488	14,778
Total Downloads	63,985	102,062	138,809	179,628	224,801	268,692
Free Downloads (%)	89.6	91.0	92.0	93.0	94.0	94.5

SOURCE: Gartner Inc. (Gartner Press Release, Symposium/ITxpo, September 2013)

Ghose and Fellow (2014) also found that the more screenshots, discounts and user reviews that were provided, the more there is a demand increase for the app. The finding complements the previous finding on improved downloads figures for higher frequently reviewed apps by Song et al. (2013) (see page 10).

Table 2.3 (below) from the mobile ads platform agency, AppFlood, presented in 2013 how some monetization strategies can be attained from the different model types.

TABLE 2.3 - 40 iOS and Android Mobile Monetization Strategies

Area	Associated Strategies
"Paid Apps"	"Paid Apps; Low Cost; Niche Paid Apps; Alternative App Stores"
"In-App Purchases"	"In-app Purchases; In-app Upgrades, Consumables & Currency"
"Partnerships"	"Mobile Partnerships; Create co-branded Games or Apps; Sponsored"
"Subscriptions"	"Subscriptions"
"Display Advertising"	"In-app Advertising; Interstitials; Banners; App Walls; Video ads; Rich Media Ads; Geo-targeted Advertising; Optimize Existing Mobile Ads; Cross-promotion Network; Incentivized Installs"
"App Promotion"	"Promotion; Email Lists; Social Media; Guerrilla Marketing; Press"
"App Development"	"App Localisation; Funnelling Freemium Users to a Paid App; Web Apps; Develop Auxiliary Apps"
"Sales & Merchandising"	"E-commerce; Affiliate Sales; Merchandising; Donations"
"Selling"	"APIs; Selling Data; Sell Your App Off; "White label" Your App's Code"
"Mix and Match"	"Mix and match Any One of These Strategies"

SOURCE: 40 Ways to Monetize Mobile Apps (AppFlood by Francis Bea, 17th December 2013)

2.7 Theoretical Acceptance Concepts

Theoretical User Acceptance concepts for analysing user experiences have come to the fore since the 1960s (Davis 1989; Dillon and Morris 1996; Armitage and Connor 2001). Some even suggest earlier since the 1940s (Röcker 2010). Theories on attitudes and behaviour can lead to a more complete yet complex model, with the intertwining of factors, constructs and in-depth analysis required (Davis 1989).

Some renowned theories, not specifically developed for acceptance but useful, include:

- *“Diffusion of Innovations Theory (DOI)” by Rogers (1962)*
- *“Theory of Reasoned Action (TRA)” by Fishbein and Ajzen (1975)*
- *“Social Cognitive Theory (SCT)” by Bandura (1977, 1986)*

Constructs for each of the above and other important models may be seen in Appendix A. Theorists who would follow (Pajares 2002; Dillon and Morris 1996) would refer to these previously laid theoretical foundations as the fundamental bedrock of further investigation to allow further expansion of the field.

Model and measurement scales of prediction have been developed in many forms over time. Davis (1989) regarded some measures for accessing the acceptance levels before the 1980s, “unvalidated but routinely in practice” (Davis 1989, p. 319).

2.7.1 Diffusion of Innovations Theory

Demirci and Ersoy (2008) summarised the diffusion theoretical concept by Rogers (1962) by concluding it attempts to capture how and why, as well as what rate a new idea (or technology) will spread from culture to culture (Demirci and Ersoy 2008). The theory has been previously utilised in a number of studies, even agricultural (Venkatesh et al. 2003). Rogers (1983, p. 11) discussed the term “newness” which may not mean brand new, but can refer to something that has been available for a while but the failure from the user to have tried it and draw an adoption conclusion.

Rogers (1983) believed as the new idea or innovation is used constantly, the corresponding level of concern (sometimes anxiety) and uncertainty for an idea or innovation is reduced for that individual user, e.g. the use of apps. Rogers (2002) examined why some innovations have a higher rate of adoption over the rest. Rogers believes the reason is due to different types of innovation adopters (classified as Innovators to Laggards) and the innovation characteristics as described by Rogers, namely:

*“(1) Relative Advantage, (2) Compatibility, (3) Complexity, (4) Trialability
(5) Observability” (Rogers 2002, p. 990)*

2.7.2 *Social Cognitive Theory*

In the 1980s, Albert Bandura developed a theory to help reveal the way people can interpret results of their behaviour and environmental surroundings, and how these results then change the subsequent behaviour patterns of those people (Pajares 2002). Pajares termed this conception as 'reciprocal determinism' and continued to outline that it was an ever evolving process (Pajares 2002). This pyramid of repetitive events was conceived and enhanced by Bandura in 1977 and 1986, outlines the basics of human functioning as:

*“Behaviour → Environmental Factors → Personal Factors”
“(Cognitive, Affective and Biological Events)” (Bandura 1977, 1986)*

Venkatesh, a renowned IS research professor, believed the SCT theory is probably the strongest human behaviour that has ever been conceived (Venkatesh et al. 2003). The theory conceives that humans observe and learn, causing constant personal adaptation and use this knowledge in future behaviour patterns as guidance (Pajares 2002). Humans learn by observing humans (i.e. environmental factors) and that will contribute to their own environmental makeup (Bandura 1977, 1986). A human acquires new skills and tools for use in life e.g. apps. Knowledge and teachings are handed down from user to user, and we live in a teaching type environment through observation, maintains Bandura.

2.7.3 *Cultural Consequences*

Is app acceptance and usage for Ireland cultural? Geert Hofstede's first explored cultural practices in the 1980s and published a study that analysed 100,000 questionnaire data, taken in a four-year period, collected from IBM employees in 40 countries. He categorised and rated attributes of each, in a range of cross-cultural examinations (Hofstede 2011). Hofstede's then rated the items and made them available on a scale for comparison.

Hofstede theorised a culture is a collective form that is a connection between a mix of individuals and personalities (Hofstede 2011). His theory was initially met with rejection, by Kuhn (1996). Hofstede (2011, p. 8) outlined cultural dimensions included:

- *“Power Distance: Different solutions to the basic problem of human inequality”*
- *“Uncertainty Avoidance: Level of stress in a society in the face of an unknown future”*
- *“Individualism versus Collectivism: Integration of individuals into primary groups”*
- *“Masculinity versus Femininity,: Division of emotional roles between women and men”*
- *“Long-term versus Short-term Orientation: Choice of focus for people's efforts: the future or the present and past”*
- *“Indulgence versus Restraint: Gratification versus control of basic human desires related to enjoying life”*

2.8 Theoretical Models and User Acceptance

Models with clearly defined constructs can help measure how a human behaves or interacts with a system and can be updated and improved over time (Davis 1989; Ajzen 1991; Sundaravej 2009; Venkatesh et al. 2003, 2012). Proven models have existed for many years (Franke and Kowalewski 2012). User adoption of a technology (e.g. app) may depend on “brand, trust, consumer estimation of charge, experiences of the service and hedonic abilities” (Ahmet and Mattila 2011, p. 25). Usability is also an important factor and is said to be measured by “effectiveness, efficiency and satisfaction” (Harrison 2013, p. 2). Although, Ajzen (1991) warned to capture human behaviour is an extremely hard task and to explain the behaviour can be harder, as humans act on many different levels. Importantly, Ajzen (1991) attributes a play a part in keeping accuracy as behaviour attitudes and the perceived control over the behavior of intentions is maintained.

2.8.1 Basic Determinants of User Acceptance (UA)

Fred Davis, a distinguished professor of IS, contributed work towards understanding user acceptance relationships and published his findings in 1989. Davis quickly highlighted the importance of PEU and related work that had been carried out by Bandura (1982). He felt this construct had striking similarities to Bandura’s self-efficacy theory of 1982. The two validated scales were defined by Davis as:

“Perceived Usefulness (PU) as the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis 1989, p. 320)

“Perceived Ease of Use (PEU) as the degree to which a person believes that using a particular system would be free of effort” (Davis 1989, p. 320)

Both scales were hypothesised in the research, and both were strategically tested by Davis in two separate studies. Davis determined both of these constructs are necessary, working in tandem, in understanding the UA of a range of technologies. Davis outlined a standout conclusion from the study in that PU maintains a stronger correlation to PEU. Later Davis, working alongside Bagozzi and Warshaw, emphasised that due to the redefined understanding of UA, PU and PEU, there was now a possibility to predict present and future technology acceptance, using the constructs previously identified by Davis alone. Acceptance throughout the academic field soon followed (Godoe and Johansen 2012; Monno and Xiao 2014).

But Röcker (2010) considered factors such as PEU that had been used previously for technology adoption in the last two decades, may be obsolete now (Röcker 2010). Röcker believed Davis had simplified the process to an unrealistic level.

2.8.2 Technology Readiness Index (TRI)

In 2000, Parasuraman conducted a 1,000 participant interview qualitative study. The study was to understand receptiveness and usage to new technology for the customers (i.e. students) of the United States based student loan service (Parasuraman 2000).

Parasuraman determined a multiple-item scale to assess and measure this receptiveness and usage of technology by users (Parasuraman 2000). Parasuraman discovered 4 clustered categories of the end user (Parasuraman 2000). The categories would be used for future acceptance models (Demirci and Ersoy 2008; Godoe and Johansen 2012). Parasuraman (2000, p. 311) concluded the categories of the scale included:

- *“Optimism: A positive view of technology and offers increased control, flexibility”*
- *“Innovativeness: A tendency to be a technology pioneer and thought leader”*
- *“Discomfort: A perceived lack of control over technology, overwhelmed by it”*
- *“Insecurity: Distrust of technology and skepticism about its ability to work properly”*

Parasuraman and Colby acknowledged five social groupings, which was classed as ‘Explorers to Laggards’ (Demirci and Ersoy 2008). Each group would be allocated a status of High or Low by Parasuraman for each category of scale (Table 2.4 below), as indicated by the findings of the student loan service study analysis.

Explorers are normally easier to attract and mostly represent the first group of accepting consumers (Demirci and Ersoy 2008). Laggards, on the other hand, as termed by Parasuraman and Colby, will not adapt to a new technology easily, or sometimes, never.

Parasuraman (2000) theorised and defined Technology Readiness (TR) as the embrace and use of technology acceptance to complete tasks (Parasuraman 2000). Godoe and Johansen (2012) reconfirmed this statement as valid when conducting a separate study of 186 employees in Norway using the same variables in a reconstruction study.

TABLE 2.4 - Characteristics of Technology Segments (Demirci and Ersoy 2008, p. 3)

Segments	Optimism	Innovation	Discomfort	Insecurity
“Explorers”	“High”	“High”	“Low”	“Low”
“Pioneers”	“High”	“High”	“High”	“High”
“Skeptics”	“Low”	“Low”	“Low”	“Low”
“Paranoids”	“High”	“Low”	“High”	“High”
“Laggards”	“Low”	“Low”	“High”	“High”

SOURCE: Demirci and Ersoy (2008, p. 3). Original by Parasuraman and Colby (2001)

2.8.3 Technology Acceptance Model (TAM)

PU and PEU constructs (Davis 1989) would become integral to the underlying mechanics of acceptance models of the future. The TAM model (and subsequently revised models of TAM2 and TAM3) included a new Dependent Variable (DV) type of Behavioural Intention (BI) (Turner et al. 2009). The new model could be used as an instrument to be able to achieve group predictions (Turner et al. 2009). During the analysis of the TAM usage and value, Turner et al. (2009) found results to suggest, in fact, the usage of BI could not just be determined by PU and PEU. Turner also highlighted that Straub et al. (1995) had previously highlighted PU could influence “morale, disposition and ultimately performance” (Turner et al. 2009, p. 472). Hence, user acceptance might not be as simple in constructs as the model suggests.

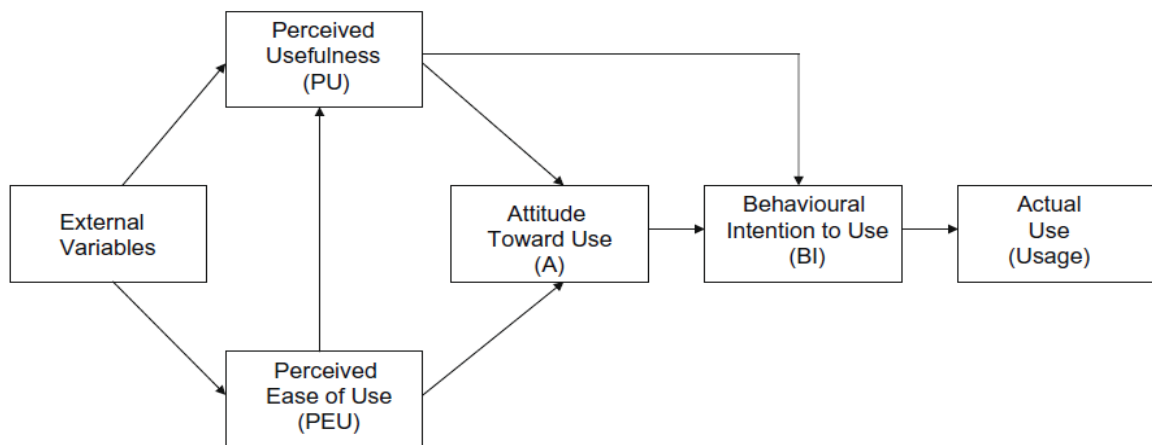


FIGURE 2.5 - TAM Original Acceptance Model (Davis 1989)

The emergence of the original TAM model (Figure 2.5 above) drew criticism in some quarters. Bagozzi (2007) was one such critic of TRA, TPB and TAM models. Bagozzi maintained that these models of simple constructs could in no way be accurate in a productive daily usage (Bagozzi 2007). Bagozzi believed the accuracy of the results would not be complete and therefore, could not be truly relied upon.

Bagozzi also argued that different decisions are taken in different situations, and to account for this, makeshift and unsustainable moderators (e.g. gender and age) were simply added to provide a proposed deeper insight. Multiple additions of various unreasoned moderators and no follow-up discussions that would acknowledge the ‘why’ they had been involved in the first place leaving perilous gaps (Bagozzi 2007). Bagozzi added that newer models should be developed with mechanisms to ascertain:

“Goal Desire → Goal Intention → Action Desire → Action Intention”
(Bagozzi 2007, p. 246)

2.8.4 Organisational UTAUT (Original UTAUT)

Two models by Venkatesh, namely the UTAUT (2003) and UTAUT2 (2012), were put forth to explain UA in organisations and consumer perspectives respectively. The models have been used as the instrument of choice in explaining user acceptance in various areas, with the higher performance achieved by both models and each an improvement on the previous. Venkatesh (2003, p. 447-453) described the UTAUT (2003) core independent model variables as:

1. *“Performance Expectancy (PE): Degree to which an individual believes that using the system will help him or her to attain gains in performance”*
2. *“Effort Expectancy (EE): Degree of ease associated with the use of the system”*
3. *“Social Influence (SI): Degree to which an individual perceives that important others believe he or she should use the new system”*
4. *“Facilitating Conditions (FC): Degree to which an individual believes an organizational and technical infrastructure exists to support use of the system”*

The Dependent Variable (DV) of Behavioural Intention (BI) i.e. “Perceived notion between oneself and some action” (Alkhunaizan and Love 2012, p. 87) is the focal point for the Independent Variables (IVs). The UTAUT model outperformed eight individual acceptance models (variance: 69%-70% compared to 17%-53%). Sundaravej (2009) used the model to examine educational web based software, Blackboard, with 262 respondents. Oliveria (2014) used the model to examine banking technology with 194 participants and a model of Task Technology Fit (TTF) and Initial Trust Model (ITM) (Oliveira et al. 2014). According to Venkatesh, the 2003 UTAUT model (Figure 2.6 below) helps the business understand acceptance drivers to proactively establish mediations (Venkatesh 2003).

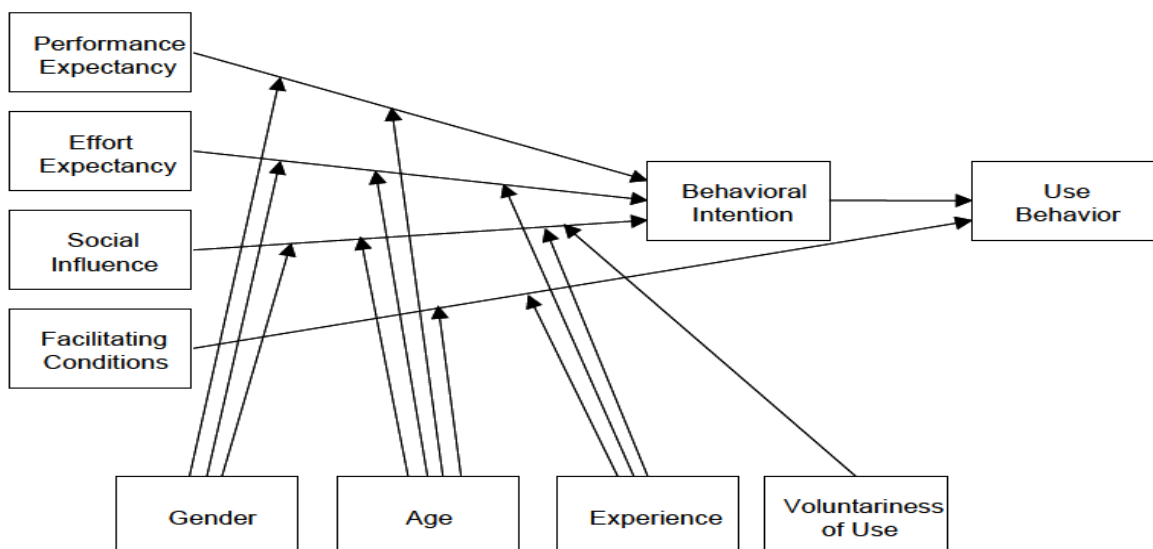


FIGURE 2.6 - UTAUT Organisational Model (Venkatesh 2003, p. 447)

2.8.5 Consumer UTAUT2 (Extended UTAUT)

The UTAUT2 (2012) considers UA from the consumer perspective of technology usage. The original 2003 UTAUT model provided the basis of the core development of the 2012 consumer version (UTAUT2) (Figure 2.7 below). Key moderators of Gender, Age and Experience are shared among both and provide personal input data from the user and Independent Variables (PE, EE, SI and FC), as outlined by Venkatesh (2003; 2012). The new model version included identification of fundamental relationships of the 2003 model (PE, EE, SI, FC) as well as the extra additional constructs of HM, PV and HA (Venkatesh et al. 2012). Venkatesh (2003, p. 161) described these three additional consumer-focused Independent Variables constructs as:

5. *“Hedonic Motivation (HM): Fun or pleasure derived from using the technology”*
6. *“Price Value (PV): Price or cost that the consumer is willing to pay”*
7. *“Habit (HA): The extent people perform behaviors automatically because of learning”*

In response to Bagozzi’s (2007) opinion of lacking theoretical mechanisms in TAM and UTAUT original 2003 version, Venkatesh (2012) replied to the criticism by pointing to the inclusion of hedonic motivation (HM), price value (PV) and habit (HA) to permit focused exploration of the consumer base as required (Venkatesh 2012). Venkatesh (2012) stated that the new model achieved superior improvements in the explanation of variance. Venkatesh (2012) outlined Behavioral intention (BI) had improved (56% to 74%) and Use Behaviour (UB) had also improved significantly (40% to 52%).

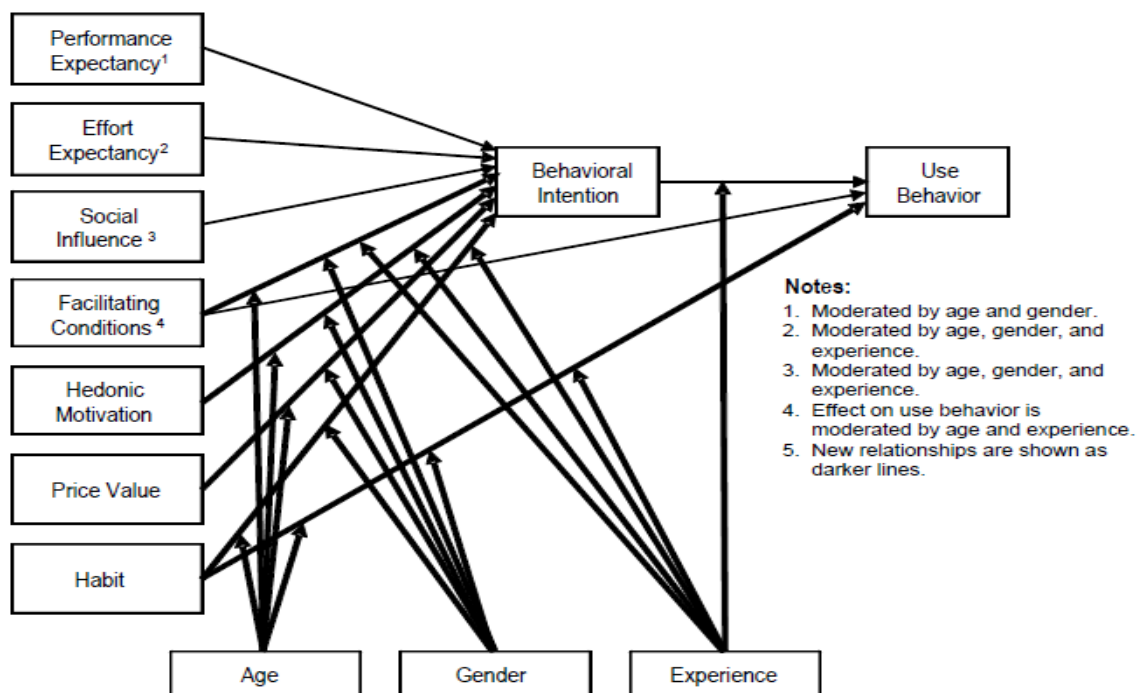


FIGURE 2.7 - UTAUT2 Consumer Model (Venkatesh 2012, p. 160)

3 METHODOLOGY AND FIELDWORK

3.1 Introduction

This methodology and fieldwork chapter outlines the chosen strategies for the study, as well as justification as to why each was chosen. It explains the underlying philosophical basis for adoption of the chosen methodology. It also explores alternative methodological options to help reinforce as to why one was chosen over the other. The study comprised of interviews conducted with professional Irish app development companies and an online survey. A sample of the Irish population was then surveyed to gather quantitative data that could be assessed to ascertain if apps are having an impact in this relatively new era of mobility is having on Ireland. Six study hypotheses were developed to enable the research seek evidence for the acceptance or refutation of each. The UTAUT2 by Venkatesh (2012) was chosen as the model for examination of user acceptance and usage of apps for the study. The UTAUT2 was considered a good fit for the study criteria as the model assesses user acceptance from the consumer point of view. The UTAUT2 model has been used in many previous studies that must examine consumer interactions (Venkatesh 2012). The pre-defined consumer constructs by Venkatesh were examined around the core constructs: User perceived beliefs of gain (PE), user associated ease of use (EE), and varying interaction levels of external social influences (SI). The research included consideration of all possible field philosophies, which Saunders (2012) defines as:

- *“Ontology: Concerned with nature of reality” (p. 130)*
- *“Epistemology: What constitutes acceptable knowledge” (p. 132)*
- *“Axiology: Studies judgements about value” (p. 137)*

The UTAUT2 model remained unmodified but was utilised on a smaller scale; using six of the original seven constructs. Facilitating Conditions (FC) was not considered as the construct relates to the support as perceived by the consumer (Venkatesh 2012) which would have been extremely in-depth process to explore in the given timeframe for study completion. The study considered the UTAUT2 constructs of:

- *“PE: Performance Expectancy” (p. 159)*
- *“EE: Effort Expectancy” (p. 159)*
- *“SI: Social Influence” (p. 159)*
- *“HM: Hedonic Motivation” (p. 161)*
- *“PV: Price Value” (p. 161)*
- *“HA: Habit” (p. 161)*

3.2 Research Philosophy

Philosophy has been studied and debated since the formation of ancient civilisations, with known traditional Greek Pre-Socratic Philosophers dating back to the 7th Century BC. Ideologies have been strengthened by renowned Philosophers, such as Plato (Teacher, an ideology of Idealism) versus Aristotle (Student of Plato, an ideology of Realism). Previous work contributed greatly to modern day research philosophy and teachings.

