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FACTORS THAT AFFECT THE ACTUAL USE OF M-GOVERNMENT FROM THE USER PERSPECTIVE: THE CASE OF ABU DHABI GOVERNMENT

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This dissertation is submitted in partial fulfilment of the requirements for the degree of Doctorate of Business Administration

Under the Supervision of Dr. Bronwyn Wood

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Declaration of Original Work

I, Sara Saleh Saeed Al Kayyoomi, the undersigned, a graduate student at the United Arab Emirates University (UAEU), and the author of this dissertation entitled "*Factors That Affect the Actual Use of M-government From the User Perspective: The Case of Abu Dhabi Government*", hereby, solemnly declare that this dissertation is my own original research work that has been done and prepared by me under the supervision of Dr. Bronwyn Wood, in the College of Business and Economics at the UAEU. This work has not previously been presented or published, or formed the basis for the award of any academic degree, diploma or a similar title at this or any other university. Any materials borrowed from other sources (whether published or unpublished) and relied on or included in my dissertation have been properly cited and acknowledged in accordance with appropriate academic conventions. I further declare that there is no potential conflict of interest with respect to the research, data collection, authorship, presentation and/or publication of this dissertation.

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Abstract

In recent years, the evolution of information technologies has shown vast growth. The popularity of and demand for mobile smartphones and applications also continue to grow, so governments are developing mobile business models and moving from electronic-government (e-government) to mobile-government (m-government) practices in order to enhance functioning and increase the efficiency and effectiveness of their services. However, there are very few pieces of systematic evidence related to m-government implementation and the level of actual use of m-government applications and services in less developed countries. Therefore, the current study aims to identify factors that affect Abu Dhabi citizens and residents' actual use of m-government applications. Moreover, this study examines the relationships between m-government service and technology characteristics, perceived ease-of-use and usefulness, user past experience, attitude toward m-government use, behavioral intention to use m-government, and actual use of m-government. In addition, 22 hypotheses are developed and tested using a sample of 279 m-government service users in Abu Dhabi, collected through a cross-sectional survey.

After developing and testing the conceptual model, the results show that the suggested m-government factors are crucial to achieving user adoption of m-government services while excluding the factors of accuracy, convenience, risk, and privacy.

Furthermore, the results of the study are expected to enhance the existing theorization of mobile technology factors that affect the user acceptance and actual usage of m-government services. From a practical perspective, this study provides a recommendation to decision makers and developers of m-governments in order to enhance and increase the level of actual usage of their applications and services.

Keywords: Abu Dhabi, Mobile-Government, Past Experience, Structural Equation Modeling, TAM, User Actual Use.

Title and Abstract (in Arabic)

العوامل المؤثرة على الاستخدام الفعلي للحكومة الإلكترونية المتنقلة في إمارة أبوظبي من وجهة نظر المستخدم

الملخص

مع التطور الهائل لتقنيات المعلومات وتزايد شعبية الطلب على الهاتف الذكي المحمول وتطبيقاته، بدأت الحكومات في تطوير نماذج الأعمال المتنقلة، والانتقال من الحكومة الإلكترونية إلى الحكومة الإلكترونية (المتنقلة) لتعزيز الطريقة التي تعمل بها ولزيادة كفاءة وفعالية خدماتها. بالرغم من ذلك، هناك القليل من الأدلة المنهجية المتعلقة بتطبيق الحكومة الإلكترونية المتنقلة في أقل البلدان نمواً وقياس مدى مستوى الاستخدام الفعلي للمستفيدين من التطبيقات والخدمات لهذا النوع من الخدمات الحكومية. لذلك، تهدف الدراسة الحالية إلى تحديد العوامل التي تؤثر على الاستخدام الفعلي للمواطنين والمقيمين في إمارة أبوظبي لتطبيقات الحكومة الإلكترونية المتنقلة. علاوة على ذلك، ستوضح هذه الدراسة العديد من الخصائص والخدمات مثل: العلاقات بين خصائص خدمة الحكومة الإلكترونية المتنقلة، خصائص تكنولوجيا الحكومة الإلكترونية المتنقلة، سهولة الاستخدام المدركة، الفائدة المتصورة، تجربة العملاء السابقة، الموقف من استخدام الحكومة الإلكترونية المتنقلة، النية السلوكية لاستخدام الحكومة الإلكترونية المتنقلة، الاستخدام الفعلي للحكومة الإلكترونية المتنقلة. إضافة إلى ذلك، تم تطوير 22 فرضية وتم اختبارها باستخدام عينة عددها 279 من مستخدمي خدمات الحكومة الإلكترونية المتنقلة في إمارة أبوظبي والتي تم جمعها من خلال المسح المقطعي.