The methodical design for this study combines philosophical substance from sourced authors (Orlikowski & Baroudi 1990; Clarke 2005; Ulrich 2006) and field instrument development (Palvia et al. 2003; Bryman 2006; Creswell 2006; Venkatesh 2013).

Saunders (2012, p. 171-172) states there are three recognised research approaches to studies that may be employed by researchers throughout the process, including:

- *“Descriptive Research: Who or What”*
- *“Exploratory Research: How”*
- *“Explanatory Research: Why”*

This study was conducted using a descriptive research approach. Chen et al. (1990) outlined the objective of such descriptive empirical research “is to obtain evidence to support or refute formulated hypotheses” (Chen et al. 1990, p. 91).

The Research Onion, termed by Saunders et al. (2012, p. 128), was explored as part of the study overview. On the outer ring of the onion, Saunders listed ten paradigms on the philosophical sphere, from Positivism to Radical Structuralist.

Both Guba (1990) and Creswell (2008) define a paradigm (i.e. worldview) as a belief system that is adhered to by people. Pragmatism, mainly accredited to Charles Sanders Pierce in the 1870's, is seen an alternative option to either a Positivist or Interpretive philosophical perspective.

Pragmatism removes the tighter restrictions that might be enforced when implementing the Positivism or Interpretive perspectives by concentrating on the answers. The freedom of perspectives allows quantitative and qualitative assumptions to be drawn (Creswell 2008). Goldkuhl (2012) expanded that Pragmatism can best extrapolate richer more grounded findings. Pragmatism premises on asking the correct questions as empirical results are achieved (Baskerville and Myers 2004, p. 331).

Therefore, Pragmatism was chosen as the paradigm for this research study.

Chosen Paradigm: Pragmatism

3.3 Approach and Distribution

A Swiss professor of Information Systems, Dr. Knut Hinkelmann, explained there are alternatives for field research which include: “Deductive Reasoning (proposes general to specific) versus Inductive Reasoning (proposes specific to general)” (Hinkelmann 2013).

An alternative option of Abductive reasoning will not be examined as part of the study.

Considering the nature of the study being theory-driven (i.e. area of research confirmed as mobile technology, app user acceptance and usage in Ireland and confirmation/rejection of those hypotheses), the study is said to be have been conducted using a Deductive approach.

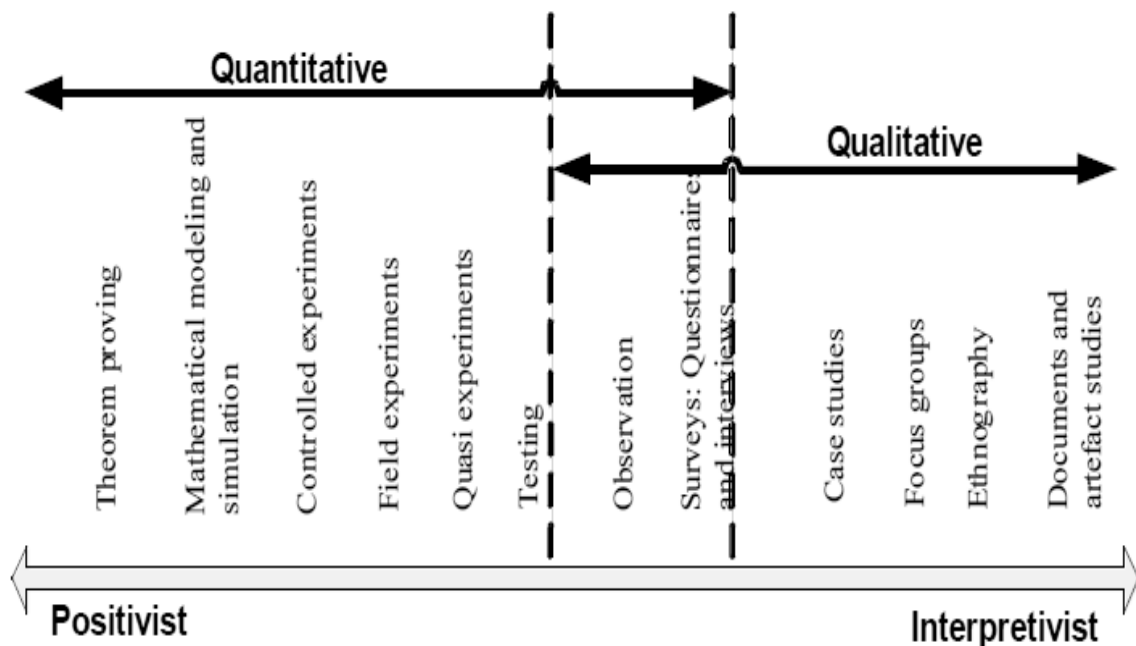
Deductive reasoning involves a series of rigorous testing of the population samples (Saunders et al. 2012). Development of a ‘theory first’ methodology was used in the study.

Chosen Approach: Deductive Reasoning

De Villiers (2005) depicts the methods available for use when deciding the study strategy (Table 3.1 below). On one end, are the quantitative methods and on the opposite end are the qualitative methods. Each provides strengths and weaknesses for data collection.

At the overlap, Observation or Surveys combine methodologies of both Quantitative and Qualitative.

TABLE 3.1 - De Villiers (2005) Methods and Strategies Table



SOURCE: De Villiers (2005, p. 14)

Blaxter et al. (2006) confirm Surveys (Questionnaires and Interviews) are techniques that are the centre of some research Social Studies (see Appendix B), and are a vital part of smaller scale studies (Blaxter et al. 2006). De Villiers (2005) acknowledges Surveys create a powerful combination for data collection. Therefore, Surveys were used in this study.

Chosen Strategy: Survey: Questionnaires and Interviews

A Mixed Methods technique was implemented as it employs the required techniques (i.e. quantitative and qualitative) throughout the study investigation. Bazeley (2004) and Denzin & Lincoln (2005) raised issues when conducting mixed methods in a pragmatism approach, such as “time, the cost as well as the level of skills and knowledge available” (Bazeley 2004, p. 8).

Creswell (2006, p. 2) responded to those concerns empathising the importance of using mixed methods in research, arguing the use “extends the logic of qualitative explanations about the social world”.

Chosen Choice: Mixed Methods: Interviews followed by Online Survey

The use of a Normal Standard Distribution Bell Curve (as opposed to Laplace or Cauchy) was applied for rejection or retention of each hypothesis. On the Symmetrical Curve (Figure 3.1 below), the \bar{x} (i.e. mean) is at the middle, with the left side a copy and vice-versa. On any curve distribution curve, the x-axis (Independent Variable) remains the cause (input) and the y-axis (Dependent Variable) remains the consequence (output). Hence, curve shape is a function of the Dependent Variable, defined as $y=f(x)$.

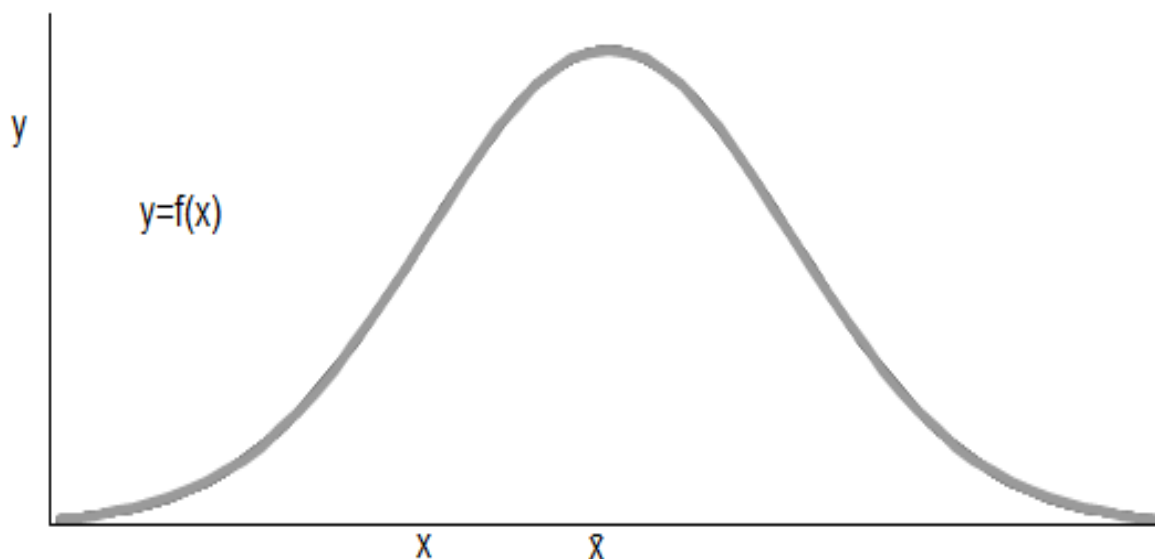


FIGURE 3.1 - Study Normal Distribution Standard Curve Diagram

3.4 Instruments and Data Collection

For interpretation and evaluation of meaningful data, the instruments used in the study included a sequential combination of semi-structured interviews (open-ended questions only), followed by a self-administered online questionnaire (open and closed questions). Both were used as the primary data sources for the study. The use of primary data enabled the study to get feedback directly from the central people concerned as required.

Secondary data sources of peer-reviewed publications and accredited articles were also collected to give substance and support to the overall investigation of the Research Question. Prior to starting the interviews or questionnaires, approval was required by Trinity's School of Computer Science and Statistics (SCSS) ethics committee.

Ethical approval for the study was granted on 18th February 2015 to allow the study to proceed with both the interviews and self-administered online survey.

Once ethical approval had been obtained, the selected professional companies were sent a letter of participation on 2nd March 2015, prior to the interviews taking place on the week of the 9th March 2015. The letter provided the study overview and kindly invited a representative from each company to partake in the interview stage.

Interviews were conducted over the telephone using a Samsung S5 phone. Each company call was recorded (voice recorded only, no image recording) using the app 'Automatic Call Recorder' by Appliqato (Appstar Solutions). This free version was downloaded onto a Samsung S5 Smartphone using the Google Play App Store.

During participation, the interviewees were informed at the beginning of the call the phone call would be recorded and asked if they would be still willing to proceed. All responded yes, they were willing to proceed with the recorded interview.

Interview participants were informed that recorded responses and comments would be used for data analysis at a later date. All participants were notified that they were free to stop the interview at any point, free to not respond to any question and free to access their own data at any time under the Freedom of Information Act, as instructed in the Trinity College Dublin Good Practice Guide.

Interviewees were selected from a list of development companies, based on Irish industry awards recognition and professional clientele. One of the interviewees was the 'Eircom Spider Awards 2014 Winner for best eLearning and education category' and an 'OMiG Finalist Awards 2014'. Interviews were time limited to a maximum of 20 minutes per interview. Each interview was analysed and theme coded using NVivo (v10.0).

The online survey was available to a target audience of Facebook Friends and LinkedIn Connections of the researcher, which satisfied the criteria of the study (i.e. Resident of Republic of Ireland, over 18 years old). The snowball sampling approach was utilised in this study. It had been successful for Ahmet and Mattila (2011) with 203 respondents on Facebook and Twitter, during a study considering at App Store adoption practices and Word of Mouth (WOM). It was also used by Baltar and Brunet (2012), who found that the use of social networking sites extremely effective, when the audience is wide reaching, such as a spread population.

The survey was checked to remove any bias, leading or loaded type questions. Participant's instruction sheet informed participants that the survey was constructed in line with the guidelines of the Data Protection Acts (1988 and 2003) and Trinity College Good Research Practice policy. Participant's had the option to exit the survey at any time without consequence. Participant survey information and the list of questions for the survey can be seen in Appendix C.

The 5-Point Likert Scale for the twelve sub-items to examine acceptance consisted of:



An internal test was first conducted prior to publishing the real online survey on the 25th February 2015. The questionnaire was proof-read by three people to verify any ambiguity or misunderstandings. The average pilot time check was 12 minutes. A test data collection from the pilot survey was performed. The data was verified to ensure it was in the correct format before proceeding with the collection of the real responses. Test data was cleared. A personalised invitational email was sent (via Facebook and LinkedIn) to friends and connections on the 1st April 2015 who satisfied the criteria.

The survey took on average 10-15 minutes to complete and absolute anonymity was assured for all respondents. Each respondent was also informed that the data would be permanently deleted on the conclusion of the study in October 2015. The survey was available for four full weeks in April. During the final week, a gentle reminder was re-issued to those who had not yet taken the survey. The survey closed midnight 30th April 2015 and the results were exported to an encrypted secure storage backup. Data exported from the survey was strong password protected.

Chosen Time Horizon: Cross-sectional: Standard - Based on a Shorter Time Frame

3.5 Study Hypotheses and Constructs

The following hypotheses will be examined as part of this study:

TABLE 3.2 - Study Hypotheses and Constructs Table

Reference	Construct	Direction	Interest Area
Hypothesis A	Performance Expectancy	Behavioral Intention	Attain Gain from Usage
H ₀ : Android and iOS users attain same benefits from apps than Windows or Blackberry H ₁ : Android and iOS users attain greater benefits from apps than Windows or Blackberry			
Hypothesis B	Effort Expectancy	Behavioral Intention	Associated Level of Ease
H ₀ : Smart Device users find apps clear and easy to use, with few complications H ₁ : Smart Device users do not find apps clear and easy to use, with many complications			
Hypothesis C	Social Influence	Behavioral Intention	External Use Perception
H ₀ : Influence from advertising, family and friends encourages the user to use an app H ₁ : Influence from advertising, family and friends does not encourage the user to use an app			
Hypothesis D	Hedonic Motivation	Behavioral Intention	Derived Pleasure Usage
H ₀ : Smart Device users derive fun and enjoyment from the use of the app H ₁ : Smart Device users does not derive fun and enjoyment from the use of the app			
Hypothesis E	Price Value	Behavioural Intention	Price Value Structure
H ₀ : Cost and pricing structure has an impact on app download and usage H ₁ : Cost and pricing structure has no impact on app download and usage			
Hypothesis F	Habit	Behavioral Intention	Automaticity
H ₀ : App usage has become a habit in daily life of the user H ₁ : App usage has not become a habit in daily life of the user			

The analysis of the study could be conducted using a 95% level of significance ($\alpha = 0.05$).

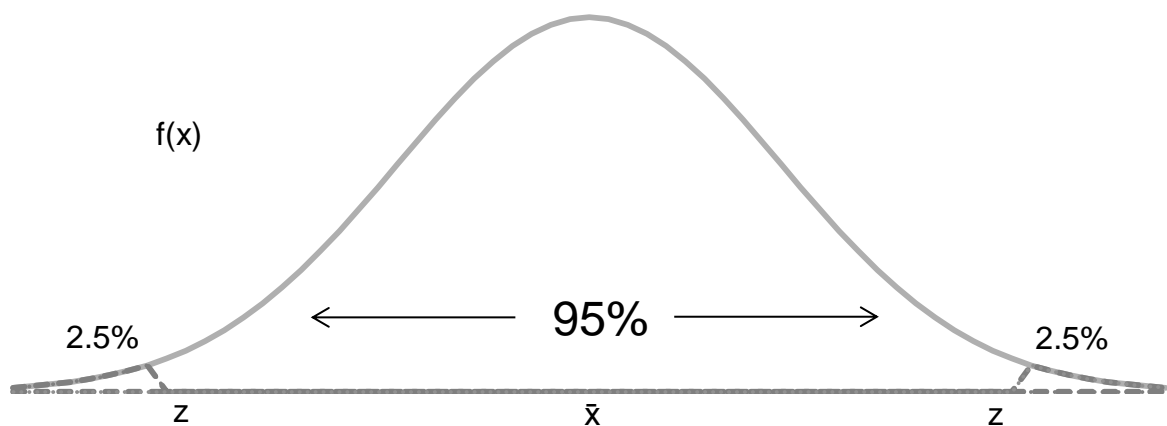


FIGURE 3.2 - Two-Tailed Tests Study Distribution Curve Diagram

The position of z (Figure 3.2 above) indicates the cut-off in the curve to the left and right of z in both tails (p -value). Hence, 95% of the area under the normal distribution was used to determine whether each null hypothesis was accepted or rejected.

The hypotheses for the study may be illustrated graphically as:

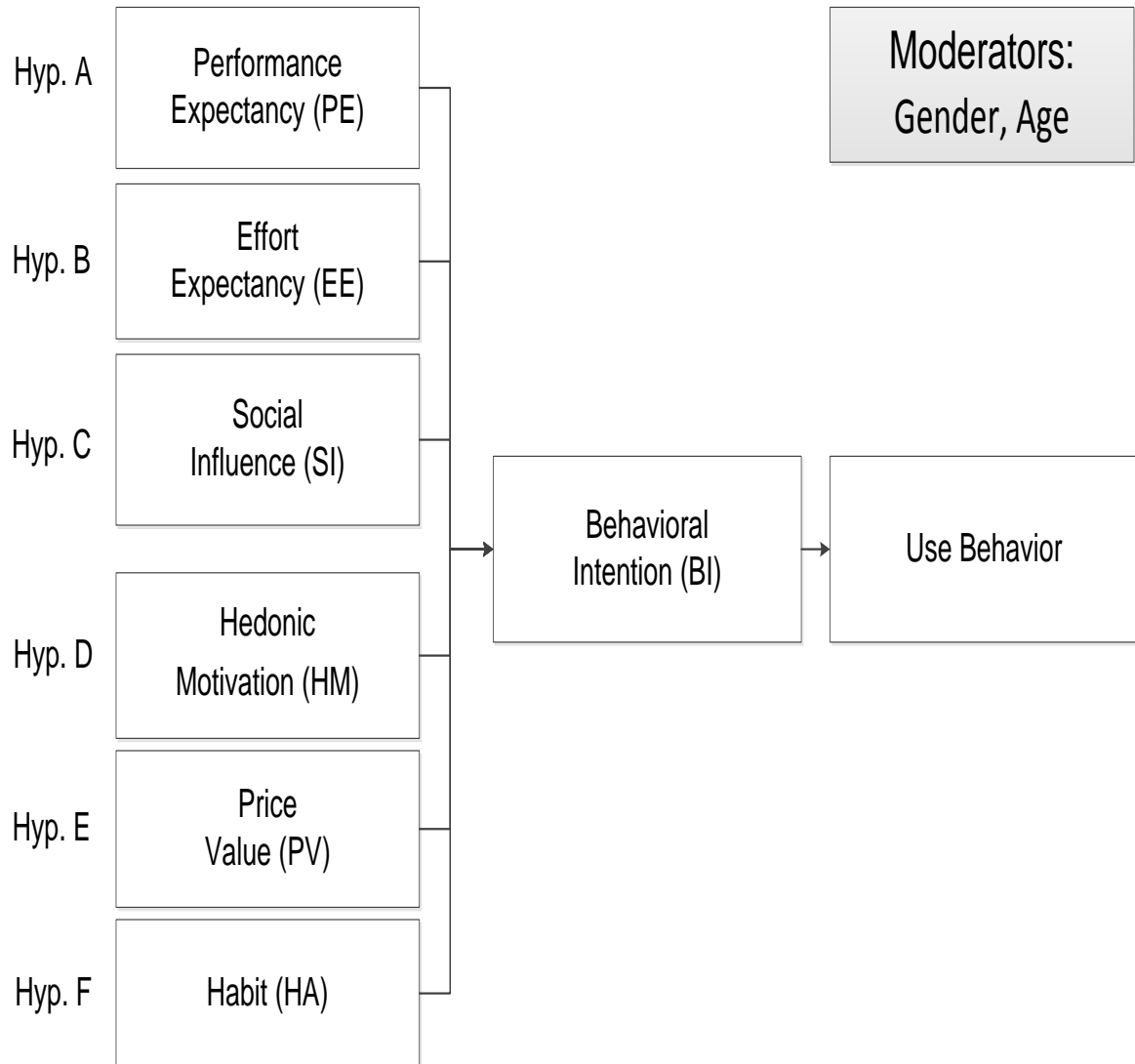


FIGURE 3.3 - UTAUT2 Study Analysis and Hypotheses Constructs

3.6 Conclusion

The chosen study methodology can be summarised as:

Paradigm: Pragmatism

Approach: Deductive Reasoning

Strategy: Survey: Questionnaires and Interviews

Choice: Mixed Methods: Sequentially - Interviews followed by Survey

Time Horizon: Cross-sectional: Standard - Based on a Shorter Time Frame

4 FINDINGS AND ANALYSIS

4.1 Introduction

This findings and analysis chapter examines the interviews and survey findings. The results were used to help draw a statistical overview of app usage in Ireland today.

By closing date, **401** responses had been received for the questionnaire. Raw data was received from the responses of the online survey. Survey Monkey contained a number of export options, including Excel, CVS and Adobe PDF. IBM SPSS (v22) was used for the survey data analysis. In the event of missing data, the following values were recorded: Standard = 99 and Age = 'Preferred Not to Answer'. The data was reviewed, error checked and cleansed. Invalid responses (i.e. no questions answered) were discarded. Seven responses fell into this category.

The final survey response rate was **394** respondents. The study utilised two-tailed hypothesis tests with the response rate of **394** for 95% significance (see section 5.4). A response rate percentage could not be determined for the study as the study was conducted using a snowball approach technique, that was also successfully applied as part of the Ahmet and Mattila (2011) study.