بعد تطوير النموذج المفاهيمي واختباره، أظهرت النتائج أن عوامل الحكومة الإلكترونية المتنقلة المقترحة ضرورية لتحقيق اعتماد المستخدم لخدمات الحكومة الإلكترونية باستثناء العوامل التالية: دقة المعلومات او الخدمات المقدمة، الراحة في استخدام البرنامج الحكومي، المخاطر المحتملة من استخدام البرنامج وحماية خصوصية المستخدم للبرنامج الحكومي المتنقل.

من المتوقع أن تعزز نتائج الدراسة النظرية الحالية لعوامل تكنولوجيا الهاتف المحمول والتي تؤثر على قبول المستخدم والاستخدام الفعلي لخدمات الحكومة الإلكترونية المتنقلة. إما من الناحية العملية، ستقدم هذه الدراسة توصية عملية إلى صناع القرار والمطورين في الحكومات الإلكترونية المتنقلة من أجل تعزيز وزيادة مستوى الاستخدام الفعلي لتطبيقاتهم وخدماتهم.

مفاهيم البحث الرئيسية: إمارة أبوظبي، الحكومة الإلكترونية المتنقلة، التجربة السابقة للعملاء، نمذجة المعادلات الهيكلية، نموذج قبول التكنولوجيا، الاستخدام الفعلي للمستفيد من الخدمات.

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Dedication

This work is dedicated to the memory of the UAE's Founding Leader,
Sheikh Zayed Bin Sultan Al Nahyan, and to my beloved country, family, and friends.

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List of Abbreviations

AED	Emirati Dirham / United Arab Emirates Dirham
AVE	Average Variance Extracted
BI	Behavioral Intention
BTS	Bartlett's Test of Sphericity
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CMB	Common Method Bias
COVID-19	Coronavirus Disease 2019
CR	Composite Reliability
E-Commerce	Electronic Commerce
EFA	Exploratory Factor Analysis
EGDI	UN E-Government Development Index
E-government	Electronic Government
E-information	Electronic Information
EPI	E-Participation Index
GCI	Global Competitiveness Index
GCR	Global Credit Rating
GFI	Goodness-of-Fit Indices
GPRS	General Packet Radio Service
IB	Internet Banking
IBM	International Business Machines Corporation
ICT	Information and Communications Technology

IDRs	Issuer Default Ratings
IDT	Innovation Diffusion Theory
IMD	Institute for Management Development
IS	Information Systems
IT	Information Technology
ITU	International Telecommunication Union
KMO	Kaiser-Meyer-Olkin
M-commerce	Mobile Commerce
M-government	Mobile Government
MIS	Management Information Systems
MLE	Maximum Likelihood Estimates
MSA	Measurement of Sample Adequacy
M-technology	Mobile Technology
OSI	Online Services Index
PCA	Principal Component Analysis
PDAs	Personal Digital Assistants
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
SEM	Structural Equation Modelling
SMEs	Small and Medium Enterprises
SN	Subjective Norm
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
TDRA	Telecommunications and Digital Government Regulatory Authority

TII	Telecommunication Infrastructure Index
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
TTF	Task Technology Fit
UAE	United Arab Emirates
UN	United Nation
UNDESA	United Nations Department of Economic and Social Affairs
USD	US Dollar / United State Dollar
UTAUT	Unified Theory of Acceptance and Use of Technology
WAPS	Wireless Application Protocol Services
WCY	World Competitiveness Yearbook

Chapter 1: Introduction

1.1 Overview

Over the last decade, information systems technology has shown exponential growth. There has also been an increased demand for efficient and effective government services. Combined, this growth and demand have brought about an unprecedented change in the way governments provide services to their citizens. This change has arisen mainly as a result of employing information technologies in the governmental sector (Almarashdeh & Alsmadi, 2017; Wang, 2014). Such change has the benefit of facilitating the growth of new services, which improve and increase communications between a government and its citizens, and has been indicated in the information technology literature as a significant means of improving governments' outputs (Madden et al., 2013; Walravens, 2015). Many countries, states, and cities have embraced e-government to deliver online services and circulate more information to residents, businesses, other governing institutions, etc. (Moon, 2004; UN e-Government Survey, 2014). The increasing popularity of mobile technologies has led businesses to develop mobile commerce models, which alters government's approach to delivering its services through mobiles devices as well as electronic sources (Sharma & Gupta, 2004).

Within the context of electronic government (e-government), mobile government (m-government) is considered a smaller element (Lallana, 2004b) that offers more accessible information and services for residents, non-profit organizations, and businesses through wireless communication networks and mobile devices, such as Personal Digital Assistants (PDAs), pagers, mobile phones, and their supporting systems (Amailef & Lu, 2008; Moon, 2004). The recent development of mobile communications technology has encouraged several governments across the world to move from e-government to m-government (Al-khamayseh et al., 2006; Antovski & Gusev, 2005; Wang, 2014). Therefore, one of the most common technologies is mobile technology, which has significantly changed communication, learning, and, most importantly, human–computer interactions (Liaw et al., 2010).

Many areas continue to appear as common research agendas of the Information Technology (IT) area, including antecedent models for acceptance of IT applications (Ayeh, 2015; Djamasbi et al., 2010; Lin & Kim, 2016), end users' attitudes (Abzari et al., 2014; Almarashdeh, 2016; Fishbein & Ajzen, 1980; Liu et al., 2014), and end users' behavioral intentions (Lee et al., 2013; Shareef et al., 2016).

M-government is an important subject for both developed and developing countries. The former have already moved toward m-government adoption over the last decade, while the latter are showing a keen interest in implementing it (Abdelghaffar & Magdy, 2012). M-government in the UAE is at an early stage compared with the progress in developed countries such as the UK, yet it has already been used to run businesses more efficiently as mobile communications are becoming more readily available. Consequently, this study also aims to determine users' actual use of m-governments by detecting the factors that play a significant role from end users' perspectives. The main purpose of this research, therefore, is to understand the actual use of m-government by Abu Dhabi citizens. The research model is based on the technology acceptance model (TAM), which is used to investigate antecedents of the actual use of m-government applications.

It is worth clarifying that m-government and e-government are not considered two separate entities. E-government comprises the usage of all technologies in order to deliver services to residents, develop government activities, and streamline processes. M-government is an addition to e-government but its use is narrowed as it is confined to the use of mobile technologies such as mobile smart phones, PDAs, Wi-Fi devices, and Bluetooth and wireless networks for delivering services.

The introduction chapter is organized as follows: First, an outline of general mobile government in developing countries, specifically in the UAE is provided. Next, a brief background and statement of the problem are outlined. The study's significance and contributions, research objectives and questions, and the researcher's motivation are then delineated. Last, research assumptions and limitations, the dissertation outline, the definition of terms, and the conclusion are discussed.

1.1.1 Mobile Government in Developing Countries

Mobile technology (m-technology) has emerged as the next wave of the IT revolution. Its advantages come mainly from two unique features: "mobility" and "wireless ability". Mobility is the most noted advantage of m-technology, as all mobile devices (laptops, PDAs, mobile phones, tablets, PCs, etc.) free users from physical ties to the desktop. The wireless feature of m-technology refers to the information-transmitting method between a computing device and a data source transmitter without a physical connection. In recent years, the use of mobile devices has shown phenomenal growth. This growth is due to several factors, including the low cost of mobile devices, the fact that mobile devices are the only infrastructure option for many developing and/or undeveloped countries, changes in people's lifestyles, and the increased functionality of mobile devices.