The results for each question in SPSS was copied into excel in tabular format, so each of the fields could be sorted and filtered for easier access to the retrieved data. Using the UTAUT2 (Venkatesh et al. 2012) as a base model for analysis, the Research Sub-Question items were created as additional computed variables in SPSS to allow examination of the study constructs.

4.2 Demographics

Survey Question 7 Analysis: Gender Profile

For the gender profile question, male response (53%) was higher than the female response (47%). A total of 24 respondents had chosen not to answer this question.

TABLE 4.1 - Demographics Gender Profile Percentages

Area	Category	Frequencies (n)	%
Gender	Male	211	57.0%
	Female	159	43.0%
	Total	370	100.0%
<i>n = 370 (24 of 394 Skipped Question)</i>			

4.3 Simple Analysis

Survey Question 8 Analysis: Age Range Profile

The age range results for the 379 respondents who answered this question can be seen in Table 4.2 (below). The largest category was the 31-40 years old category (46.2%). The 41-50 years old category (22.4%) was second and the 21-30 years old category in third (19.8%). The smallest category came from the 61-64 years old response rate at 0.3%.

TABLE 4.2 - Demographics Age Range Profile Percentages

Area	Category	Frequencies (n)	%
Age Range	18-20 Years	14	3.7%
	21-30 Years	75	19.8%
	31-40 Years	175	46.2%
	41-50 Years	85	22.4%
	51-60 Years	25	6.6%
	61-64 Years	1	0.3%
	65+	3	0.8%
	Preferred Not to Answer	1	0.3%
	Total	379	100.0%

n = 379 (15 of 394 Skipped Question)

Of the 378 that had specified an age range response (379 minus 1 Preferred Not to Answer), only 364 people had also specified a gender in their response. The tornado chart for the cross-examination of Gender and Age for Male and Female (excludes Preferred Not to Answer responses) can be seen for the study respondents (Figure 4.1 below).

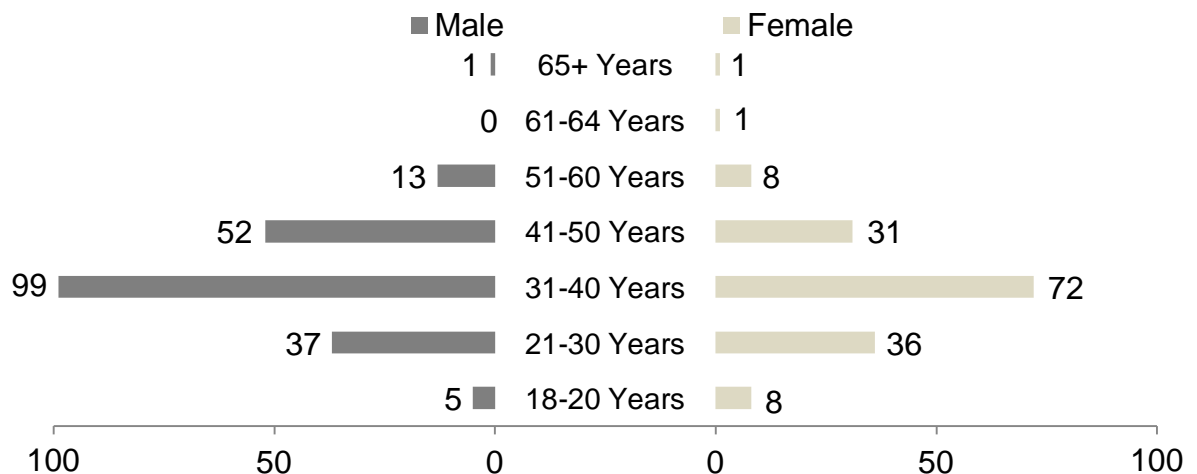


FIGURE 4.1 - Demographic Male and Female Tornado Chart

Survey Question 1 Analysis: Smartphone or Tablet Operating System of Choice

The most popular Operating System was Google’s Android (52.1%). This was followed by Apple’s iOS (40.9%). Microsoft Windows followed in third place (5.4%). Blackberry received the lowest response rate of only 1 response (0.3%). The category of ‘Others’ provided the remaining choices (1.3%).

TABLE 4.3 - Operating System of Choice by Gender

Area	Frequencies (n)				
	Android	iOS	Windows	Blackberry	Other
Operating System					
Male	116 29.7%	75 19.2%	15 3.8%	0 0.0%	3 0.7%
Female	75 19.1%	76 19.4%	5 1.3%	1 0.3%	1 0.3%
Preferred Not to Answer	13 3.3%	9 2.3%	1 0.3%	0 0.0%	1 0.3%
Total (% of n)	204 52.1%	160 40.9%	21 5.4%	1 0.3%	5 1.3%
<i>n = 391 (3 of 394 Skipped Question)</i>					

The 5 responses for ‘Others’ (1.3%) included (in order of date received): “One plus One with Cyanogenmod”, “Apple Mac”, “Apple Mac”, “An Android Tablet” and “Android”.

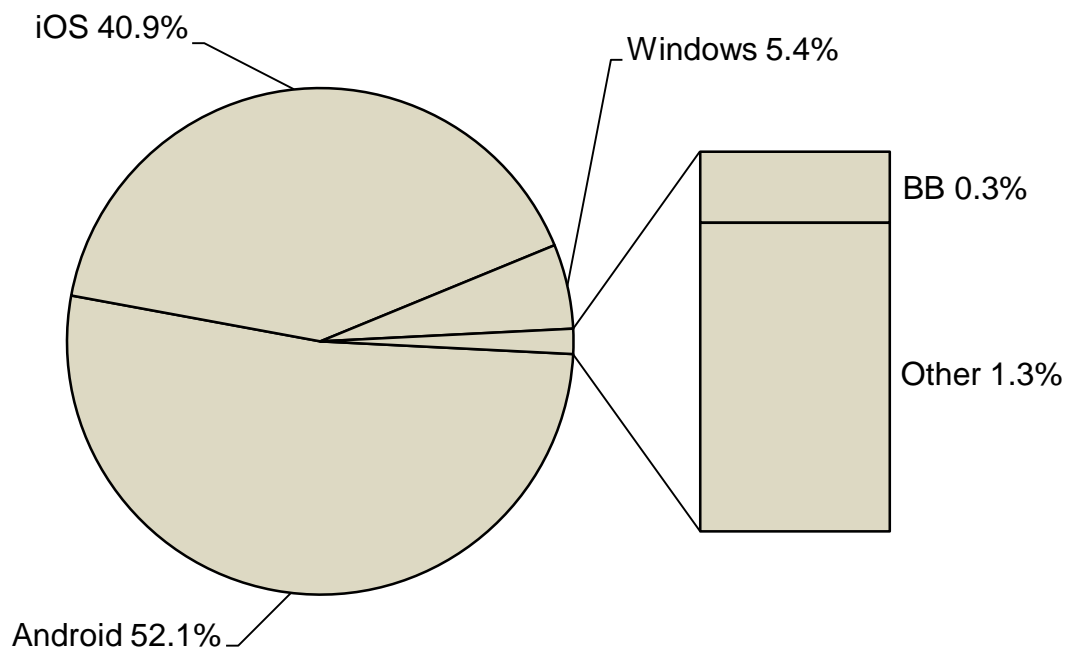


FIGURE 4.2 - Operating System Percentages Pie Chart (Total % Shares)

The question of “What is your Smartphone or tablet operating system of choice?” had been directed at Smartphone, Tablet, Phablet or iPad users. Android and iOS were clearly the operating systems that people used most, with responses of 204 and 160 respectively. Blackberry (1 response) and ‘Other’ (5 responses) had received only 6 respondent responses in total. This figure accounted for only 1.6% of the total 100% of respondents. Android had a large response difference for Males (116) and Females (75). On the iOS side, the OS usage was split fairly between Males (75) and Females (76). Windows and Blackberry had minor variances only.

Survey Question 2 Analysis: Number of Apps Used in the Past 7 Days

The gender breakdown to this question can be seen in Table 4.4 (below). A total of 390 participants responded to the “Number of Apps Used in the Past 7 Days”. Only 367 people had specified a gender during the participation of the survey.

TABLE 4.4 - Apps Used in the Preceding 7 Days by Gender

Area	Frequencies (<i>n</i>)					
Preceding 7 Day App Usage	None	1-5	6-10	11-15	16-20	21+
Male	7	42	78	38	21	23
Female	2	59	58	21	11	7
Preferred Not to Answer	3	5	7	3	3	2
Totals (% of <i>n</i>)	12	106	143	62	35	32
<i>n</i> = 390 (4 of 394 Skipped Question)						

Responses for the question received weighty and varying differences between the 6 choices of ‘Select One Option Only’ question. The most selected option was 6-10 apps, receiving 143 responses (36.7%). The second most frequently selected option was 1-5 apps, with 106 responses (27.2%). The options of 11-15, 16-20 and 21+ had received approximately the same number of responses. The 1-5 and 6-10 groups showed the greatest levels of usage for the Irish population sample within the study.

The option of ‘None’ received only 12 responses of the total 390 (*n*). The 12 ‘None’ responses represent a lowly 3% of the total available. The response count difference for Males (78) versus Females (58) for 6-10 apps used within the 7 days preceding was 20 for Males. Interestingly, the number of responses for the 1-5 apps option had the only reverse of Males higher than Females, as higher Females (59) responded to this option versus the Males (42) or (15% versus 11%). The ‘Preferred Not to Answer’ question response rate was low (4). This question had one of the highest response counts.

Survey Question 3 Analysis: Past Interactions Performed Per User

For the question of “Past Interactions Performed per User”, the respondents had to select one or multiple options. A total 382 respondents answered this question. The results for the question were widely varied, with high responses for Social and low responses for ‘Do not know’. The response count for past interactions for both Social (91.6%) and Browse (84.8%) were nearly twice the response rate of the Service (44.0%) and Transaction (52.1%) response count.

The largest number of respondents to this question came from the Social group for Males (187), followed by Females (182). Out of the four options of Social, Browse, Service and Transaction, the Service option was the lowest response rate (168).

TABLE 4.5 - Past Interactions Performed by Gender

Area	Frequencies (n)				
	Social	Browse	Service	Transaction	Unknown
User Past Interactions					
Male	187	182	90	108	2
Female	147	133	73	83	3
Preferred Not to Answer	16	9	5	8	1
Totals	350	324	168	199	6
% of n	91.6%	84.8%	44.0%	52.1%	1.6%
<i>n = 382 (12 of 394 Skipped Question)</i>					

Past Interactions graph shows highest responses for Social and Browse Interactions:

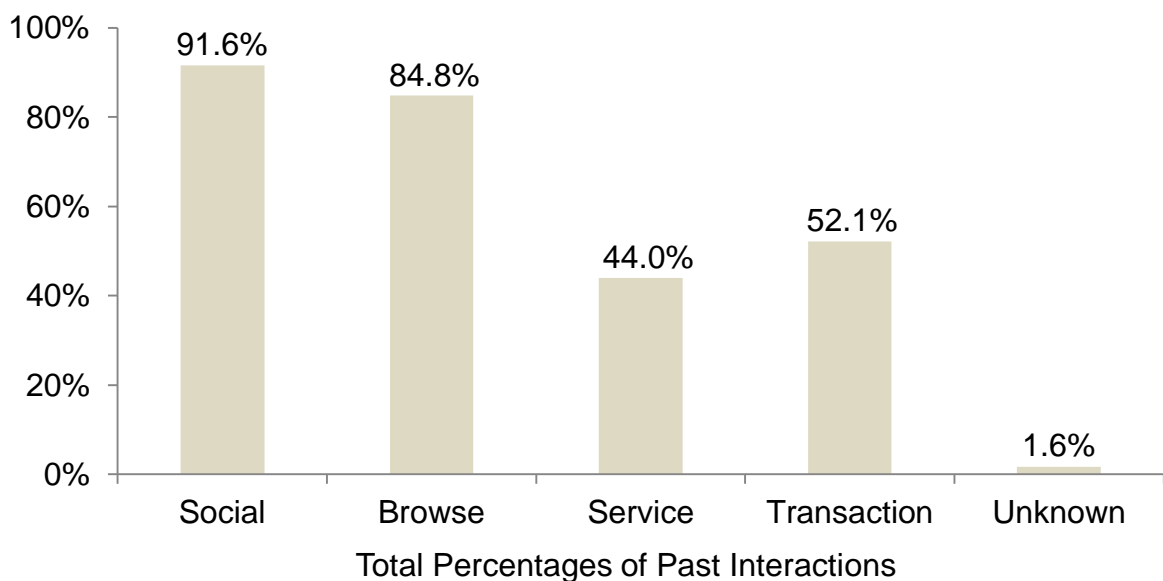


FIGURE 4.3 - Past Interactions Total Percentages Column Chart

Survey Question 4 Analysis: Most Frequently Downloaded Categories

A total 390 respondents completed this question. Social Networking for both Male (31.3%) and Female (27.4%) was the number one category of download specified. This was followed by Sports (26.7%) and Entertainment (22.9%) for Males and Music (17.4%) and Photos (16.4%) by Females. Transport and Weather each received low response rates.

TABLE 4.6 - Top 10 Most Frequently Downloaded Categories

Frequencies (n)					
Male		Female		Preferred Not to Answer	
Social Networking	122 31.3%	Social Networking	107 27.4%	Books	9 2.3%
Sports	104 26.7%	Music	68 17.4%	Music	6 1.5%
Entertainment	89 22.9%	Photo	64 16.4%	Games	5 1.3%
Maps	85 21.8%	Entertainment	59 15.1%	Social Networking	4 1.2%
Games	80 20.5%	News	57 14.6%	Lifestyle	4 1.2%
Music	78 20.0%	Games	52 13.3%	Finance	4 1.2%
News	71 18.2%	Maps	50 12.8%	Business	4 1.2%
Transport	68 17.4%	Transport	50 12.8%	Photo	3 0.7%
Photo	58 14.9%	Weather	49 12.5%	News	3 0.7%
Weather	51 13.0%	Books	45 11.5%	Maps	3 0.7%
<i>n = 390 (4 of 394 Skipped Question)</i>					

The ten responses (7 males, 3 females) for ‘Others’ in this questions included (in order of date received): “Gambling”, “Email”, “Crafts”, “Web Development programming”, “Mail App”, “Logistics”, “Pinterest”, “Fashion”, “Wildlife”, “Conservation” and “Sci-fi”.

This open question only accounted for 2.6% of the total 390 of responses (n).

Survey Question 5 Analysis: App Usage Discontinuation

Advertising Annoyance was the top response for discontinuation of usage by users.

TABLE 4.7 - Top Reasons for Discontinuation of App Use

Frequencies (n)					
Male		Female		Preferred Not to Answer	
Advertising Annoyance	150 38.6%	Advertising Annoyance	114 29.3%	Advertising Annoyance	7 1.7%
App Performing Slowly	105 27.0%	Price Charges Introduced	86 22.1%	Quality Alternative	7 1.7%
Price Charges Introduced	96 24.7%	App Performing Slowly	72 18.5%	Price Charges Introduced	6 1.5%
Poor App Design	91 23.4%	Quality Alternative	57 14.7%	Bad App Reviews	6 1.5%
Security Concerns	77 19.8%	Security Concerns	55 14.1%	Poor App Design	5 1.3%
Quality Alternative	69 17.7%	Poor App Design	48 12.3%	Security Concerns	4 1.0%
Easier on Desktop	51 13.1%	Easier on Desktop	42 10.8%	Easier on Desktop	4 1.0%
Screen Size too Small	27 7.0%	Screen Size too Small	29 7.5%	Screen Size too Small	3 0.8%
Bad App Reviews	25 6.4%	Bad App Reviews	24 6.2%	App Performing Slowly	2 0.5%
Unpopular in Public View	6 1.5%	Unpopular in Public View	6 1.5%	Unpopular in Public View	1 0.3%
<i>n = 389 (5 of 394 Skipped Question)</i>					

The 11 responses (7 males, 4 females) for 'Others' in this questions included (in order of date received): "Get bored of it / Do not use enough", "Logging my input in any way or geo-location", "Unrequested notifications", "Lack of use by me", "Free games that require long waiting times to progress and where that waiting time can be improved at a cost.", "Too many app updates taking up memory", "Lose interest in it after time", "Invasive", "Poor reliability/instability within OS", "Takes up too much space", "App didn't match expectations". This open question accounted for 2.8% of the total 389 of responses (n).

4.4 Reliability Analysis

Survey Question 6 Analysis: User Ratings of Acceptance

Reliability analysis is important in a study to ascertain if items are consistent for use multiple times. The 12 Scale Items as part of Question 7, “Please specify your rating for each of the questions below”, were altered from the original UTAUT2 (Venkatesh et al. 2012). Each sub-item was on a 5-point Likert Scale including: “1 = Strong Disagree”, “2 = Disagree”, “3 = Agree”, “4 = Strongly Agree” and “5 = Do Not Know”. Ratings count and percentages by respondents are shown in Appendix D.

The Kaiser-Meyer-Olkin (KMO) result (0.715) and Alpha result (0.000) provided confidence that the 12 Scale Item data maintained a good degree of informative strength for data analysis (i.e. $0.715 > 0.6$ minimum). Factor Analysis, using ‘Principal Component Analysis (PCA)’ model extraction and VARIMAX rotation, was generated in SPSS for the 12 items to determine any future possible data reduction and examination. The Components Matrix and the Rotated Matrix conducted both extracted 4 components for the Factor Analysis results. Total variance for all items from the Factor Analysis output is shown in Table 4.8 below. The greatest degree of variance explained came from Component 1 (PE) at 24%, with Component 2 (EE) at 13%.

TABLE 4.8 - Constructs Total Variance Percentages

Components Variances			
Component	Total	% Variance Explained	Cumulative %
1	2.877	23.972%	23.972%
2	1.613	13.445%	37.417%
3	1.243	10.357%	47.774%
4	1.068	8.903%	56.677%
5	0.946	7.883%	64.560%
6	0.772	6.437%	70.998%
7	0.710	5.915%	76.913%
8	0.698	5.813%	82.726%
9	0.652	5.436%	88.162%
10	0.564	4.701%	92.862%
11	0.434	3.616%	96.478%
12	0.423	3.522%	100.000%

KMO (12 Scale Items) = 0.715, Bartlett’s Chi Square Test Result = 687.872, Sig. = 0.000, $p < 0.5$

To aid verification of the internal consistency of the 12 Scale Items of user acceptance (i.e. measures individual items inter-relations as part of a group), Cronbach's Alpha Analysis was then performed. These tests checked the coefficient of reliability. With all 12 items, the Cronbach Alpha result returned 0.589 (Table 4.9 below). Removal of Items 7 and 8 (both related to Hedonic Motivation) from the Reliability Tests in SPSS increased the Cronbach's Alpha value to 0.693 (just under 0.7). The Cronbach's Alpha test, on the standardised items, returned 0.701. Recoding of any defined variables made no defining difference.

TABLE 4.9 - Reliability Statistics Internal Consistency

Comment	<i>n</i>	Items #	Alpha (α)	Reliability
Initial 12 Items	372	12	0.589	High - Moderate
11 Items (Removal for Item 7)	372	11	0.655	High – Moderate
10 Items (Removal for Item 8)	375	10	0.693	High – Moderate

Alkhunaizan and Love (2012, p. 90) state various scholars suggest reliability can be measured as: "Excellent: 0.90 and Higher", "High: 0.70 to 0.90", "High to Moderate: 0.50 to 0.70" and "Low: 0.49 and below". All tests of reliability returned 'High – Moderate'.

Each pair of two Scale Items for this question was also computed into a new variable and renamed in SPSS. Items 1 and item 2 represented PE and were computed to represent the PE construct. Item 3 and item 4 represented the EE construct and were computed to represent EE. This practice was completed for all 12 Scale Items, given 6 new variables that could be used for deeper analysis. The correlation between the computed construct items is below (Table 4.10). For each element, the closer to zero, the stronger the independence of each construct using the computed construct variable in SPSS.

TABLE 4.10 - Construct Inter-item Correlation Matrix

	PE	EE	SI	HM	PV	HA
PE	1.000	0.307	0.183	-0.262	0.149	0.405
EE	0.307	1.000	0.114	-0.165	0.075	0.407
SI	0.183	0.114	1.000	0.047	0.198	0.208
HM	-0.262	-0.165	0.047	1.000	-0.002	-0.146
PV	0.149	0.075	0.198	-0.002	1.000	0.190
HA	0.405	0.407	0.208	-0.146	0.190	1.000

KMO (6 Computed Constructs) = 0.686, Bartlett's Chi Square = 221.997, Sig. = 0.000, $p < 0.5$

4.5 Descriptive Statistics

Using the computed variables, descriptive statistics were run and analysed in SPSS per Construct (Table 4.11) and per Item (Table 4.12). Mean and Standard Deviations of each were formatted to 3 decimal places. The constructs with the highest Means were PE (6.594) and EE (6.130) and the highest Standard Deviation construct was PV (1.995).

TABLE 4.11 - Descriptive Statistics per Construct

Constructs		Min	Max	Mean	SD
PE	Performance Expectancy	2	10	6.594	1.482
EE	Effort Expectancy	2	10	6.130	1.507
SI	Social Influence	2	10	5.210	1.565
HM	Hedonic Motivation	2	10	4.638	1.568
PV	Price Value	2	10	5.601	1.996
HA	Habit	2	10	5.972	1.693

For the individual 12 Scale Item analysis, the PV2 item returned the highest Standard Deviation (1.180), indicating the response had the largest spread of values for that group of data points in the Acceptance analysis for Question 7.

TABLE 4.12 - Descriptive Statistics per Item

Items	Mean	SD
PE1: "Find apps beneficial in my daily life"	3.365	0.806
PE2: "Apps enables me to complete tasks faster"	3.230	0.903
EE1: "Find apps clear and easy to use"	3.229	0.775
EE2: "Apps are easier to use than the computer"	2.888	1.067
SI1: "Apps recommended in advertising makes me want to use it"	2.351	1.035
SI2: "Influence of family and friends makes me use the app"	2.869	0.950
HM1: "Apps are not fun but hard work"	2.083	0.981
HM2: "Prefer to use apps only for pleasure"	2.577	0.976
PV1: "Would pay a one-time charge if the price was worth it"	3.023	1.089
PV2: "Would pay a yearly subscription fee if the price was worth it"	2.581	1.180
HA1: "Automatically think of using an app rather than a desktop"	2.714	1.085
HA2: "The use of an app in my daily life has become a habit"	3.263	0.985
<i>n</i> = 369		

Eight chi-square ‘Test of Independence’ sample tests were run to analyse the possible relationships between Gender/Age and constructs of Hedonic Motivation, Price Value, Habit, and Behavioral Intention. Data from Question 3 for “Past 7 Day Usage” was duplicated (recoded) and used as Behavioral Intention construct data during the analysis of sample tests. The rationale for this decision was if a user downloaded an app in the 7 days preceding, the user would maintain an intention to actually use it, even to trial.