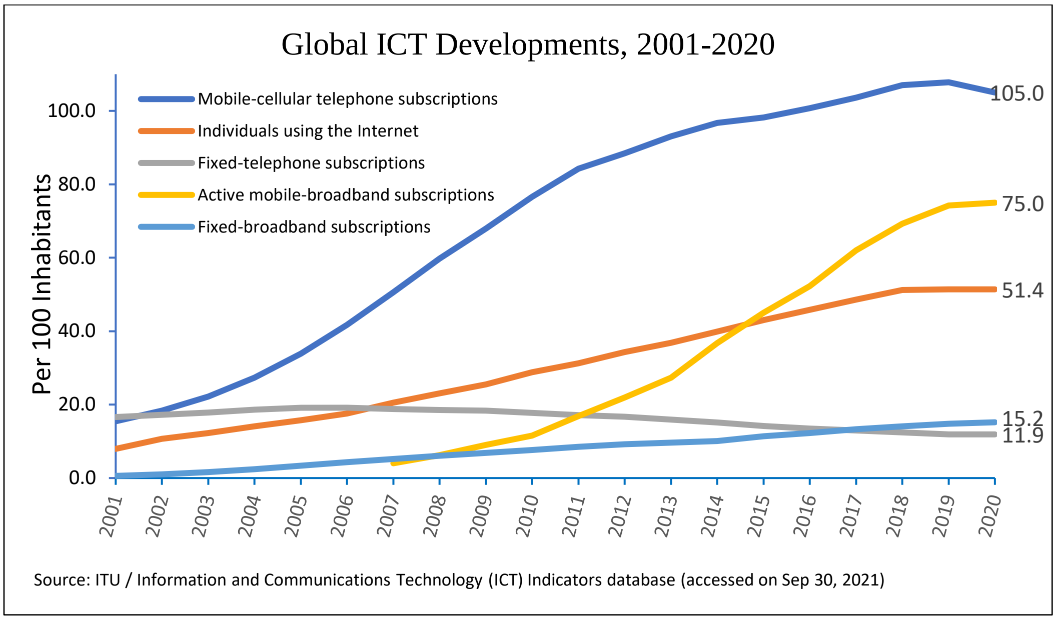


Figure 1: Global ICT Developments, 2001–2020 (Estimated)

According to International Telecommunication Union (ITU) statistical data, illustrated in Figure 1, the number of mobile broadband users surpassed the number of wired users starting from the end of 2007 and continued to increase gradually into the present. Similarly, mobile cellular phone subscriptions dramatically increased over time.

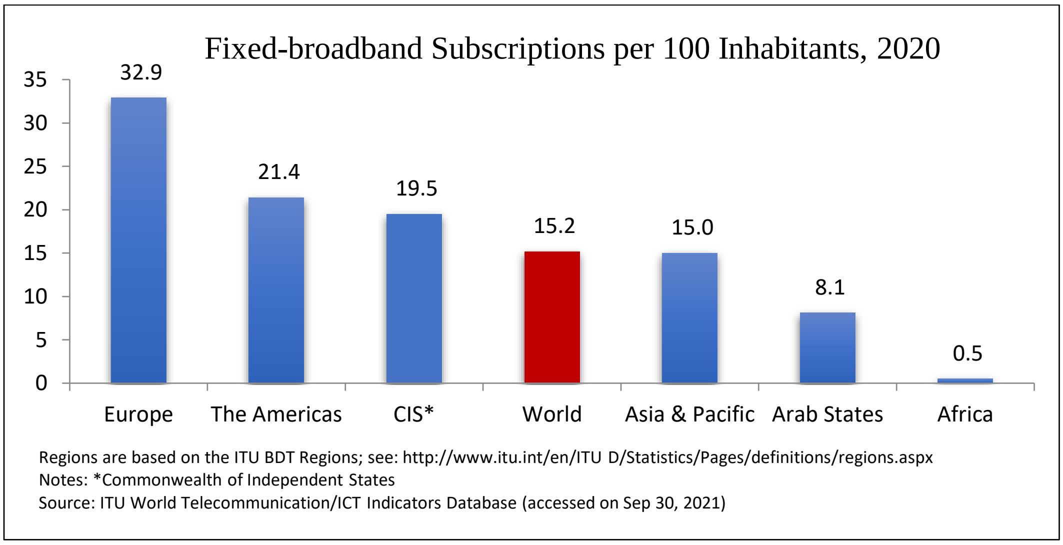


Figure 2: Fixed-broadband Subscriptions per 100 Inhabitants in 2020 (Estimated)

In developing countries, mobile phones clearly dominate whereas fixed telephone line subscriptions remain the exception. In Africa, for example, the fixed line penetration rate in 2020 was 0.5 per 100 inhabitants, by far the lowest in the world, as shown in Figure 2 (Global ICT Developments, 2020).