Test 1: Gender on Hedonic Motivation: pValue 0.542

Test 2: Gender on Price Value: pValue 0.400

Test 3: Gender on Habit: pValue 0.232

Test 5: Age on Hedonic Motivation: pValue 0.544

Test 6: Age on Price Value: pValue 0.055

Test 7: Age on Habit: pValue 0.088

Test 8: Age on Behavioral Intention: pValue 0.497

Result: The pValue results for tests 1, 2, 3, 5, 6, 7 and 8 were all greater than the 0.05 (5%) significance level. Therefore, it could be stated Gender and Age had no defined relationships (i.e. independent variables) with Hedonic Motivation, Price Value and Habit.

Test 4: Gender on Behavioral Intention: pValue 0.002

Result: Test number 4 result of 0.002 was less than the 0.05 (5%) significance level. Therefore, it could be stated that a relationship between Gender and Behavioral Intention was discovered. The % relationships between Gender and BI are shown in Table 4.13.

TABLE 4.13 - Cross-tabulation Analysis on Behavioral Intention by Gender

Behavioral Intention		Male	Female	Total
1.00	Count	7 (77.8%)	2 (22.2%)	9 (100.0%)
2.00	Count	42 (41.6%)	59 (58.4%)	101 (100.0%)
3.00	Count	78 (57.4%)	58 (42.6%)	136 (100.0%)
4.00	Count	38 (64.4%)	21 (35.6%)	59 (100.0%)
5.00	Count	21 (65.6%)	11 (34.4%)	32 (100.0%)
6.00	Count	23 (76.7%)	7 (23.3%)	30 (100.0%)
	Total Count	209 (56.9%)	158 (43.1%)	367 (100.0%)

4.6 Hypotheses Explored

Each of the six hypotheses from the Study Hypothesis Table (see Section 3.5) were analysed using SPSS and the Kruskal-Wallis Independent Sample test. Question 3 data was used again as the BI construct within the model. An individual test was conducted per Hypothesis. The hypotheses examinations are a focal point of the study exploration.

The Kruskal-Wallis Independent Sample test type in SPSS was determined to be the most appropriate test for examination of this data, as there were 2 factors for comparison i.e. Construct and the Behavioral Intention Construct. The 0.05 (5%) Significance Level was also used to accept or refute each hypothesis. The pValues are outlined below for each and the result of the examination.

*Hypothesis A (Performance Expectancy): pValue 0.034 = **ALTERNATIVE SUPPORTED***

Rational: 0.034 is less than 5% (< 0.05) study significance. NULL hypothesis was rejected. Android and iOS users attain greater benefits from apps than Windows or Blackberry.

*Hypothesis B (Effort Expectancy): pValue 0.076 = **NULL SUPPORTED***

Rational: 0.076 is greater than 5% (> 0.05) study significance. Fail to reject the NULL hypothesis. Users find apps clear and easy to use, with few complications.

*Hypothesis C (Social Influence): pValue Result 0.228 = **NULL SUPPORTED***

Rational: 0.228 is greater than 5% (> 0.05) study significance. Fail to reject the NULL hypothesis. An Influence from advertising, family and friends encourages the user to use an app.

*Hypothesis D (Hedonic Motivation): pValue 0.067 = **NULL SUPPORTED***

Rational: 0.067 is greater than 5% (> 0.05) study significance. Fail to reject the NULL hypothesis. Smart Device users derive fun and enjoyment from the use of the app.

*Hypothesis E (Price Value): pValue 0.292 = **NULL SUPPORTED***

Rational: 0.292 is greater than 5% (> 0.05) study significance. Fail to reject the NULL hypothesis. Cost and pricing structure has an impact on app download and usage.

*Hypothesis F (Habit): pValue 0.001 = **ALTERNATIVE SUPPORTED***

Rational: 0.001 is less than 5% (< 0.05) study significance. NULL hypothesis was rejected. App usage has not become a habit in the daily life of the user.

TABLE 4.14 - Construct Hypothesis Verification Results

Reference	Construct	Direction	Support
Hypothesis A	Performance Expectancy (PE)	Behavioral Intention	ALTERNATIVE
Hypothesis B	Effort Expectancy (EE)	Behavioral Intention	NULL
Hypothesis C	Social Influence (SI)	Behavioral Intention	NULL
Hypothesis D	Hedonic Motivation (HM)	Behavioral Intention	NULL
Hypothesis E	Price Value (PV)	Behavioral Intention	NULL
Hypothesis F	Habit (HA)	Behavioral Intention	ALTERNATIVE

Hypothesis B, C, D and E pValue results (0.076, 0.228, 0.067 and 0.292) indicated the constructs and Behavioral Intention (BI) had a greater test value (i.e. inside 95% of the curve). This result inferred Effort Expectancy (EE), Social Influence (SI), Hedonic Motivation (HM) and Price Value (PV) **NULL hypotheses statements may be accepted** as valid regarding acceptance and usage of an app.

Hypothesis A and F pValue results (0.034 and 0.001) indicated the constructs and Behavioral Intention had a lower test value (i.e. inside a 0.25% tail of curve). This result inferred that Performance Expectancy (PE) and Habit (HA) **ALTERNATIVE hypotheses statements may be accepted** as valid regarding the acceptance or usage of an app.

Both supported ALTERNATIVE hypotheses A and F (“Android and Blackberry users attain greater benefits from apps than Windows or Blackberry” and “App usage has not become a habit in daily life of the user”) and these are important finds for the study.

Because both PE and HA had shown to have some level of impact, therefore the ALTERNATIVE hypothesis was accepted for both, further investigation was required for each Hypothesis. A Means Test was completed on both to help determine the level of impact on each of the Operating Systems.

Means Tests results indicated for the Performance Expectancy construct, operating systems of Android (*Result 7.0*) and iOS (*Result 7.0*) had a greater level of significance median than both Windows (*Result 6.0*) and Blackberry (*Result 5.0*) type devices. This inferred that users of Android and iOS type Operating Systems had attained potential greater benefits from apps than Windows or Blackberry. For the Habit construct, Android (*Result 6.0*) and iOS (*Result 6.0*) had a greater level of significance median than both Windows (*Result 5.0*) and Blackberry (*Result 5.0*) type devices. This inferred that users of Android and iOS type Operating Systems attained a greater potential level of a habit of each operating system, as compared to the users of Windows and Blackberry.

4.7 Interviews Summary

Each response gathered during the interviews was deemed credible valuable information, for current use or a future study (see Appendix E for Transcriptions Key Points). The top seven response key points per question, relevant to **this** study's concept of App User Acceptance and Usage, are outlined below. Each item is weighted by the researcher (Importance Weight x Relevance Score) to order the key points by study relevance:

General Importance Weight: 1 = Low, 2 = Medium, 3 = High

Actual Relevance Score regarding this Study: 1 = Low, 2 = Medium, 3 = High

Question 1: What do you feel is the future direction of smart device mobile apps that would enhance and provide additional benefits to users at the current quality level?

Performance Expectancy (PE) Comments	Weight	Score	Total
"Huge Phrase of User Adoption and Acceptance"	3	3	9
"Driven by Perceived Perception and Need for an App"	3	2	6
"Should Provide Some Kind of Focus and Service"	3	2	6
"More Use of Inbuilt Features e.g. Motion Sensors"	2	2	4
"Smart Technologies Adaption and Utilisation"	2	2	4
"Better Peripherals Connections and Hardware Usage"	1	2	2
"Use of More Connected Utilities e.g. Thermostat™"	1	1	1

Adoption, Acceptance and Perceived Perceptions were the highest scorings finds for PE.

Question 2: What considerations or design patterns does your company employ to allow users greater ease of use when they are using apps built by your company?

Effort Expectancy (EE) Comments	Weight	Score	Total
"End User Assumptions and Easier Tasks for Completion"	3	3	9
"Keep App Navigation Simple as Possible for Users"	3	2	6
"Watch and Use of Latest UI/UX Recommendations"	3	2	6
"Watch Code Best Practices and Apply Them Frequently"	2	2	4
"Gather Customer Feedback, Validation and Reuse"	2	2	4
"Provide Feeling that App is Doing Something"	2	1	2
"Make them Beautiful So App Users Want to Return"	1	1	1

End User Assumptions with Easier Task Completion and Navigation both topped EE.

Question 3: How much influence do you believe there is to use an app when recommended in magazines, newspapers, online or television?

Social Influence (SI) Comments	Weight	Score	Total
"Rare Direct Downloads From Advertising Performed"	3	3	9
"Huge Social Engagement While Watching TV"	3	3	9
"App Engagement Increases During Ad Breaks (Sports)"	3	2	6
"Pay-Per-Click Advertising Still Present Today in Ireland"	2	2	4
"See That Standard Forms of Advertising Apply"	2	2	4
"Print to Digital Delay Reach Not Immediate in Ireland"	2	1	2
"Difference in Google AdWords and the Other Forms"	1	1	1

One interviewee commented that rarely direct downloads are generated by advertising itself while others believed that apps usage spikes during ad breaks on TV, with the TV providing the Social Influence factor.

One interviewee also comments that 'Pay-Per-Click' revenue is still present for Apps in Ireland. Advertising based business models could succeed and be profitable if the product had an appealing international audience influence.

Question 4: Based on your professional subject knowledge and industry experience, what estimated percentage of fun apps versus functional apps is in place in Ireland today?

Hedonic Motivation (HM) Comments	Weight	Score	Total
"Daily Apps Creation to Meet Consumer Demands"	3	3	9
"For Website Subscriptions, Huge % of Mobile Users"	3	3	9
"For Others, More Desktop Users on B2B side"	2	2	4
"Game App Development is By Dedicated Type House"	2	2	4
"Very Distinct Areas for Fun and Functional App Types"	2	1	2
"Business and Functional Apps Creation Generally"	1	1	1
"Towards Educational Type Fun and Learning Apps"	1	1	1

One interviewee commented that every day, an app is developed to meet a user need such is the power of the App Stores and the current knowledge to create the necessary app.

Another commented that for existing website subscriptions, users have been migrating off of the web onto the smart device, allowing for easier ease of access to necessary content.

Question 5: GAAGO, Sky Go and Youtube have been in the news regarding subscription charging models, by either creating a charging model at launch or by introducing fees after a number of years of the service available. Is this a future viable business model for Irish companies going forward?

Price Value (PV) Comments	Weight	Score	Total
"Business Model is Dependent on Few Different Items"	3	3	9
"Signup and Cancel After Non-Engagement and Usage"	3	3	9
"Yes. Subscription Business Models Tendency"	2	3	6
"In Ireland, Country Inadequate Size to Cover Costs"	2	2	4
"Subscription in Ireland is Difficult Because Small"	2	1	2
"Absolutely No Guarantees for Any Business Model"	1	1	1
"Physiology Improved As Challenges Removed"	1	1	1

One interviewee commented that the Business Model for any App Project has absolutely no guarantees and success depends on a number of factors working together well at the same time.

Another commented that a Subscription based model can be productive, but there is a tendency for certain users to sign-up and cancel later due to lack of activity.

Question 6: As a development company, are there any strategies you can employ to entice the user to use the app automatically, rather than reverting to the desktop?

Habit (HA) Comments	Weight	Score	Total
"Ease of Use Critical to Acceptance For Users to Return"	3	3	9
"Word 'App' to Essentially Mean 'Service' for All"	3	3	9
"Greater Access to Hardware Required e.g. GPS"	2	3	6
"Detection of Device and Usage, Splash Screens"	2	2	4
"Mobile Users Still Experience Input Issues e.g. Dates"	2	2	4
"30% of Our Traffic Volume Still Through Desktops"	1	1	1
"Redesign, Redesign, Redesign for Equal Experience"	1	1	1

One interviewee commented that it is vital that for acceptance of the app, the user finds the app easy to use and comfortable for the task that is required for completion.

Another interviewee commented that the word 'App' will evolve to mean 'service' in the future, for all application types i.e. Desktop App, Native App, Table App or Watch App.

4.8 Survey Summary

The most popular operating system found was Android (52.1%), followed by iOS (40.9%). This was followed by Windows in third (5.4%) and Blackberry in fourth (0.3%). For Males, Android outnumbered iOS (116-75), but for Females, it was evenly split between Males and Females (76-75). The largest age category responses rate was the 31-40 years old category (46.2%), with the second highest the 41-50 years old category (22.4%).

The largest number of apps used in the preceding 7 days per user was the 6-10 apps category (143), with the second largest the 1-5 apps category (106). The category for 1-5 apps was the only category in which Females achieved higher than Males (42-59). Only 35 respondents had used between 16-20 apps in the 7 days preceding and 32 respondents used 21+ apps. Only 12 (3%) had used no apps in the same period. The device is used nearly twice as much for Social (91.6%) and Browse (84.8%) as it is for conducting a Service (44.0%) and completing a transaction (52.1%).

Social Networking for both Male (31.3%) and Female (27.4%) was the number 1 category of download specified (see page 50). Transport and Weather apps received low responses. Additional categories mentioned in the open 'Other' field included: "Gambling", "Email", "Crafts", "Web Development programming", "Mail App", "Logistics", "Pinterest", "Fashion", "Wildlife", "Conservation" and "Sci-fi". For both Males and Females,

Advertising Annoyance was the number 1 annoyance for all respondents (see page 51), at 38.6% and 29.3% respectively. The top annoyance for male users included Apps Performing Slowly (27.0%), followed by Prices (24.7%). Females found Price structures (22.1%) most annoying followed by App Performing Slowly (18.5%). This was the reverse to the findings for males.

On examination of Performance Expectancy, Hypothesis A result indicated that Android and iOS users attain greater benefit from apps than Windows or Blackberry. It was supported by a high response rate of 'Agree/Strongly Agree' (340/394) to "Find apps beneficial in my daily life" and high response rate of 'Agree/Strongly Agree' (304/394) to "Apps enable me to complete tasks faster" (see page 52). Results found high responses for Social Networking, Sports, Entertainment and Maps for Males and high responses for Social Networking, Music, Photos and Entertainment for Females. A total of nearly 34% (33.681) of the variance could be explained by this construct.

On examination of Effort Expectancy, Hypothesis B result indicated that Smart Device users find apps clear and easy to use, with few complications. It was supported by a high response rate of 'Agree/Strongly Agree' (328/394) to "Find apps clear and easy to use".

However, only over half chose 'Agree/Strongly Agree' (200/394) for "Apps are easier to use than the computer". The screen size appeared to be no issue for users as the device screen size was the second lowest response rate for Question 6 responses. The "Easier to Complete on Desktop" was the third lowest response rate, suggesting no issues for users on apps.

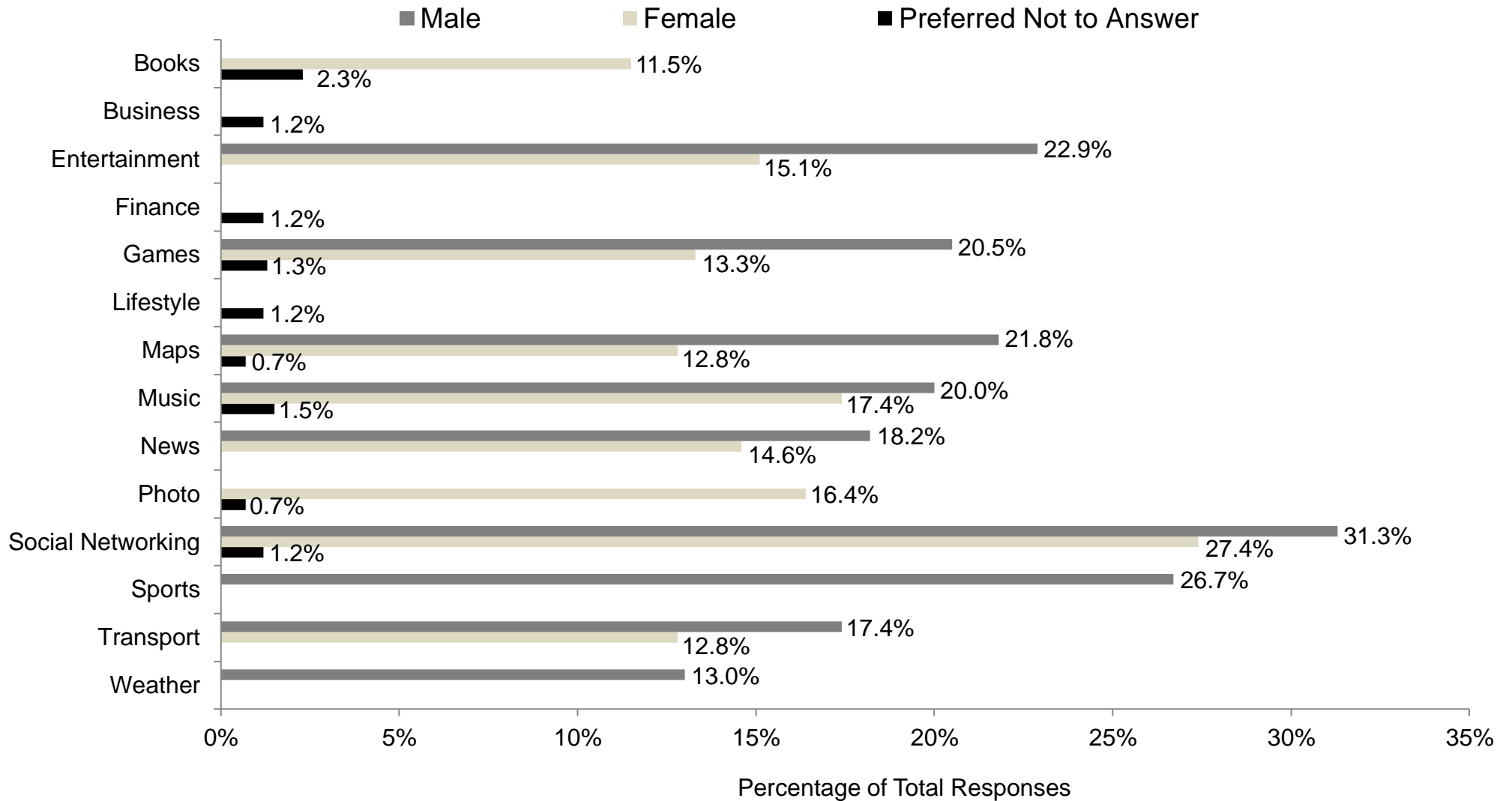
On examination of Social Influence, Hypothesis C result indicated that there is an Influence from advertising, family and friends that encourages the user to use an app. It was supported by a response rate (≈ 1 in 3) of 'Agree/Strongly Agree' (117/394) to "Apps recommended in advertising makes me want to use it" and high response rate of 'Agree/Strongly Agree' (225/394) to "Influence of family and friends makes me use the app". It was further supported as Social Networking for both Male (31.3%) and Female (27.4%) was the number 1 category of download specified. Reviews received the lowest response rate for all Genders, inferring that users paid little attention to bad reviews.

On examination of Hedonic Motivation, Hypothesis D result indicated that Smart Device users derive fun and enjoyment from the use of the app. It was supported by a high response rate of 'Disagree or Strongly Disagree' (310/394) to "Apps are not fun but hard fun" and high response rate of 'Disagree/Strongly Disagree' (206/394) to "Prefer to use apps only for pleasure". Social Networking for both Male (31.3%) and Female (27.4%) was the number 1 category of download specified.

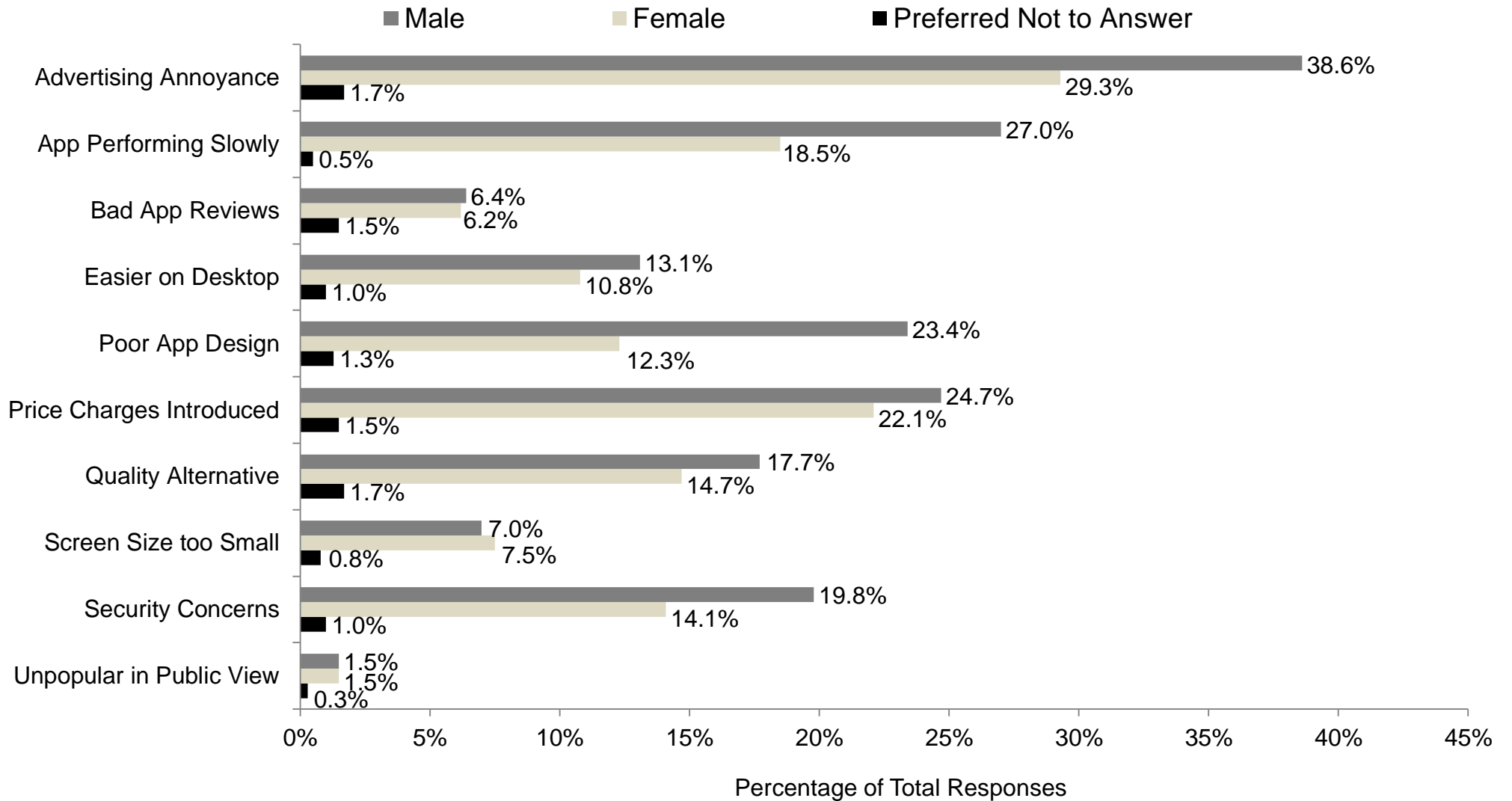
On examination of Price Value, Hypothesis E result indicated Cost and Unit Price do have an impact on app download and usage. It was supported by a high response rate of 'Agree/Strongly Agree' (259/394) to "Would pay a one-time charge for my favourite app, if the price was worth it" and high response rate of 'Agree/Strongly Agree' (179/394) to "Would pay a yearly subscription fee for my favourite app, if the price was worth it". However, high number of responses (259/394) (≈ 2 in 3) Agreed or Strongly Agreed they may be willing to pay a one-time charge and whereas only 179/394 (nearly half) stated they may be willing to pay a yearly subscription if the app provided value for money.

On examination of Habit, Hypothesis F result indicated the use of an app in the user's daily life has not become a habit. This was supported by a just under half response rate of 'Agree/Strongly Agree' (185/394) (≈ 1 in 2) to "Automatically think of using an app rather than a desktop to perform a task". However, it was challenged by a higher response rate of 'Agree/Strongly Agree' (300/394) to "The use of an app in my daily life has become a habit". The results for this construct may vary due to the user question interpretation. Chi-Square test 4 returned a result of 0.002, less than the 5% (< 0.05) study level and it could be argued that a relationship between Gender and Behavioral Intention existed.

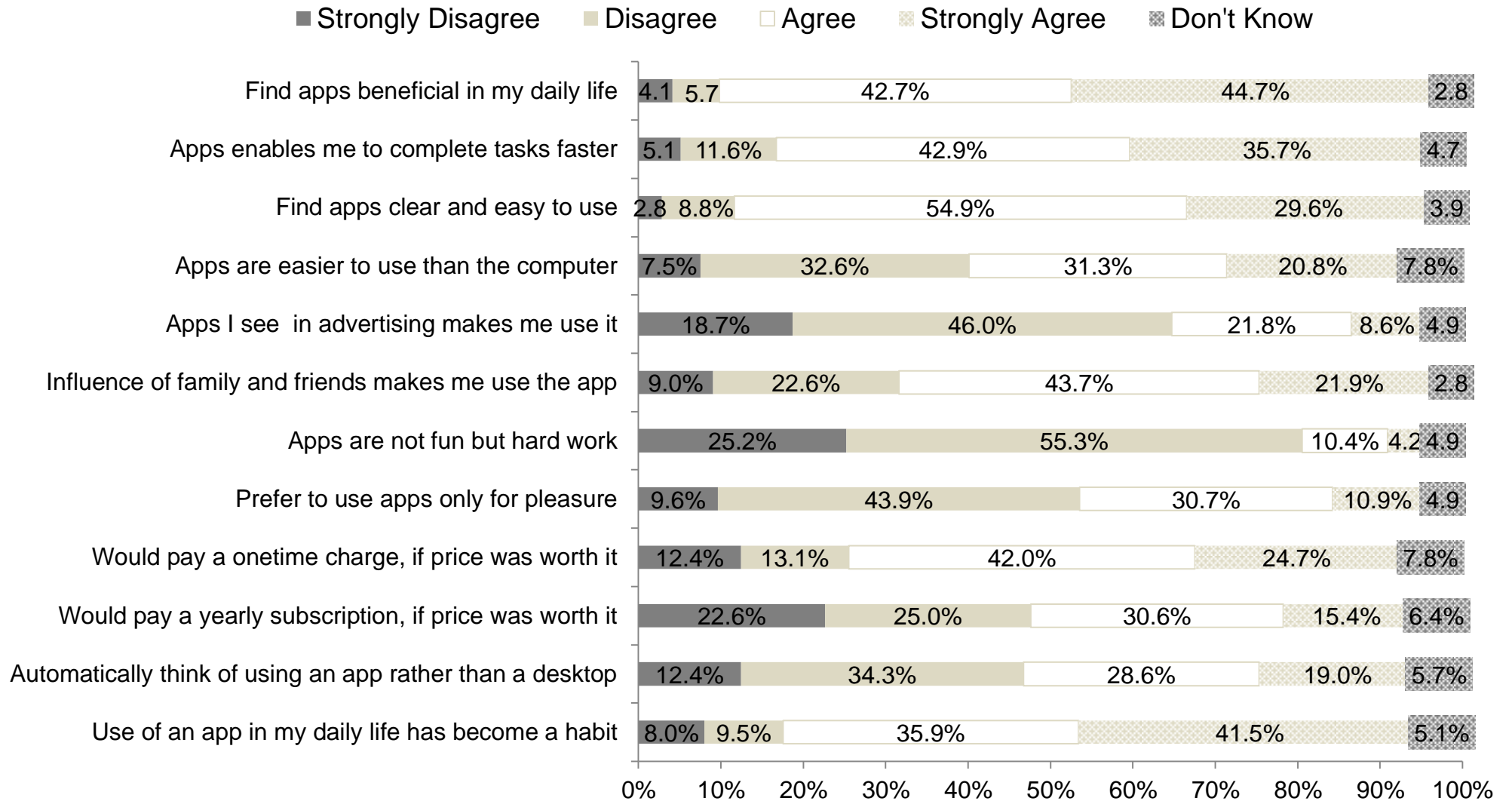
Survey Question 5 Analysis: Top 10 Most Frequently Downloaded Categories Bar Chart (Multiple Choice Type Question)



Survey Question 6 Analysis: App Usage Discontinuation Bar Chart (Multiple Choice Type Question)



Survey Question 7 Analysis: Ratings of User Acceptance Bar Chart (% of Total)



5 CONCLUSIONS AND FUTURE WORK

5.1 Introduction

With ubiquitous app availability for Ireland, this study examines user acceptance and usage of Smart device apps for users over 18 years of age. The purpose was to gain an understanding regarding the impact (if any and to what level) apps has in the context of Irish daily life in 2015. The results show high levels of acceptance for apps and usage is frequent within Ireland. The highest usage for the sample population found in the study in the 7 days preceding was 6-10 apps (Figure 5.1 below).

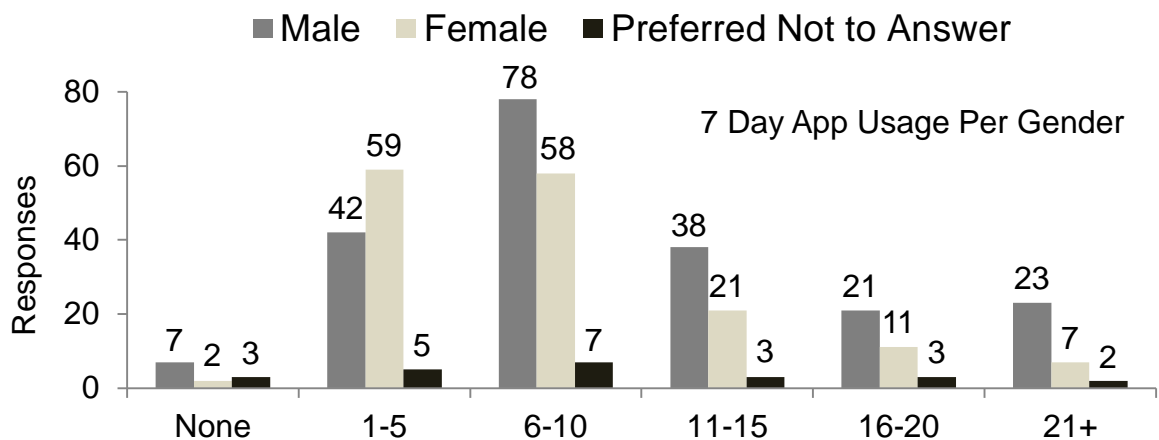


FIGURE 5.1 - Apps Used in the Preceding 7 Days Clustered Bar Chart

But study results highlight challenges remain to be resolved, however, such as achieving in-app advertising balance (revenue versus user tolerance) and performance, to achieve greater acceptance levels in Ireland. The results show high levels of usage exist for Social Networking, but not for meticulous tasks or product purchases. In this chapter, findings of each previously outlined Sub-Research Question will be discussed. Sample Calculations that was used for the study are explained. Limitations, challenges and possible future research proposals are also examined. The chapter concludes by attempting to answer the Research Question (RQ): *Is Ireland Embracing the Mobile Application Paradigm Shift?*

5.2 New and Interesting Findings

This section examines new findings for the Research Sub-Questions:

Sub RQ 1: What are the Operating Systems of Choice for Smart Devices in Ireland?

In the study, the top Operating Systems in Ireland were found to be: 1. Android 2. iOS 3. Windows 4. Blackberry. This order of Operating System hierarchy was identical to what had been suggested by Statista for the Operating System hierarchy globally for 2014.

Sub RQ 2: What is the App Access Rate in Ireland for the Preceding 7 Days?

O'Leary (2014) suggested 76% of Irish adults utilise apps regularly. In this study, the results show a high number (378/390) who accessed an app in the 7 days preceding. This response rate would give an app interaction rate of $\approx 97\%$ for all age groups in this study.

Sub RQ 3: Which Interactions are performed using Apps in Ireland?

The results show a high percentage of usage and acceptance exists in Ireland at $\approx 97\%$. The results also show product browsing (non-purchases) accounts for 85%. The 2014 Irish Digital Consumer Report suggested 58% attain information on the Smart device app but complete the transaction on an alternative solution, e.g. desktop (O'Leary 2014).

In this study, 52% of respondents booked and completed a payment transaction using an app. As only 52% of users use an app to book, confirm and pay for the product or service, this would imply 48% of respondents who had taken the study survey may not have accepted in-app purchasing using Smart Device apps. The findings suggest the challenge of moving the consumer to in-app purchases still exists in Ireland today, as some consumers continue to shy away from deeper app associations and cognitive reasoning.

Sub RQ 4: What are the Most Frequently Downloaded App Categories in Ireland?

The study on App Store ratings by Pagano and Maalej (2003) found Social Networking had received the greatest number of user reviews and comments. In this study, 12 years after the 2003 study, Social Networking category still outnumbered all other categories. SNS received a response rate of 31% for Males (next closest category Sports 27%) and 27% for Females (next closest category Music 17%). User accounts driven companies, such as Google, Facebook, Twitter and LinkedIn, evolve to keep users from switching to a rival, but ultimately depend on groups of global unearthing's to maintain growing footprints of new user activation accounts.

Sub RQ 5: What are the Top Deterrents of Continued Use for an App in Ireland?

O'Leary (2014) found Banner Ads the most annoying ad format in Ireland with 61% reporting them as annoying. A large top banner ad may be appropriate on a web page but may cause user annoyance if the ad covers a majority of the allocated display on an app. In this study, both Males (39%) and Females (29%) concluded 'Advertising Annoyance' as the top annoyance and justification to discontinue the use of an app. Available free apps are open to the mercy of the provider regarding in-app advertising. Users may anticipate some level of in-app advertising inconvenience within the free version. Even still, free apps are anticipated to be 93% of global downloads in 2015 (Gartner Inc. 2013).

Sub RQ 6: What Types of Charges are App Users in Ireland Willing to Pay?

In this study, results show users are willing to pay a one-time charge (259/394) or a yearly subscription for an app (179/394). By the nature of the internet, free is always a popular choice. Users may be hesitant to pay for an app, that might be used infrequently and not see a value for money if charged a fee if a free satisfactory alternative exists.

Consumers 'willingness to pay' (WTP) and the combination of quality apps on App Stores offer a greater varied selection of app choice. The business must ascertain Return of Investment (ROI) and Total Cost Ownership (TCO) for each development. Interviewees acknowledged that to have a successful app and generate revenue, the app must be an international seller, as the market in Ireland can be too small to cover all associated costs. Interviews also acknowledged "Subscription in Ireland is a Difficult Market" with "Absolutely No Guarantees for Business Model". Therefore, with a plethora of models, platforms, screen sizes and resolutions, challenges exist for app teams to ensure that each app is compatible with the recommended platform while ultimately enabling the user to get the required task completed, especially if charged a price.

Any charging mode (one-time or subscription) must be appropriate to the app. But user trust is also required. Online payment processing companies such as PayPal Inc. (United States, formed 1997) and Realex Payments (Ireland, formed 2000) have only existed for a short number of years in a technological perspective. Therefore, consumers may still be hesitant regarding mobile payment adoption and the handover of personal details. Interestingly, Ghose and Fellow (2014) found apps that contained an in-app purchase option, demand for downloads improved while apps that contained in-app advertisement option, demand for downloads declined. This finding complements previous research by O'Leary (2014) regarding low response interaction (only 22%) for app ads in Ireland.

Ghose and Fellow (2014) also opened a contradictory argument for the inclusion of in-app advertisements, in that not every size fits all. Ghose and Fellow confirmed larger revenues may still be maintained with the inclusion of good placement of in-app advertising, even with the expected loss of certain users.

Sub RQ 7: Does Social Influence and Habit Exist for App Users in Ireland?

In this study, results show Advertising and Viral Marketing to be some influence (117/394). Influence by family or friends results (225/394) accounted for nearly twice that figure. Both types may be a powerful influence, positively and negatively, as users determine the next app to download. Ahmet and Mattila (2011) highlighted the so-called 'viral message' is likely to spread quicker and wider to consumer acquaintances.

Influence to use apps today may also come from companies, who wish to encourage existing and potential product purchases by providing easy apps for flights, reservations, tickets, taxis, and food. Hence, interviews acknowledged “Huge Social Engagement While Watching TV”, as well as “App Engagement Increases during Ad Breaks (e.g., Sports)” for tailored product placements. Although, another interviewee commented that direct downloads related from such advertising placements are “Rare and Unlikely” and have no substantial impact. Interviews also acknowledged to entice the use of an app to become a habit many challenges must be resolved beforehand. Interviewees confirmed “Users Still Experience Input Issues” and must go through phases of “Redesign, Redesign, and Redesign” to improve overall quality. These phases of growth facilitate better “Ease of Use” each time and helps maintain continued satisfied use.

But results in this study did not indicate in-app purchasing is a habit while engaging with family and friends on SNS’s is commonplace in many Irish lives. Photos, messages, and social engagement may be presently faster than ever envisioned. Just under half of the respondents (185/394) confirm they automatically think of using an app when a task is required. Nearly three-quarters (300/394) believe that the use of a certain app is a habit in their daily lives.

Sub RQ 8: Does User Acceptance Challenges Exist for App Users in Ireland?

The study results show ‘App Performing Slowly’ was the second largest discouragement for Male (27%) and for Female third (18%). Both groups acknowledge In-app advertising as the top discouragement and, therefore, a challenge exists for companies to find the correct balance for ad placement (revenue versus user tolerance). Zakas (2013) and Harrison (2013) warned app innovation may be decreased by slow CPU’s, internal scripts, memory and power consumption on devices. During this study, responses highlight that such issues still exist today and discourage users from future use. The potential issue of a small screen size did not show to have a negative impact for respondents. Only a small percentage of Males (7%) and Females (8%) indicated screen size was an issue.

However, some prior investigation (e.g. mobile analytics) to acquire an understanding of the target market may prove invaluable for User Acceptance. Smart device screens provide the ability to ‘Pan, Zoom and Rotate’ to allow avoidance of some annoyance and extra comfort when working with meticulous on-screen items. The study interviewees of the Irish App Development companies stress to use the “Latest UI/UX Recommendations, Best Practices, Navigation but Keep the App Simple as Possible”. The companies follow the latest published guidelines to ensure apps are constantly up to date, with code enhancements, bug fixes, and improved security.

New External Findings for the Research Sub-Questions...

In March 2015, press details were released that the national public broadcaster of Ireland, Raidió Teilifís Éireann (RTÉ), was launching a new online digital service aimed at international audiences. The RTÉ Player International app, launched on iOS first, provides nearly 500 hours of Irish free-to-air and subscription based television (RTÉ 2015).

In April 2015, BBC Technology reported Android had developed a tool called Arc Welder. Google told BBC the wrapper type tool allowed Android apps to be run on various Operating Systems, such as Windows and Linux (BBC Technology 2015a). This may indicate the start of cross-platform tools to allow apps to be able to run on full operating systems, such as Windows 10 by Microsoft or Ubuntu by Linux.

In May 2015, the Financial Times reported new ad-blocking software for apps was pre-production ready. The company, based in Israel, informed the Financial Times newsgroup the software had been successfully tested and had been accepted by a number of operators. The software can be installed directly onto the network (Financial Times 2015).

5.3 Research Sub-Questions Implications for Ireland

Mobile carriers in Ireland, such as Vodafone, Three and Meteor, allow adequate 4G data plan allocations for Smart device users. In this study, results show the top Smart devices OS in Ireland are Android and iOS, accounting for 93% of the sample population. Therefore, the average Irish user appears to have the necessary tools required as the results show in this study app usage levels remain high in Ireland.

But trust is a factor to the Irish consumer when in-app purchasing is available. The high response study results show an app interaction rate of $\approx 97\%$ in this study for all age groups, yet this percentage falls to 52% who have actually booked and completed a payment transaction using an app. The Irish app users may be wary when asked to provide important personal details like bank card numbers. Kumar and Mukherjee (2013) acknowledged retailers perceive a value of allowing the consumer to purchase in a secure well-built app. But the consumer must trust that the app is a secure real well-built app, to part with such personal details. A charging model employed by some Irish companies, e.g. Sky Ireland, is to charge a standard bundled service e.g. Phone/TV, Broadband and Secured App. Box Office events may be purchased directly from the app (Sky Ireland 2015). Sky Ireland announced in July 2015, it was experiencing its best growth in 11 years. Both Sky and Google Play, trusted brands in the Irish market, maintain user bank card details for future purchases. Yet, both maintain a large presence within the population of Ireland.

5.4 Sample Calculations and Generalisability

Population figures for the study were gathered from the last Central Statistics Office (CSO) Census Survey of 2011, namely the 'Census 2011 Ireland and Northern Ireland'. The population (in 1000s), as outlined in the 2011 census, for the island of Ireland was 6,403, with 4,588 (72%) in the Republic of Ireland and 1,814 (28%) in Northern Ireland (Census 2011a, p. 9). Figures were taken from the CSO and were freely accessible.

The figures from the Central Statistics Office for the 2011 Census did not match 100% with the study requirements (e.g. census included 15-17 Years of Age). Therefore, minor adjustments were required to the CSO census figures to achieve the correct population representational figures required for this study.

This study used a stratified sampling approach, as reflected by Saunders (2012).

TABLE 5.1 - Census 2011 Republic of Ireland Population (Census 2011b)

Population	Age Bracket	Males	Females
*Males = 144,262 (all 15-19 year old males) Study Estimation = 57,704.8 ((144262 / 5) * 2) Hence, 57,704.8 ≈ 57,705 (18 and 19 Years of Age)	18-19 Years	57,705*	55,503*
	20-24 Years	146,636	150,595
	25-29 Years	173,714	187,408
	30-34 Years	194,774	199,171
	35-39 Years	182,237	182,024
*Females = 138,757 (all 15-19 year old females) Study Estimation = 55,502.08 ((138757 / 5) * 2) Hence, 55,502.08 ≈ 55,503 (18 and 19 Years of Age)	40-44 Years	166,330	164,482
	45-49 Years	151,516	153,669
	50-54 Years	136,737	137,649
	55-59 Years	122,121	122,401
	60-64 Years	109,869	108,917
	65-69 Years	86,298	87,340
	70-74 Years	63,476	67,714
	75-79 Years	46,631	55,405
Totals		1,580,339	1,616,715

NOTE: *Denotes Adjusted Figures in Population Table

Study Sampling Frame (Population): 3,197,054 (1,580,339 + 1,616,715)

Study Sampling Criteria: Resident of the Republic of Ireland, 18-80 Years of Age

The 95% Confidence Level provides a 5% (i.e. ± 5 percent) margin of error. A margin of error must be considered and expected to allow for inaccuracies and user error.

Saunders et al. (2012, p. 266) outlined that the sample figure for sizes of a population $> 1,000,000$ and $< 10,000,000$, **384** respondents were required for the sample size to be statistically significant (i.e. probable) for the study.

The 384 figure can be re-verified using Cochran's (1963, p. 75) original mathematical quotation that was developed to yield a representative for sample proportions (Israel 2013):

$$n_0 = Z^2 pq / e^2$$

A worked example of Cochran's (1963, p. 75) original mathematical quotation above using a 5% precision level and 5% significance level (Israel 2013, p. 3) can be shown as:

$$\begin{aligned} & ((1.96)^2 \times 0.5(0.5)) / (0.05)^2 \\ & (3.8416 \times 0.25) / 0.0025 \\ & 0.9604 / 0.0025 \\ & = 384.16 \end{aligned}$$

Hence, $384.16 \approx 384$ Questionnaire respondents were required for study significance.

A total of **394** people completed the survey submission satisfactorily so the recommended minimum of **384** survey respondents was surpassed for this study.

Saunders (2012) highlights Generalisability can be referred to as 'external validity'. This study is not claiming the outlined theory, results or conclusions can be generalised to all populations and studies. Any future undertaking must be considered individually to ensure the appropriateness of the chosen methodology for any newly conducted study.

The study participant response size with verified valid data was higher than the 384 required participants and, therefore, could be considered representative of the Republic of Ireland as of 2015.

Communication work with friends, family and connections was required to be able to adequately represent the required population sample size for the people of Ireland.

5.5 Limitations, Challenges and Lessons

Limitations of the study:

- *Time constraints to make sure that the study was adhered to deadline*
- *A longitudinal study may have revealed more detailed results over a longer time period*
- *To allow for examination of the integrated model as originally examined by Venkatesh et al. (2012), a greater in-depth survey and time allocation would have been required*
- *App usage and development is quite a recent innovation, so the discovery of relevant information studies relating to apps for the last three years was limited for Ireland*

Challenges of the study:

- *The waiting of the ethical approval by the Trinity Committee was a foreseen limitation and therefore, the structure of the work was designed with this in mind to allow other work items to continue during the approval waiting period*
- *Initially, the idea was to survey the researcher's place of employment. This request was rejected by the corporation, as it may result in productivity loss for the duration of the survey for participants, so a directional change to Social Networking Sites (SNSs) was enforced*

5.6 Possible Future Research Proposals

- *Explore BYOD 2.0 Smart Device utilization as educational institutions trail the moving to tablet and removal of printed material in the Irish educational system*
- *Re-examine the same study using the proposed 2016 Central Statistics Office Census population figures for the Republic of Ireland at that stage, to ascertain if app usage and acceptance have increased further in 2016/2017*
- *Examine the role of Application Programming Interfaces (APIs) in Apps for improved user interaction, data capture and cross-platform support functionality*
- *Conduct Further Research into Augmented Reality for apps, including products such as holographic helmet and Cortana (Voice Controlled Assistant) in Windows 10 (Released 29th July 2015) (Microsoft 2015)*
- *Conduct a longitudinal type investigation on emerging new web technologies for Smart devices for in-depth understanding regarding apps*
- *Examine how the Gartner Inc. Hype Cycle, that tracks rising and failing technologies, has evolved to encompass apps from the basic 2005 model to the 2015 model*
- *Study the economic worth of Apps to Ireland as the App based transportation company Uber announces 150 new permanent positions for Ireland in August 2015 (RTÉ News 2015)*

5.7 Conclusion

This study examined app usage and user acceptance within Ireland for users over 18 years of age. Areas examined included: Application Stores, Ecosystem Challenges, M-Commerce Diffusion, Monetization Opportunities, Theoretical Acceptance Concepts, Theoretical Models and User Acceptance. A consumer-focused acceptance model was utilised to examine user acceptance and usage in the context of Irish app users today. The consumer-focused model was used as the driving engine throughout the study, to help steer the investigation and draw necessary conclusions, with the use of Interviews and Survey. Six constructs of the original seven were examined within the study. The construct of Facilitating Conditions was not examined as that construct explores the use of the system from both organisational and infrastructure support considerations and time would not have permitted such an undertaking. The 2012 UTAUT (Venkatesh 2012) version included new consumer specific constructs that were added to the original 2003 version. Additions of Hedonic Motivation (HM), Price Value (PV) and Habit (HA) facilitate examination regarding consumer intention and behaviour.

Completed results for the Study Hypotheses tests (see Section 3.5) may be shown as:

Performance Expectancy (PE)	Android and iOS users attain greater benefits from apps than Windows or Blackberry
Effort Expectancy (EE)	Smart Device users find apps clear and easy to use, with few complications
Social Influence (SI)	Influence from advertising, family and friends encourages the user to use an app
Hedonic Motivation (HM)	Smart Device users derive fun and enjoyment from the use of the app
Price Value (PV)	Cost and pricing structure has an impact on app download and usage
Habit (HA)	App usage has not become a habit in daily life of the user

FIGURE 5.2 - Study Hypotheses Findings

Research Question (RQ): *Is Ireland Embracing the Mobile Application Paradigm Shift?*

YES...Ireland appears to be Embracing the Mobile Application Paradigm Shift

BUT... while frequent app usage levels are high, obstacles permitting increased levels of usage and acceptance remain for apps that are available to the Irish population.

The results show a high percentage of usage and acceptance exists in Ireland at 97%. They also show 85% of respondents use apps for product browsing, but only 52% perform meticulous tasks or in-app purchases using apps. The popular Social Networking Sites (SNS) category outnumbered all other categories. Therefore, high influence from trusted sources (e.g. family or friends) may be necessary for superior user adoption as suggested by Ahmet and Mattila (2011).

Bandura's Social Cognitive Theory (1977, 1986) maintains that humans observe, learn and adapt for the future from the teaching of others. But if some users in Ireland are not performing tasks as habits such as in-app purchasing, then fewer 'knowledge sharers or trusted sources' exist to pass on teachings. Although, Hofstede (1980) believed that some items may never be fully accepted by certain societies, due to the cultural fabric of each.

With a population in the Republic of Ireland of circa 4.6 million (CENSUS 2011b), with online (and offline) capabilities for the potential market, the Irish consumer base for app usage could be positive. But as the interviews indicated, the Irish market alone may not be enough for adequate returns for maximised profits for self-sustained purchased apps. Performance issues and in-app advertising appear to be a hindrance, as completion rates for meticulous tasks are not as high for apps. The desktop provides fewer such interruptions. Joseph Schumpeter's (1936) ideology, not too dissimilar to Smith (1776), theorised the basic economy blueprint may be thought of as a steady circular flow. Disruptive influences can interrupt this steady flow and unbalance the natural equilibrium, creating innovation and economic growth (Schumpeter 1936). Kuhn (1962) theorised acceptance of a new paradigm can occur to resolve fluctuations in the market by the introduction of the new phenomenon or innovation, and hence, lead back to market stability. With the EU announcement of Open Access Internet changes, superior fibre broadband rollout and wireless access targets, as well as data roaming charges elimination by June 2017 (EU COMMISSION 2015), the app phenomenon could heighten again. Greater innovation, markets and knowledge sharing opportunities for Ireland, as described by Schumpeter, Kuhn and Bandura, may be close. But technological challenges and payment trust hesitations must be overcome by the Irish Government and Industry working in tandem to provide trust to the users in this new era of mobility.

References

ABI RESEARCH (2011)

'Is Your Mobile Application Ready For Business?' ABI Research 2011. [Online] Available at: <http://www.keynotedeviceanywhere.com/userfiles/file/DeviceAnywhere%20WP%20-%20Final%20Format.pdf> (Accessed: 26 October 2014)

ABOLFAZLI, SAEID ET AL. (2013)

'Rich Mobile Applications: Genesis, taxonomy, and open issues', *Journal of Network and Computer Applications* 40 (2014) pp. 345-362

ABOLFAZLI, SAEID ET AL. (2014)

'Cloud-Based Augmentation for Mobile Devices: Motivation, Taxonomies, and Open Challenges', *IEEE Communication Surveys & Tutorials*, Vol. 16, No. 1. pp. 337-368

AHMET, ZEYNEP and MATTILA, KAISA VÄÄNÄNEN-VAINIO (2011)

'Face to Face Makes a Difference – Recommendation Practices of Users of Mobile Services', ISBN-13: 978-1-4503-0924-0, pp. 25-28

AJZEN, ICEK (1991)

'The Theory of Planned Behavior', University of Massachusetts at Amherst. *Organizational Behavior and Human Decision Processes* 50, pp. 179-211 (1991)

ALKHUNAIZAN, ABDULMOHSIN and LOVE, STEVE (2012)

'What drives mobile commerce? An empirical evaluation of the revised UTAUT model', *International Journal of Management and Marketing Academy*, Vol. 2, No. 1, pp. 82-99

ANDERSON, JANNA and RAINEE, LEE (2014)

'Digital Life in 2025', [Online] Available at: <http://www.pewinternet.org/2014/03/11/digital-life-in-2025/> (Accessed: 13 January 2015)

APPFLOOD (2013)

'40 iOS and Android mobile monetization strategies for app developers', 2013 PapayaMobile [Online] Available at: <http://appflood.com/blog/40-ios-and-android-mobile-monetization-strategies-for-app-developers> (Accessed: 1 April 2015)

ARHIPAINEN, LEENA and TÄHTI, MARIKA (2003)

'Empirical Evaluation of User Experience in Two Adaptive Mobile Application Prototypes', Proceedings of the 2nd international conference on mobile and ubiquitous multimedia. 2003. pp. 27-34

ARMITAGE, CHRISTOPHER and CONNER, MARK (2001)

'Efficacy of the Theory of Planned Behaviour: A meta-analytic review', *British Journal of Social Psychology* (2001), 40, pp. 471-499

BAGOZZI, RICHARD P. (2007)

'The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift', *Journal of the Association for IS*. Volume 8, Issue 4, Article 7, pp. 244-254, April 2007, University of Michigan, US

BALL (2015)

'1980-2012 – A 30+ Year Timeline of Technology Innovation', [Online] Available at:

http://www.corbinball.com/articles_technology/index.cfm?fuseaction=cor_av&artID=8878

(Accessed: 19 February 2015)

BALTAR, FABIOLA and BRUNET, IGNASI (2012)

'Social research 2.0: virtual snowball sampling method using Facebook', *Internet Research*, Vol. 22 Iss 1 pp. 57-74

BANDURA, ALBERT (1977)

'Self-Efficacy - Toward a Unifying Theory of Behavioral Change',

Psychological Review Journal. Volume: 84 Issue: 2 Pages: pp. 191-215

BANDURA, ALBERT (1993)

'Perceived Self-Efficacy in Cognitive Development and Functioning',

Educational Psychologist Journal. Volume: 28 Issue: 2 Pages: pp. 117-148.

BASKERVILLE, RICHARD and MYERS, MICHAEL D. (2004)

'Special Issue on Action Research in Information Systems: Making IS Research Relevant To Practice', *MIS Quarterly*. 28 (3), pp. 329-335

BAZELEY, PAT (2002)

'Issues in Mixing Qualitative and Quantitative Approaches to Research', 2002. Published

In: *Applying qualitative methods to marketing management research*. pp. 141-156

BBC TECHNOLOGY (2015a)

'Android apps to run on Windows, Macs and Linux', BBC News 2015, April 2015. [Online]

Available at: <http://www.bbc.com/news/technology-32160263> (Accessed: 2 April 2015)

BBC TECHNOLOGY (2015b)

'Will mobile firms really block ads?' BBC News 2015. May 2015. [Online] Available at:

<http://www.bbc.com/news/technology-32752437> (Accessed: 16 May 2015)

BINVISIONS (2015)

'List of Tablet and Smartphone Resolutions and Screen Sizes', [Online] Available at:

<http://www.binvisions.com/articles/tablet-smartphone-resolutions-screen-size-list/>

(Accessed: 13 February 2015)

BLAXTER, LORAIN ET AL. (2006)

'How To Research', 4th ed. Maidenhead: McGraw-Hill ed. ISBN-13: 978-03-3523-867-5

BONET, ÁNGEL (2013)

'Ubernet, the new internet in 2025', [Online] Available at:

<http://www.indracompany.com/en/sostenibilidad-e-innovacion/neo/blog/articulo/ubernet-new-internet-2025> (Accessed: 10 February 2015)

BRENNAN, DAVINIA (2014)

'Developing mobile apps, how to be privacy savvy', A&L Goodbody [Online]. Available at:

<http://www.algoodbody.com/media/Developingmobileappshowtobeprivacysavvy1.pdf>

(Accessed: 2 February 2014)

BRESNAHAN, TIMOTHY F. ET AL. (2013)

'Economic Value Creation in Mobile Applications', Stanford University and INSEAD

BRYMAN, ALAN (2006)

'Integrating Quantitative and Qualitative Research: How Is It Done?' SAGE Publications Ltd. University of Leicester, Qualitative Research. Vol. 6(1) pp. 97-113

BUSINESS INSIDER (2014)

'Hackers Access At Least 100,000 Snapchat Photos', 2014 James Cook. [Online] Available at: <http://uk.businessinsider.com/snapchat-hacked-the-snappening-2014-10?r=US>
(Accessed: 12 April 2015)

BUSKIRK, TRENT D. and ANDRUS CHARLES H. (2014)

'Field Methods', *Sage Publications Ltd*, Vol. 26(4) pp. 322-342

CASTRO, DANIEL ET AL. (2010)

'Embracing the Self-serve Economy', The Information Technology & Innovation Foundation (ITIF), April 2010. [Online] Available at: <http://www.itif.org/files/2010-self-service-economy.pdf> (Accessed: 19 November 2014)

CENSUS (2011a)

'Census 2011 Ireland and Northern Ireland', Published by the Central Statistics Office and the Northern Ireland Statistics & Research Agency. [Online] Available at: <http://www.cso.ie/en/media/csoie/census/documents/north-south-spreadsheets/Census2011IrelandandNorthernIrelandwebversion2.pdf>
(Accessed: 27 November 2014)

CENSUS (2011b)

'CD204: Population by Age Group, Sex, Province County or City and Census Year', Published by the Central Statistics Office and the Northern Ireland Statistics & Research Agency [Online] Available at: <http://www.cso.ie/px/pxeirestat/Statire/SelectVarVal/Define.asp?maintable=CD204&PLanguage=0> (Accessed: 08 January 2015)

CENSUS (2011c)

'Population by Sex and Census Year Quick Table', Population 1901-2011. Published by the Central Statistics Office and the Northern Ireland Statistics & Research Agency [Online] Available at: <http://www.cso.ie/multiquicktables/quickTables.aspx?id=cna13>
(Accessed: 08 January 2015)

CHAE, M. and KIM, J. (2004)

'An Empirical Study of the Effects of Screen Size, Information Structure, and Task Complexity on User Activities with Standard Web Phones', [Online] Available at: http://www.researchgate.net/publication/220208675_Do_size_and_structure_matter_to_mobile_users_An_empirical_study_of_the_effects_of_screen_size_information_structure_and_task_complexity_on_user_activities_with_standard_web_phones (Accessed: 26 September 2014)

CHARMAZ, KATHY (2006)

'Constructing Grounded Theory: A Practical Guide through Qualitative Analysis (Introducing Qualitative Methods series)', SAGE Publications Ltd. ISBN-10: 07-619-7353-2
ISBN-13: 978-07-6197-353-9

CHEN, MINDER ET AL. (1990)

'Systems Development in Information Systems Research', *Journal of Management Information Systems* Winter IEEE 1990-91, Vol. 7, No. 3, pp. 89-106.

CLARKE, R. J. (2005)

'Research Methodologies', HDR Seminar Series - Commerce. [Online] Available at: http://business.uow.edu.au/content/groups/public/@web/@commerce/documents/doc/uow_012042.pdf (Accessed: 26 September 2014)

COCHRAN, WILLIAM G. (1963)

'Sampling Techniques', 2nd ed. John Wiley & Sons, Inc. New York. 1953-1963.
ISBN-13: 978-04-7116-238-4 ISBN-10: 04-711-6238-8

COGLAN, DAVID and BRANNICK, TERESA (2010)

'Doing Action Research in Your Own Organization', 3rd ed. SAGE Publications Ltd.
ISBN-13: 978-18-4860-215-1

COMSCORE (2014)

'Understanding the Mobile Consumer: Insights into Ireland's Mobile Media Usage', November 4, 2014. [Online] Available at: <http://www.comscore.com/Insights/Presentations-and-Whitepapers/2014/Understanding-the-Mobile-Consumer> (Accessed: 6 February 2015)

CRESWELL, JOHN W. (2008)

'Research Design: Qualitative, Quantitative and Mixed Method Approaches', 3rd ed. SAGE Publications Ltd. ISBN-13: 978-14-1296-556-9 ISBN-10: 14-129-6556-X

CUADRADO, FÉLIX AND DUEÑAS, JUAN C. (2012)

'Mobile Application Stores: Success Factors, Existing Approaches, and Future Developments', *IEEE Communications Magazine* November 2012. pp. 160-167

CURRAN, MICHAEL ET AL. (2015)

'Mobile App Stores', Letterkenny Institute of Technology (LYIT), Ireland. IGI Global Publishing. pp. 262-268

DAVIS, FRED D. (1989)

'Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology', *MIS Quarterly*, September, pp. 319-340

DAVIS, FRED D. ET AL. (1989)

'User acceptance of computer technology: a comparison of two theoretical models', *Management Science* 35 (8) (1989) pp. 982-1003.

DE VILLIERS, RUTH M. (2005)

'Interpretive Research Models for Informatics: Action Research, Grounded Theory, and the Family of Design – and Development Research', (2005) 10-52 ISSN 1023-1757

DEHLINGER, JOSH and DIXON, JEREMY (2013)

'Mobile Application Software Engineering: Challenges and Research Directions',
Department of Computer and Information Sciences, Towson University, Maryland, US

DEMIRCI, AHMET EMRE and ERSOY, NEZIHE FIGEN (2008)

'Technology Readiness for Innovative High-Tech Products: How
Consumers Perceive and Adopt New Technologies', Anadolu University, Turkey

DEN HAAN (2009)

'An Enterprise Ontology based approach to Model-Driven Engineering', 2009. Faculty
EEMCS, Delft University of Technology. Available Online at: <http://www.ewi.tudelft.nl>

DICKSON, JARED (2013)

'Xamarin Mobile Development', (2013). Technical Library. Paper 167. [Online] Available at:
<http://scholarworks.gvsu.edu/cistechlib/167>

DILLON, ANDREW and MORRIS, MICHAEL G. (1996)

'User acceptance of new information technology: theories and models', M. Williams (ed.)
Annual Review of Information Science and Technology, Vol. 31, Medford NJ, pp. 3-32

DOBROW, ROBERT P. (2013)

'Probability: with Applications and R', 1st ed. Wiley-Blackwell.
ISBN-13: 978-11-1824-125-7 ISBN-10: 11-182-4125-8

ENIS, MATT (2012)

'Mobile Evolution', *Library Journal*, February 1, 2013. <http://www.libraryjournal.com>
pp. 34-36. Media Source, Inc.

EU COMMISSION (2013a)

'EU plans to end mobile phone roaming charges', 16th September 2013. [Online] Available
at: http://ec.europa.eu/news/science/130916_en.htm (Accessed: 22 December 2014)

EU COMMISSION (2014)

'Horizon 2020 - EU Research and Innovation Programme', European Commission. [Online]
Available at: <http://ec.europa.eu/programmes/horizon2020/> (Accessed: 09 November 2014)

EU COMMISSION (2015)

'Roaming charges and open Internet: questions and answers', European Commission.
[Online] Available at: http://europa.eu/rapid/press-release_MEMO-15-5275_en.htm
(Accessed: 01 July 2015)

FISHBEIN, MARTIN ET AL. (1977)

'Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research',
Penn State University Press. Vol. 10, No. 2 (Spring, 1977), pp. 130-132

FORBES (2015)

'5 Consumer Trends that Change Work and Mobile', March 25, 2015. [Online] Available at:
<http://www.forbes.com/sites/maribellopez/2015/03/25/5-consumer-trends-that-change-work-and-mobile/> (Accessed: 26 April 2015)

FORRESTER RESEARCH (2015)

'2015 Mobile App Marketing Trends', January 30, 2015. [Online] Available at:
<https://www.forrester.com/2015+Mobile+App+Marketing+Trends/fulltext/-/E-RES120582>
(Accessed: 25 February 2015)

FINANCIAL TIMES (2015)

'Mobile Operators Plan to Block Online Advertising' Financial Times. [Online] Available at:
<http://www.ft.com/intl/cms/s/0/7010ae7a-f4c6-11e4-8a42-00144feab7de.html> (Accessed:
26 May 2015)

GARTNER INC. (2011)

'Android to Command Nearly Half of Worldwide Smartphone Operating System Market by
Year-End 2012', [Online] Available at: <http://www.gartner.com/newsroom/id/1622614>
(Accessed: 08 September 2014)

GARTNER INC. (2013)

'Mobile App Stores Will See Annual Downloads', [Online] Available at:
<http://www.gartner.com/newsroom/id/2592315> (Accessed: 13 October 2014)

GHOSE, ANINDYA and FELLOW, DANIEL (2014)

'Estimating Demand for Mobile Applications in the New Economy', *Management Science*.
College of Business, City University of Hong Kong. pp. 1-37

GLIEM, JOESPH A. and GLIEM, ROSEMARY R. (2004)

'Calculating, Interpreting, and Reporting Cronbach's Alpha Reliability Coefficient for Likert-
Type Scales', The Ohio State University. pp. 82-88

GODOE, PREBEN and JOHANSEN, TROND STILLAUG (2012)

'Understanding adoption of new technologies: Technology readiness and technology
acceptance as an integrated concept', *Journal of European Psychology Students*, [S.l.], v.
3, pp. 38-52, May. 2012. ISSN 2222-6931.

GOLDKUHL, GÖRAN (2012)

'Pragmatism vs Interpretivism in Qualitative Information Systems Research',
European Journal of Information Systems, (21), pp. 135-146

GPEN (2014)

'Global Privacy Sweep - Raises concerns about mobile apps', [Online] Available at:
[http://www.dataprotection.ie/docs/10-09-14-Global-Privacy-Sweep-raises-concerns-about-
mobile-apps/1456.htm](http://www.dataprotection.ie/docs/10-09-14-Global-Privacy-Sweep-raises-concerns-about-mobile-apps/1456.htm) (Accessed: 06 December 2014)

GRAY, DAVID E. (2009)

'Doing Research in the Real World', 2nd ed. SAGE Publications Ltd.
ISBN-13: 978-18-4787-336-1 ISBN-10: 18-478-7336-7

GUBA, EGON C. and LINCOLN, YVONNA. S. (1994)

'Competing Paradigms in Qualitative Research', In N. K. Denzin & Y. S. Lincoln (Eds.),
Handbook of qualitative research (pp. 105-117). Thousand Oaks, CA: Sage Pub. Ltd.

HARRISON, RACHEL ET AL. (2013)

'Usability of mobile applications: literature review and rationale for a new usability model',
Journal of Interaction Science 2013. pp. 1-16

HEANET (2013)

'Mobile Application Primer', [Online] p. 1-93. Available at:

<http://heanet.ie/sites/default/files/HEAnet%20%20Mobile%20App%20Primer%20Jan%202013%20v1.pdf> (Accessed: 06 December 2014)

HERNÁNDEZ, IRENE ET AL. (2013)

'Analysis for the design of open applications on mobile devices', *IEEE Journal*.

ISBN-13: 978-14-6736-155-2. pp. 126-131

HINKELMANN, KNUT (2013)

'How to Evaluate Research', University of Applied Sciences Northwestern Switzerland,
School of Business. [Online] Available at:

http://knut.hinkelmann.ch/lectures/project2013/p1_7_evaluation.pdf

(Accessed: 12 November 2014)

HOFSTEDE, GEERT (2011)

'Dimensionalizing Cultures: The Hofstede Model in Context. Online Readings in

Psychology and Culture', [Online] Available at: <http://dx.doi.org/10.9707/2307-0919.1014>

(Accessed: 07 December 2014)

HOLDEN, MARY T. and LYNCH, PATRICK (2004)

'Choosing the Appropriate Methodology: Understanding Research Philosophy', Waterford
Institute of Technology. [Online] Available at: <http://repository.wit.ie/1466/>

(Accessed: 17 December 2014)

IDC (2015)

'Mobile App Advertising and Monetization Trends 2013-2018: Freemium and In-App Ads
Expand Their Lead', March 2015 IDC and App Annie [Online] Available at:

<http://www.idc.com/getdoc.jsp?containerId=prUS25528015> (Accessed: 15 April 2015)

IPSOS MBRI (2015)

'Social Messaging Quarterly Survey February 2015', IPSOS MBRI Research Ireland.

[Online] Available at: [http://www.ipsosmbr.com/social-messaging-quarterly-survey-](http://www.ipsosmbr.com/social-messaging-quarterly-survey-february-2015.html)

[february-2015.html](http://www.ipsosmbr.com/social-messaging-quarterly-survey-february-2015.html) (Accessed: 27 February 2015)

IRISH INDEPENDENT (2012)

'Smart Consumer: Are money Apps the way forward? You can bank on it!', Irish

Independent News Group [Online] Available at: [http://www.independent.ie/life/smart-](http://www.independent.ie/life/smart-consumer/smart-consumer-are-money-apps-the-way-forward-you-can-bank-on-it-26867877.html)

[consumer/smart-consumer-are-money-apps-the-way-forward-you-can-bank-on-it-](http://www.independent.ie/life/smart-consumer/smart-consumer-are-money-apps-the-way-forward-you-can-bank-on-it-26867877.html)

[26867877.html](http://www.independent.ie/life/smart-consumer/smart-consumer-are-money-apps-the-way-forward-you-can-bank-on-it-26867877.html) (Accessed: 24 January 2015)

IRISH INDEPENDENT (2015)

'Microsoft set for Windows 10 launch', [Online] Available at:

[http://www.independent.ie/business/technology/microsoft-set-for-windows-10-launch-](http://www.independent.ie/business/technology/microsoft-set-for-windows-10-launch-30923958.html)

[30923958.html](http://www.independent.ie/business/technology/microsoft-set-for-windows-10-launch-30923958.html) (Accessed: 18 February 2015)

ISRAEL, GLENN D. (2013)

'Determining Sample Size', University of Florida, IFAS Extension [Online] Available at:
<http://edis.ifas.ufl.edu/pd006> (Accessed: 12 January 2015)

ITU (2015)

'The world in 2015', International Telecommunication Union (ITU). [Online] Available at:
<http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf>
(Accessed: 1 June 2015)

JARA, ANTONIO ET AL. (2014)

'Mobile digcovery: discovering and interacting with the world through the Internet of things',
Springer-Verlag London 2013, Pers Ubiquit Comput (2014) 18: pp. 323-338

JOORABCHI, MONA ET AL. (2013)

'Real Challenges in Mobile App Development', University of British Columbia. pp. 1-10

KIM, JIEUN ET AL. (2012)

'Mobile application service networks: Apple's App Store', *Springer-Verlag* Berlin 2013

KOCH, STEFAN and KERSCHBAUM, MARKUS (2013)

'Joining a smartphone ecosystem: Application developers' motivations and decision
criteria', *Information and Software Technology* 56 (2014) pp. 1423-1435

KUHN, THOMAS (1962)

'The Structure of Scientific Revolutions', University of Chicago Press.
ISBN-13: 978-02-2645-808-3 ISBN-10: 02-264-5808-3

KUMAR, ARCHANA AND MUKHERJEE, AVINANDAN (2013)

'Shop While You Talk: Determinants of Purchase Intentions Through a Mobile Device',
IJMM Summer 2013. Vol. 8, No. 1. pp. 23-37

KVALE, STEINAR (2008)

'Interviews: An Introduction to Qualitative Research Interviewing Paperback', 1st ed. SAGE
Publications Ltd. ISBN-13: 978-08-0395-820-3 ISBN-10: 08-039-5820-X

MENGRU, SHEN ET AL. (2013)

'Comparative Analysis of Mobile Application Stores in Different Charging Modes', *China
Communications* December 2013. pp. 158-168

MANTERE, SAKU and KETOKIVI, MIKKO (2013)

'Reasoning in Organization Science', *Academy of Management Review*, 2013, 38:
pp. 70-89

MICROSOFT (2014)

'Microsoft officially welcomes the Nokia Devices and Services Business',
25th April 2014. Microsoft Corporation [Online] Available at:
<http://news.microsoft.com/2014/04/25/microsoft-officially-welcomes-the-nokia-devices-and-services-business/> (Accessed: 26 November 2014)

MICROSOFT (2015)

'Windows 10 to get 'holographic' headset and Cortana', 21st January 2015. Microsoft Corporation [Online] Available at: <http://www.bbc.com/news/technology-30924022> (Accessed: 16 March 2015)

MINGERS, JOHN (2004)

'Paradigm wars: ceasefire announced who will set up the new administration?' Canterbury Business School, University of Kent, Canterbury, UK. *Journal of Information Technology* (2004) 19, pp. 165-171

MONNO, PAUL and XIAO, DAZHI (2014)

'Mobile Commerce App Adoption: Consumer Behavior Differences between Europe and Asia', School of Economics and Management. [Online] Available at: <http://lup.lub.lu.se/luur/download?func=downloadFile&recordId=4468608&fileId=4468616> (Accessed: 15 October 2014)

MYERS, MICHAEL D. and NEWMAN, MICHAEL (2006)

'The qualitative interview in IS research: Examining the craft', *Science Direct*, Information and Organization 17 (2007) pp. 2-26

NICHOLAS, DAVID (2013)

'The Times They Are a-Changin'1 (again!): the second, great digital transition to the mobile space', CIBER Research Ltd. ZIN 2013, 51(2), pp. 42-51

OLIVEIRA, TIAGO ET AL. (2014)

'Extending the understanding of mobile banking adoption: When UTAUT meets TTF and ITM', *International Journal of Information Management* 34 (2014) pp. 689-703

ORLIKOWSKI, WANDA and BAROUDI, JACK J. (1990)

'Studying Information Technology in Organisations: Research Approaches and Assumptions', Leonard N. Stern School of Business Working Paper IS-90-04. pp. 1-25

PAJARES, FRANK (2002)

'Overview of Social Cognitive Theory and of Self-Efficacy', Emory University. [Online] Available at: <http://www.emory.edu/EDUCATION/mfp/eff.html> (Accessed: 27 October 2014)

PALVIA, PRASHANT ET AL. (2003)

'Management Information Systems Research: What's There in a Methodology?' *Communications of the Association for Information Systems* Volume 11 Article 16 3-2-2003 ISSN: 1529-3181 pp. 289-309

PAGANO, DENNIS and MAALEJ, WALID (2003)

'User Feedback in the AppStore: An Empirical Study', *Requirements Engineering Conference (RE), 2013 21st IEEE International*, Vol., no., pp. 125,134, 15-19 July 2013

PARASURAMAN, A. (2000)

'Technology Readiness Index (Tri): A Multiple-Item Scale to Measure Readiness to Embrace New Technologies', *Journal of Service Research* 2000, Volume 2, No. 4, May 2000. pp. 307-320

PERCHAT, JOACHIM ET AL. (2014)

'Component Based Framework to Create Mobile Cross-platform Applications', *Procedia Computer Science* 19 (2013) pp. 1004-1011

PORTIO RESEARCH (2013)

'Mobile Applications Futures 2013-2017 - Analysis and Growth Forecasts for the Worldwide Mobile Applications Market', Portio Research Limited, United Kingdom. [Online] Available at: <http://www.portioresearch.com/en/mobile-industry-reports/mobile-industry-research-reports/mobile-applications-futures-2013-2017.aspx> (Accessed: 25 January 2015)

PRATAP, UDAY and SRIVASTAVA, R.K (2011)

'Mobile Application Development - Hottest Segment in Global Market', *International Journal of Computer Science And Technology*, Vol. 2, Issue 4, Oct. - Dec. 2011. pp. 543-547

RECKER, JAN (2005)

'Conceptual Model Evaluation. Towards more Paradigmatic Rigor', Centre for Information Technology Innovation, Queensland University of Technology, pp. 1-12

RÖCKER, CARSTEN (2005)

'Why Traditional Technology Acceptance Models Won't Work for Future Information Technologies', Communication Sciences Department at RWTH Aachen University, pp. 1-10

ROGERS, EVERETT M. (1983)

'Diffusion of Innovations (Third Edition) Paperback', 3rd ed. Free Press (1983) ISBN-10: 00-092- 6650-5

ROGERS, EVERETT M. (2002)

'Diffusion of Preventive Innovations. Addictive Behaviors', Vol.27(6): pp. 989-993

ROONEY, COLIN (2013)

'Data on smart devices - are data subjects being protected?' Data Protection Ireland. *PDP Journals*, Volume 6, Issue 3

RTÉ (2015)

'RTÉ Launches New Global Online Irish Television Service for International Audiences', Raidió Teilifís Éireann Broadcasting Company 2015. [Online] Available at: <http://www.rte.ie/blogs/digital/2015/03/04/rte-launches-new-global-online-irish-television-service-for-international-audiences/> (Accessed: 5 March 2015)

RTÉ News (2015)

'Uber promises 150 jobs for Limerick', Raidió Teilifís Éireann Broadcasting Company 2015. [Online] Available at: <http://www.rte.ie/news/2015/0728/717618-uber-jobs/> (Accessed: 3 August 2015)

SAMSUNG (2015)

'Samsung Unveils the Samsung Z1, the First Tizen Powered Smartphone for Indian Consumers', Samsung Mobile Press, Samsung Corporation [Online] Available at: <http://www.samsungmobilepress.com/2015/01/14/Samsung-Unveils-the-Samsung-Z1,-the-First-Tizen-Powered-Smartphone-for-Indian-Consumers-1> (Accessed: 15 January 2015)

SAUNDERS, MARK ET AL. (2012)

'Research Methods for Business Students', 6th ed. Pearson ed.
ISBN-13: 978-0-273-75075-8

SKY IRELAND (2015)

'Sky Go', Sky Ireland 2015. [Online] Available at: <http://www.sky.com/products/ways-to-watch/sky-go/facts/index-roi.html> (Accessed: 2 March 2015)

SONG, JAEKI ET AL. (2013)

'Application discoverability and user satisfaction in mobile application stores',
Decision Support Systems 59 (2014) pp. 37-51

STATISTA (2014)

'Statistics and facts about Mobile App Usage', [Online] Available at:
<http://www.statista.com/study/11559/mobile-app-usage-statista-dossier/>
(Accessed: 18 December 2014)

SYKES, EDWARD R. (2014)

'New Methods of Mobile Computing: From Smartphones to Smart Education', *Tech Trends*.
May/June 2014 Volume 58, Number 3. pp. 26-38

THE ANALYSIS FACTOR (2014)

'Confusing Statistical Term #6: Factor', [Online] Available at:
<http://www.theanalysisfactor.com/confusing-statistical-term-6-factor/>
(Accessed: 30 December 2014)

THINKHOUSE.IE (2014)

'Irish Mobile Youth Report 2014', [Online] Available at:
<http://thinkhouse.ie/downloads/mobilereport/Full-Report-Thinkhouse-Mobile-Youth-Survey.pdf> (Accessed: 23 October 2014)

TRANSPORT FOR IRELAND (2014)

'Real Time Ireland', [Online] Available at: http://www.nationaltransport.ie/wp-content/uploads/2014/05/Real_Time_App_Stats.pdf (Accessed: 15 November 2014)

ULRICH, FRANK (2006)

'Towards a pluralistic conception of research methods in information systems research',
ICB-Research Report, No. 7, pp. 1-69

UPC Ireland (2014)

'The Second UPC Report on Ireland's Digital Future', [Online] Available at:
http://www.upc.ie/pdf/UPC_2014_report.pdf (Accessed: 23 January 2015)

US Census Bureau (2015)

'World Population - Total Midyear Population for the World: 1950-2050', [Online] Available
at: http://www.census.gov/population/international/data/worldpop/table_population.php
(Accessed: 09 February 2015)

USWITCH (2013)

'Sky surpass 2 million app downloads in Ireland', [Online] Available at:

<http://www.uswitch.ie/press-room/press-releases/sky-surpass-2-million-app-downloads-in-ireland.pdf> (Accessed: 23 January 2015)

VENKATESWARAN, N. (2013)

'An Empirical Study on e-Commerce Applications Growth Opportunities and Business Prospects', *International Research Journal of Business and Management*. pp. 89-96

VISION MOBILE (2014)

'Developer Economics Q3 2014: State of the Developer Nation', [Online] Available at:

<http://www.visionmobile.com/product/developer-economics-q3-2014/> (Accessed: 24 September 2014)

VISION MOBILE (2015)

'Developer Economics Q3 2015: State of the Developer Nation', [Online] Available at:

<https://www.developereconomics.com/reports/developer-economics-state-of-the-developer-nation-q3-2015/> (Accessed: 1 August 2015)

VRECHOPOULOS, ADAM ET AL. (2002)

'Critical Success Factors for Accelerating Mobile Commerce Diffusion in Europe', 15th Bled Electronic Commerce Conference eReality: Constructing the eEconomy. pp. 447-492

XAMARIN (2015)

'Xamarin is free for students', [Online] Available at: <https://xamarin.com/student>

(Accessed: 25 April 2015)

YENKATESH, VISWANATH (2003)

'User acceptance of information technology: Toward a unified view', *MIS Quarterly*, Vol. 27 No. 3, pp. 425-478/September 2003

YENKATESH, VISWANATH ET AL. (2012)

'Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology', *MIS Quarterly* Vol. 36 No. 1 pp. 157-178

YENKATESH, VISWANATH (2015)

'Theoretical Models: Unified Theory of Acceptance and Use of Technology (UTAUT)',

[Online] Available at: http://www.vvenkatesh.com/organizations/Theoretical_Models.asp

(Accessed: 11 February 2015)

YIN, ROBERT K. (2009)

'Case study research: Design and methods', 4 ed. SAGE Publications Ltd. Applied social research methods. ISBN 978-14-1296-099-1

ZAKAS, NICHOLAS C. (2013)

'The Evolution of Web Development for Mobile Devices', *Communications of the ACM*.

April 2013 Vol. 56 No. 4. pp. 42-48

Bibliography

AMBERG, MICHAEL ET AL. (2004)

'The Compass Acceptance Model for the analysis and evaluation of mobile services', *Int. J. Mobile Communications*, Vol. 2, No. 3, 2004

BANNISTER, FRANK and REMENYI, DAN (2005)

'Why IT Continues to Matter: Reflections on the Strategic Value of IT', *The Electronic Journal Information Systems Evaluation* Volume 8 Issue 3, pp. 159-168

BENBASAT, IZAK and ZMUD, ROBERT W. (1999)

'Empirical Research in Information Systems: The Practice of Relevance', *MIS Quarterly* Vol.23 No. 1, pp. 3-16/March 1999

BRYMAN, ALAN (2008)

'Social Research Methods', 6 Mar 2008. 3rd ed. OUP Oxford Publishing.
ISBN-13: 978-01-9920-295-9 ISBN-10: 01-992-0295-8

CARDOSO, ANA and RAMOS, ISABEL (2012)

'Looking at the Past to Enrich the Future: A Reflection on Klein and Myers' Quality Criteria for Interpretive Research', *The Electronic Journal of Business Research Methods* Volume 10 Issue 2 2012. pp. 77-88

CHENAIL, RONALD J. (2011)

'Ten Steps for Conceptualizing and Conducting Qualitative Research Studies in a Pragmatically Curious Manner', *The Qualitative Report* Volume 16 Number 6 November 2011 pp. 1713-1730

CRESWELL, JOHN W. (2003)

'Research Design: Qualitative, Quantitative, and Mixed Methods Approaches', SAGE Publications, 2003, Dated 30th May 2012. ISBN-10: 07-619-2442-6

CRESWELL, JOHN W. ET AL. (2006)

'How Interpretive Qualitative Research Extends Mixed Methods Research', *Mid-South Educational Research Association* 2006, Vol. 13, No. 1, pp. 1-11

CRONBACH, LEE J. (1951)

'Coefficient Alpha And The Internal Structure of Tests', *Psychometrika*. September 1951, Volume 16, Issue 3, pp. 297-334

CRONBACH, LEE J. and MEEHL, PAUL E. (1955)

'Construct Validity in Psychological Tests', *Psychological Bulletin*, 52, pp. 281-302

DARKE, PETA ET AL. (1998)

'Successfully completing Case Study Research: combining Rigour, Relevance and Pragmatism', *Info systems* (1998) 8, pp. 273-89

DARWIN, CHARLES (1859)

'The Origin of Species', 17 Dec 2011. Empire Books Publishing.
ISBN-13: 978-16-1949-130-4 ISBN-10: 16-194-9130-3

DENZIN, NORMAN K. and LINCOLN, YVONNA S. (2005)

'SAGE Handbook of Qualitative Research', 3rd ed. SAGE Publications Ltd.
ISBN-13: 978-07-6192-757-0

EU BUSINESS (2014)

'5G Mobile Technology Deal with South Korea', 19th June 2014. [Online] Available at:
<http://www.eubusiness.com/topics/telecoms/5g-mobile> (Accessed: 10 December 2014)

EU COMMISSION (2013b)

'Digital Agenda for Europe - A Europe 2020 Initiative', European Commission. [Online]
Available at: <https://ec.europa.eu/digital-agenda/about-our-goals/> (Accessed: 22 January
2015)

GABLE, GUY G. (1994)

'Integrating Case Study and Survey Research Methods: An Example in Information
Systems', *European Journal of Information Systems* 3(2): pp. 112-126. Palgrave
Macmillan.

GOLDING, PAUL (2004)

'Next Generation Wireless Applications: Creating Mobile Applications in a Web',
Wiley-Blackwell (18 Jun 2004). ISBN-13: 978-04-7086-986-4 ISBN-10: 04-708-6986-0

GREENER, SUE (2008)

'Business Research Methods', 4th ed. Dr. Sue Greener & Ventus Publishing.
ISBN-13: 978-87-7681-421-2

GUBRIUM, JABER F. (2012)

'The SAGE Handbook of Interview Research: The Complexity of the Craft', 2nd ed. SAGE
Publications Ltd. ISBN-13: 978-14-1298-164-4 ISBN-10: 14-129-8164-6

HOFSTEDE, GEERT (1980)

'Culture's consequences: international differences in work-related values', Sage
Publications Inc.; Abridged edition (November 1, 1980) ISBN-10: 08-039-1306-0

HOGAN, JOHN ET AL. (2009)

'Approaches to Qualitative Research: Theory & Its Practical Application – A Guide for
Dissertation Students', ISBN-13: 978-19-0488-7 31-7

KING, NIGEL and HORROCKS, CHRISTINA (2010)

'Interviews in Qualitative Research Hardcover', SAGE Publications Ltd.
ISBN-13: 978-14-1298-164-4 ISBN-10: 14-129-8164-6

KLEIN, HEINZ K. and MYERS, MICHAEL D. (1999)

'A set of principles for conducting and evaluating interpretive field studies in
Information Systems', *MIS Quarterly*. 23 (1), pp. 67-93

KOTHARI, C.R. (2006)

'Research Methodology: Methods and Techniques', New Age International Ltd.
ISBN-10: 81-224-1522-9

KUHN, THOMAS (1996)

'The Structure of Scientific Revolutions', 3rd ed. University of Chicago Press.
ISBN-13: 978-02-2645-807-6 ISBN-10: 02-264-5807-5

KVALE, STEINAR (2006)

'Dominance Through Interviews and Dialogues', *Qualitative Inquiry* Volume 12 Number 3
June 2006. pp. 480-500

MANGAN, JOHN (2002)

'Combining quantitative and qualitative methodologies in logistics research', Irish
Management Institute, Dublin, Ireland. *International Journal of Physical Distribution &
Logistics Management*. Vol. 34 No. 7, 2004 pp. 565-578

MINGERS, JOHN ET AL. (2013)

'Critical Realism in Information Systems Research', *MIS Quarterly* Vol. 37 No. 3, pp. 795-
802/September 2013 pp. 795-802

MYERS, MICHAEL D. and AVISON, DAVID (2002)

'Qualitative Research in Information Systems: A Reader', 4th ed. SAGE Publications Ltd.
ISBN-10: 07-619-6632-3

MYERS, MICHAEL D. and NEWMAN, MICHAEL (2006)

'The Qualitative Interview in IS Research: Examining the Craft', *Science Direct*. Information
and Organization 17 (2007) doi:10.1016/j.infoandorg.2006.11.001

NBS (2014)

'National Broadband Scheme', Department of Communications, Energy and Natural
Resources, Government of Ireland. [Online] Available at:
<http://www.dcenr.gov.ie/communications/communications+development/national+broadband+scheme.htm> (Accessed: 28 September 2014)

NICOLAS, DAVID and CLARKE, DAVID (2013)

'Information on the go: A case study of Europeana mobile users (Europe)', *Journal of the
American Society for Information Science and Technology*, 64(7):1311–1322, 2013

OATES, BRIONY J. and FITZGERALD, BRIAN (2005)

'Multi-metaphor method: organizational metaphors in information systems development',
Info Systems J (2007) 17, pp. 421-449

OPENi (2014)

'Open Source Mobile Cloud Applications Solution', European Union [Online] Available at:
<http://www.openi-ict.eu/> (Accessed: 27 October 2014)

REMENYI, DAN (2002)

'Research Strategies – Beyond the Difference', School of Systems and Data Studies,
Trinity College Dublin, Ireland. *Electronic Journal of Business Research Methods*, Volume
1 Issue 1 (2002) pp. 38-41

SARKER, SUPRATEEK ET AL. (2013)

'Qualitative Studies in Information Systems: A Critical Review and Some Guiding
Principles', *MIS Quarterly* Vol. 37 No. 4 pp. iii-xviii/December 2013

SCHUMPETER, JOSEPH A. (1936)

'Business Cycles - A Theoretical, Historical and Statistical Analysis'. [Online] Available at: http://classiques.ugac.ca/classiques/Schumpeter_joseph/business_cycles/schumpeter_business_cycles.pdf (Accessed: 19 July 2015)

SOARES, ANA MARIA ET AL. (2006)

'Hofstede's dimensions of culture in international marketing studies', *Journal of Business Research* 60 (2007) pp. 277–284

SMITH, ADAM (1776)

'The Wealth of Nations', Simon and Brown Publishers, April 2, 2012.
ISBN-13: 978-1-613-82300-2 ISBN-10: 16-138-2300-2

SMITH, GREGORY S. (2013)

'Straight to the Top: CIO Leadership in a Mobile, Social and Cloud-based World', 2nd ed.
John Wiley & Sons, Inc. 2013. ISBN-13: 978-1-118-39003-0

STRASSMANN, PAUL (1985)

'The Information Payoff', Free Press. 2002, Dated 30th May 2012. ISBN-10: 02-9317-20-7

TANIAR, DAVID (2008)

'Mobile Computing: Concepts, Methodologies, Tools, and Applications', 1st ed. (Nov 20, 2008) Information Science Reference. ISBN-13: 978-1-605-66054-7

TRIOLA, MARIO F. (2012)

'Elementary Statistics (12th Edition)', December 31, 2012. 12th ed. Pearson.
ISBN-13: 978-0-321-83696-0 ISBN-10: 03-218-3696-0

WALSHAM, GEOFF (1995)

'The Emergence of Interpretivism in IS Research', *Institute for Operations Research and the Management Sciences*, December 1995 International Research. pp. 376-394

WALSHAM, GEOFF (2006)

'Doing Interpretive Research', *European Journals of Information Systems. European Journal of Information Systems* (2006) 15, pp. 320–330

WARD, JOHN and PEPPARD, JOE (2002)

'Strategic Planning for Information Systems', Wiley & Sons Ltd. Press 2002,
Dated 30th May 2012. ISBN-10: 04-708-4147-8

YENKATESH, VISWANATH (2000)

'Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion in the Technology Acceptance Model', *Information Systems Research*, Vol. 11, No. 4, December, pp. 342-365

YENKATESH, VISWANATH (2012)

'Bridging the Qualitative-Quantitative Divide: Guidelines for Conducting Mixed Methods Research in Information Systems', *MIS Quarterly*, pp. 1- 34

ZACHARIADIS, M. ET AL. (2010)

'Exploring Critical Realism as the Theoretical Foundation of Mixed-method Research: Evidence from the economics of IS innovations', *MIS Quarterly* Vol. 23 No. 1, pp. 3-16

Appendices

Appendix A: Acceptance Models and Theories

Models and Theories	Constructs
<p>“Innovation Diffusion Theory (IDT) by Rogers (1962) is adapted to information systems innovations by Moore and Benbasat (1991). Five attributes from Rogers’ model and two additional constructs are identified”</p> <p>*indicates TAM2 only</p>	<p>“Relative Advantage*, Compatibility*, Complexity* Observability*, Trialability*, Image, Voluntariness of Use”</p>
<p>“Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975) derives from psychology to measure behavioural intention and performance”</p>	<p>“Attitude, Subjective Norm”</p>
<p>“Social Cognitive Theory (SCT) by Bandura (1986) is applied to information systems by Compeau and Higgins (1995) to determine the usage”</p>	<p>“Encouragement of Others, Others Use, Support, Self-Efficacy, Performance Outcome Expectations, Personal Outcome Expectations Affect, Anxiety”</p>
<p>“Theory of Planned Behavior (TPB) by Ajzen (1991) extends TRA by including one more variable to determine intention and behaviour”</p>	<p>“Attitude, Subjective Norm Perceived Behavioural Control”</p>
<p>“Combined TAM and TPB (C-TAM-TPB) by Taylor and Todd (1995)”</p>	<p>“Perceived Usefulness, Perceived Ease of Use Attitude, Subjective Norm Perceived Behavioural Control”</p>
<p>“Technology Acceptance Model (TAM) by Davis (1989) develops new scale with two specific variables to determine user acceptance of technology. Technology Acceptance Model 2 (TAM2) by Venkatesh and Davis (2000) is adapted from TAM and includes more variables”</p> <p>*indicates TAM2 only</p>	<p>“Perceived Usefulness, Perceived Ease of Use Subjective Norm, Experience* Voluntariness*, Image* Job Relevance*, Output Quality* Result Demonstrability*”</p>
<p>“Unified Theory of Acceptance and Use of Technology Model (UTAUT) by Venkatesh et al. (2003) integrates above theories and models to measure user intention and usage on technology”</p>	<p>“Performance Expectancy Effort Expectancy, Attitude toward Using Technology Social Influence Facilitating Conditions Self-Efficacy, Anxiety”</p>

SOURCE: Models and Theories of Individual Acceptance (Sundaravej 2009, p. 3-4)

Appendix B: Research Strategies Summary Table

Applicable	Explanation
Experiment NO	“Social sciences are concerned with human behaviour and perspectives. Ethical issues around the use of experiments involving people. Yet, while they appear particularly evident in the case of experiments, these issues are just as strong for other research approaches” (Blaxter et al. 2006, p. 75-76)
Surveys YES	“Research that uses predefined and structured questionnaires to capture data from individuals” (Palvia 2003, p. 291). “Questionnaires and interviews, the techniques which are at the heart of one type of survey research, occupy a major place in small-scale social science research projects” (Blaxter et al. 2006, p. 80)
Case Studies NO	“In general, case studies are the preferred method when (a) "how" or "why" questions are being posed, (b) the investigator has little control over events, and (c) the focus is on a contemporary phenomenon within a real-life context” (Yin 2009, p. 19)
Action Research NO	“Action research in its traditional sense comes from the work of Kurt Lewin (1946, 1948) and involves a collaborative change management or problem-solving relationship between researcher and client. The researcher and client engage in collaborative cycles of planning, taking action and evaluating” (Coghlan and Brannick 2005, p. 44)
Grounded Theory NO	“Grounded theorists start with data. We construct these data through our observations, interactions, and materials that we gather about the topic or setting. We study empirical events and experiences and pursue our hunches and potential analytic ideas about them” (Charmaz 2006, p. 3)
Ethnography NO	“Ethnographic research comes from the discipline of social and cultural anthropology where an ethnographer is required to spend a significant amount of time in the field.” (Myers 1999, p. 3-4)
Archival Research NO	“An archival research strategy makes use of administrative records and documents as the principal source of data and allow research questions which focus upon the past and changes over time to be answered” (Saunders et al. 2012, p. 178-179)

SOURCE: Multiple. Author(s) in brackets, including page number and reference

Appendix C: Information Sheet and Question Set

Information Sheet

SURVEY INFORMATION SHEET FOR PARTICIPANTS

Project Title: Is Ireland Embracing the Mobile Application Paradigm Shift?

Name of Lead Researcher (student in case of project work): Graham Patrick Johnson

Name of Supervisor: Dr. Denise Leahy, School of Computer Science and Statistics

You are invited to participate in this research project which is being carried out by Graham Patrick Johnson as part of a dissertation in the Taught Masters Programme M.Sc. in Management of Information Systems in the School of Computer Science and Statistics, Trinity College Dublin, Ireland.

This study examines how the people of Ireland, over 18 years old, are using smart device (i.e. Smartphone or tablet) applications (commonly known as 'apps') in their daily lives. Many people throughout Ireland are now using apps for many different activities including social media updates and world news, photos and reading, online shopping, purchasing flights and hotels, watching multimedia, learning new languages, paying for services, as well as online banking facilities.

The aim of the study is to assess if any gaps exist in the use of applications today in Ireland and if any improvements can be made to close such gaps at the present level of application quality.

If you are willing to participate in the survey, it will involve answering 19 optional questions as part of an anonymous survey. The survey will be online and will take approximately 10-15 minutes to complete.

The study investigates the benefits of apps, how easy they are to use, potential pressures to use certain apps, if used for necessity or pleasure, price or cost considerations and user habits.

The study is concerned with applications only that have been downloaded and installed by the user from one of the many available App Stores including Apples App store, Androids Google Play, Windows Phone Store, and Blackberry World among others. Pre-installed applications by the Operating System provider will not be examined in this study.

A Smart device in the context of this study refers to Smartphone, Tablet, Phablet and iPad. MP3 Players and iPods are not included as part of this study.

Care in this study will be taken to ensure that any revealing information mistakenly given will be edited to ensure anonymity of all data, except if illicit activity is reported. In that case, the data will be handed to appropriate authorities.

I have no conflict of interest with regard to the research topic and participants, either individually or any other level (employment or university).

All survey data collected will be strong password protected and will be permanently deleted on conclusion of the study October 2015.

As stipulated by the Computer Science & Statistics Ethics Committee of Trinity College Dublin, it is important to note:

- Your participation is voluntary; you can withdraw at any time without any consequences of any kind.
- Each question is optional. Please feel free to omit a response to any question you wish.
- The survey can be taken on your desktop, laptop or any smart device (Smartphone, tablet or iPad).
- All questions should be answered from a personal usage consideration. Each participant may take the survey once.
- The study does not seek criticism of any third party application providers or any specific application names.
- In the extremely unlikely event that illicit activity is reported to me during the study or within a survey question response, I will be obliged to report it to appropriate authorities.

Survey Questions - Page 1 of 4

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

Same app, on multiple devices, should be counted only once. Apple's iPad is a tablet.

What is your Smartphone or tablet operating system of choice?

- Android
- iOS
- Windows
- Blackberry

Other (please specify)

In the past 7 days, what is the estimated number of apps you have used on your Smartphone or tablet?

- None
- 1-5
- 6-10
- 11-15
- 16-20
- 21 or More

What interaction you have performed on your Smartphone or tablet at any time in the past? (Please select all that apply.)

- Social (social media interactions only)
- Browse (equivalent of window shopping or information gathering)
- Service (booking or confirmation but payment made on desktop)
- Transaction (booking or confirmation and payment made on a Smartphone or tablet app)
- Don't Know

Survey Questions - Page 2 of 4

Please specify the categories that you have most frequently downloaded onto your Smartphone or tablet. (TOP FIVE is adequate.)

- | | | |
|---|---|--|
| <input type="checkbox"/> Books | <input type="checkbox"/> Lifestyle | <input type="checkbox"/> Public Transport |
| <input type="checkbox"/> Business | <input type="checkbox"/> Maps | <input type="checkbox"/> Retail |
| <input type="checkbox"/> Education | <input type="checkbox"/> Medical | <input type="checkbox"/> Social Networking |
| <input type="checkbox"/> Entertainment | <input type="checkbox"/> Music | <input type="checkbox"/> Sports |
| <input type="checkbox"/> Finance | <input type="checkbox"/> Navigation (Road or By Foot) | <input type="checkbox"/> Training |
| <input type="checkbox"/> Food & Drink | <input type="checkbox"/> News | <input type="checkbox"/> Travel |
| <input type="checkbox"/> Games | <input type="checkbox"/> None of the Above | <input type="checkbox"/> Utilites |
| <input type="checkbox"/> Health & Fitness | <input type="checkbox"/> Photo | <input type="checkbox"/> Video |
| <input type="checkbox"/> Language | <input type="checkbox"/> Productivity | <input type="checkbox"/> Weather |
| <input type="checkbox"/> Other (please specify) | | |

Please specify the main reasons why you would stop using an app. (TOP THREE is adequate.)

- | | | |
|---|---|---|
| <input type="checkbox"/> Advertising Popup Annoyance | <input type="checkbox"/> Easier to Complete Task on Desktop | <input type="checkbox"/> Screen Size too small |
| <input type="checkbox"/> Bad App Reviews | <input type="checkbox"/> Poor App Design | <input type="checkbox"/> Unpopular in the Public View |
| <input type="checkbox"/> Better Quality Alternative Available | <input type="checkbox"/> Security Concerns | |
| <input type="checkbox"/> Price Charges Introduced | <input type="checkbox"/> App Performing Slowly | |
| <input type="checkbox"/> Other (please specify) | | |

Survey Questions - Page 3 of 4

Please specify your rating for each of the questions below.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
I find apps beneficial in my daily life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apps enables me to complete tasks faster	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find apps clear and easy to use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apps are easier to use than the computer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apps I see recommended in advertising makes me want to use it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Influence of family and friends makes me use the app	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apps are not fun but hard work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I prefer to use apps only for pleasure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would pay a one-time charge for my favourite app, if the price was worth it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would pay a yearly subscription fee for my favourite app, if the price was worth it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I automatically think of using an app rather than a desktop to perform a task	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The use of an app in my daily life has become a habit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Survey Questions - Page 4 of 4 - Final Page

What is your gender?

- Male
- Female

What is your age range?

- 18-20
- 21-30
- 31-40
- 41-50
- 51-60
- 61-64
- 65+
- Prefer Not to Say

Appendix D: Acceptance Survey Results Table

Frequencies (n)						
	Strongly Disagree	Disagree	Agree	Strongly Agree	Do Not Know	Total
Construct	Performance Expectancy					
PE1: "Find apps beneficial in my daily life"	16 4.1%	22 5.7%	166 42.7%	174 44.7%	11 2.8%	389 100%
PE2: "Apps enables me to complete tasks faster"	20 5.1%	45 11.6%	166 42.9%	138 35.7%	18 4.7%	387 100%
Construct	Effort Expectancy					
EE1: "Find apps clear and easy to use"	11 2.8%	34 8.8%	213 54.9%	115 29.6%	15 3.9%	388 100%
EE2: "Apps are easier to use than the computer"	29 7.5%	125 32.6%	120 31.3%	80 20.8%	30 7.8%	384 100%
Construct	Social Influence					
SI1: "Apps recommended in advertising makes me want to use it"	72 18.7%	177 46.0%	84 21.8%	33 8.6%	19 4.9%	385 100%
SI2: "Influence of family and friends makes me use the app"	35 9.0%	88 22.6%	170 43.7%	85 21.9%	11 2.8%	389 100%

Frequencies (n)						
	Strongly Disagree	Disagree	Agree	Strongly Agree	Do Not Know	Total
Construct	Hedonic Motivation					
HM1: "Apps are not fun but hard work"	97 25.2%	213 55.3%	40 10.4%	16 4.2%	19 4.9%	385 100%
HM2: "Prefer to use apps only for pleasure"	37 9.6%	169 43.9%	118 30.7%	42 10.9%	19 4.9%	385 100%
Construct	Price Value					
PV1: "Would pay a one-time charge for my favourite app, if the price was worth it"	48 12.4%	51 13.1%	163 42.0%	96 24.7%	30 7.8%	388 100%
PV2: "Would pay a yearly subscription fee for my favourite app, if the price was worth it"	88 22.6%	97 25.0%	119 30.6%	60 15.4%	25 6.4%	389 100%
Construct	Habit					
HA1: "Automatically think of using an app rather than a desktop to perform a task"	48 12.4%	133 34.3%	111 28.6%	74 19.0%	22 5.7%	388 100%
HA2: "The use of an app in my daily life has become a habit"	31 8.0%	37 9.5%	139 35.9%	161 41.5%	20 5.1%	388 100%

Appendix E: Interview Transcriptions Key Points

Key item points only are listed below from each of the six interviews. The points have not been modified in any way and represent the interviewees own comments. Each interviewee waived their right to anonymity.

Question 1 (Performance Expectancy): What do you feel is the future direction of smart device mobile apps that would enhance and provide additional benefits to users?

Jaime Casey @ Armour:

- “An awful lot to do with the perception for the companies actual need for an app”
- “Not really sure what they want in it, they just want to have one”
- “Apps should have some kind of a focus and need to be able to provide a service”
- “Focus of apps can go on into the future when the whole mysteriousness and people's lack of understanding of them fades away”

Patrick McDonald @ Foto Store:

- “We're probably entering a phrase of huge Smartphone adoption”
- “I can only see it coming more and more into day to day life”
- “I think that's going to become more and more as entrepreneurs, innovators and inventors think of new ways to utilise the Smart technology around them”
- “It's going to get better and more use definitely”

Mat May @ Fusio:

- “We have gone through a phrase just about, doing other things that we do already”
- “Using the features that the phone has unique to it, for example, motion sensors”
- “Getting more connected with the things in your house, example like ‘nest’ [The Nest Thermostat™ from Electric Ireland], where you control your home heating”
- “Little bit more of stepping away from games and just downloading of information and more becoming a tool that is using the features that the hardware has”

Cathal Greaney @ Irish Apps:

- “I think you'll see more mainstream competition tasks being done on mobile”
- “And you'll also see the internet of things and hardware, peripherals connected”
- “There are two areas, the peripherals and the hardware integration into mobile devices and also on the common business processes you see that. More and more standard mobile apps have come on for things that use to be done on laptop”
- “I think you'll see an alteration where a lot of people, particularly sales people and people that are out on the road are using tablets and phones rather than the laptops”

Question 2 (Effort Expectancy): What considerations or design patterns does your company employ to allow users greater ease of use when they are using apps built by your company?

Jaime Casey @ Armour:

- “Keep up to date with the latest recommendations given by Apple and by Google in terms of UI, UX, layout of components and navigation”
- “Navigation tends to be more involved, tends to be more levels of navigation”
- “Have to kind of think outside the box, in terms of how to get around in an app and keep it as simple as possible”
- “The user does not have to be thinking about reaching for the help button; obvious to them what needs to be done”

Patrick McDonald @ Foto Store:

- “Whole concept is being able to print your photos and get them delivered to your door”
- “Main selling point of the app is the simplicity”
- “From a design principle, from a usability point of view, it’s really you can kind of start off with an assumption of usability or an assumption of what will be easier for the user”
- “Reality is that we do not really know without experimentation”
- “We look for customer feedback, customer validation, for every feature or for every enhancement we make in the app; this is the only true way we believe that you can provide an enhanced usability for users”

Mat May @ Fusio:

- “Try to make the apps as simple as possible”
- “We try to make them beautiful, so that people will want to use them again”
- “Very simple little things, like, you get the feeling that something is happening”
- “Always stick to the latest UI guidelines would be covering from the user point of view”
- “It does not have to be a confusing discovery thing for the user to be able to work out what should be a very simple task”

Cathal Greaney @ Irish Apps:

- “We keep an eye on the best practices on both Android and iOS and we apply them”
- “We have a dedicated visual communications engineer and his full time job is analysing and researching the latest UI and UX type frameworks, and best practices”
- “And just keep a distinct design pattern for mobile and tablet”
- “Just making sure you equal or succeed the market leaders in whatever app you’re doing or whatever sector you happen to be designing or developing for”

Question 3 (Social Influence): How much influence do you believe there is to use an app when recommended in magazines, newspapers, online or television?

Jaime Casey @ Armour:

- “It would definitely; huge increase in the number of people who are socially engaged while they're watching TV”
- “This is specially increased during ad breaks so if somebody was watching a TV program and an ad break comes on, they reach for their phone”
- “Immediately somebody may be on the play store or app store. They might be like that looks good so I might download that”

Patrick McDonald @ Foto Store:

- “We are seeing with Photo Store, is that the standard forms of advertising apply”
- “Definitely there is a difference between Google AdWords and the other forms”
- “A good few years ago, I thought that Facebook would start eating into the likes of AdWords or that kind of ‘pay per click’ approach”
- “AdWords is a different form because users are actually already looking for your product so that's where they find you”
- “It's not a huge amount of advertisement change I've seen for any different media”

Mat May @ Fusio:

- “Not much, we would have seen cases where apps might have been mentioned”
- “The reach is not immediate because you have to go from print to digital”
- “You have to make that physical move. We haven't seen it work well”
- “Advertising is about marketing the name of something and getting it in the back of somebody's head. It very rarely creates a direct download”
- “You can mention them from statistics, you can put up demand, you put up some marketing, and there is just not direct effect”

Cathal Greaney @ Irish Apps:

- “All the development in our business is related to our business processes, so we do not develop any apps, apart from demonstration or for charity purposes”
- “Everything we do is actually for the businesses, other entrepreneurs, other start-ups”
- “The marketing of the apps are very much down to them so we wouldn't really have a total opinion on that”
- “Personally, I think it would have a big influence”

Question 4 (Hedonic Motivation): Based on your professional subject knowledge and industry experience, what estimated percentage of fun apps versus functional apps is in place in Ireland today?

Jaime Casey @ Armour:

- “We would have done so far would be business and functional apps with the exception of one, which was the app that was built for teaching the Irish language, which would have been an educational app”
- “Look in analytics for a specific thing, but unless you have a massive sample set, you can't really tell for certain with any comparison”
- “We often see is that website subscriptions, we'll say Connaught Rugby, they have a huge percentage of mobile users, actually over half would be browsing the website using their mobile phone”
- “Others, are more business to business related, you would get much more desktop viewers”

Patrick McDonald @ Foto Store:

- “I can see definitely that there is a lean towards educational apps. I've got two young children so perhaps I see that more”
- “Definitely I can see there seems to be a push on the As Gaeilge apps, to learn Irish”
- “Seems that it there's a problem that can be solved by an app, an app will appear the next day”
- “I think it's even really”

Mat May @ Fusio:

- “I wouldn't have a realistic figure on that”

Cathal Greaney @ Irish Apps:

- “Almost all of our business is in the business to business or business to consumer side, and it's very much on the functional side”
- “That's what's come to us over the years and that's what we've specialised in”
- “We specialise in corporate, medical, automotive, engineering type apps”
- “If you are doing games, it's normally dedicated game type development house”
- “They are two very distinct areas”

Question 5 (Price Value): GAAGO, Sky Go and Youtube have been in the news regarding subscription charging models, by either creating a charging model at launch or by introducing fees after a number of years of the service available. Is this a future viable business model for Irish companies going forward?

Jaime Casey @ Armour:

- “Definitely, but it's all depends on a few different things”
- “What you might see is people signing up for the month and just not being engaged by the thing, so not using it and cancel”
- “Likes of Netflix [subscription] are a perfect example of something that has strived and which has been very successful”
- “Does not matter type of marketing machine, there are absolutely no guarantees”

Patrick McDonald @ Foto Store:

- “Absolutely yes. There is a tendency towards subscription based models”
- “Subscription business models have been around for centuries”
- “Take for example for your phone bill you know, you pay as you go or bill pay. You get the better phone when you go on bill pay”
- “Would like to take a little bit of money off someone regularly, rather than getting a chance of a little bit more once of. To have regular income is a great model”

Mat May @ Fusio:

- “In Ireland you have the chance of gaining revenue from subscription if you have a large international market, the internal market is too small”
- “In Ireland, the revenue that you will get back is no way near the cost of a decent app”
- “You have to always be looking international. If you do come up with an idea that is international and has a big enough following, then I certainly think you do”
- “It's a huge challenge because the content isn't free to create”
- “At the moment your new market, as a business model in Ireland, is advertising”

Cathal Greaney @ Irish Apps:

- “An app targeting a million+ users, then for sure, the freemium or subscription or the 80% free and 20% subscription content, it is viable. But only for volume type apps”
- “I think a pay as you go for specific content, is definitely going to be a bigger thing in the future because up to now it was more of a technological barrier to doing that”
- “I think it would be a matter of getting the physiology of it excepted and then using it, because, people forget that up to this point it wasn't possible technically to do”
- “It's why it was never done before”

Question 6 (Habit): As a development company, are there any strategies you can employ to entice the user to use the app automatically, rather than reverting to the desktop?

Jaime Casey @ Armour:

- “You can detect the mobile phone and add a splash page to download our latest app”
- “Could have functionality that would be almost exclusive functional to an app”
- “More access to the hardware on the phone so things like taking photographs, uploading them, use of the RAM, better use of the GPS, all that kind of stuff”
- “Big thing would be saving data to the phone itself, and all that kind of stuff is possible using a native app, and stuff that mightn't be possible using a mobile website”

Patrick McDonald @ Foto Store:

- “They [our consumers] won't really be on the desktop”
- “We assumed that everyone was searching for our product on the internet would have been searching for the app; there was a huge amount of desktops”
- “It was like 30% of our traffic is still desktops”
- “The word app will essentially mean service. It's a desktop app, it's a native app, it's a tablet app, and it's a watch app, they have to cater for all platforms”

Mat May @ Fusio:

- “I think in every situation it's different”
- “Ryanair is a good example because if you can consolidate the booking, the ticket, the check-in and everything in the app, in a very easy way, then I think that is excellent”
- “I think the easier that you can make it for a person they'll then go back and use it”
- “In other situations, such as online journalism, they would be making more money from the desktop version than they would for the mobile version because of the limits of the value of the advertising on mobile”

Cathal Greaney @ Irish Apps:

- “Just for the user experience to be superior. That's the only way that they will do it”
- “Up to recently, to very recently, the user experience has been superior on desktop”
- “You have to just really redesign, redesign, redesign, and iterate in order to make the mobile experience equal or superior to desktop experience”
- “Even right now, mobile is just an inferior user experience to desktop, when you're putting in your credit card details, when you're picking the date, it just does not come up properly”
- “You just have to design it were its equal or superior to the desktop experience”