The limited availability of fixed lines has been a barrier to the application of fixed broadband; it is probable that Africa's broadband market will be led by mobile connections. Falling prices of mobile devices and the increased licensing and availability of mobile networks are expected to support this over the coming years (Patel & White, 2005). Country-wide wireless coverage has contributed to the fact that mobile subscriptions have a higher penetration compared to land lines—even in remote and rural areas—specifically in developing parts of the world that suffer from a lack of telecommunication infrastructure (Kushchu & Kuscu, 2003). Therefore, m-government is mostly suited as a solution for urban areas of developing countries where fixed-line Internet access rates are low, but mobile device usage and subscription penetration are growing rapidly (Lallana, 2004b).

Dixit (2009) stated that the number of mobile users is increasing in developing countries. More people than ever own and use mobile devices, which makes them capable of accessing m-government and m-services. Consequently, mobile devices more easily connect people to the Internet compared with fixed devices. In Ghana, for example, urban citizens are using mobile devices to enjoy an "Internet experience" through wireless application protocol services, powered by general packet radio service. Likewise, m-government has the ability to access remote areas, as mobile devices can cover and reach those areas when the necessary infrastructure setup of wired Internet networks is difficult and costly. In developing countries, m-government services may become a crucial method to reach citizens who are further away from the city, as well as promoting communication exchanges between the government and its people. In countries lacking conventional telecom infrastructures and with a greater acceptance of mobile devices, the problem of reaching rural areas could be solved by focusing on mobile technologies. Therefore, m-government supports the inclusion of the most marginalized people in society. M-government also enables individuals to access needed services wherever they are, and at low cost, as mobile devices are relatively inexpensive compared to other technologies.

In addition to Dixit (2009), several other researchers (Jalote, 2018; Jotischky & Nye, 2011; Ojo et al., 2013) have focused on the value of mobile technologies in terms of benefiting rural citizens of developing economies. In countries where the majority of the population lives in rural areas, e-government faces implementation difficulties because the infrastructures are not established and well-developed; thus, m-government is the best solution for delivering services to all community members (Ghyasi & Kushchu, 2004).

1.1.2 Mobile Government in the UAE

In this study, the UAE government and its smart services will be evaluated against global indexes that reflect government readiness and capability levels. These will include the following: Global Credit Rating (GCR), Global Competitiveness Report of the World Economic Forum, Institute for Management Development World Competitiveness Yearbook, The United Nations E-Government Survey, and Global Digital Competitiveness.

1.1.2.1 Global Credit Rating

The GCR reflects the creditworthiness of federal government entities and the capability of drawing sustainable growth plans for the country. The GCR maintains the highest performance standards for credit control backed by a large group of strength factors. Accordingly, the UAE is highly ranked with a stable outlook by international credit rating institutions, such as Fitch Ratings, Inc. and Moody's Rating (Global Credit Rating, 2020).

Rating by Fitch

Fitch Ratings, Inc., a US credit rating agency, bases its score on 18 indexes that mainly measure the financial, economic, monetary, and banking sectors of an organization, in addition to foreign trade and balance of payment. Fitch issues its forward-looking credit ratings as views on the relative ability of an institution or entity to meet its financial commitments. Issuer default ratings are assigned to sovereign entities, corporations, and financial institutions, such as leasing companies, insurers, banks, public finance entities, and local and regional governments.

In November of 2020, Fitch rated the UAE federal government as AA- with a stable outlook. Such a high rating at a time when the world was trying to cope with the effects of the COVID-19 pandemic emphasizes the UAE's resilience, ability to overcome economic challenges, and potential to develop creative financial, economic, and monetary policies that enable it to weather crises. The rating report estimates that the total consolidated assets of the UAE's sovereign funds stood at USD$1.3 trillion (around AED 4.76 trillion) in addition to its large oil and gas reserves (Global Credit Rating, 2020).

Rating by Moody's

In December of 2020, Moody's, an international rating agency, gave the UAE government a creditworthiness rating of Aa2 with a stable outlook for the national economy. The UAE received the highest sovereign rating in the region.

Moody's report of the UAE's sovereign credit profile indicated that the credit strength of the UAE was supported by high per capita Gross domestic product, strong and broad international relations, and high internal stability. Moody's report also stated that the UAE presented strong institutional effectiveness by diversifying its revenue base and spearheading reforms.

As for the outlook of the national economy, Moody's report was supported by the upward potential from continuing diversification efforts, the stable outlook of the sovereign credit rating, and the UAE's compliance in emergency commitments associated with government and geopolitical tensions (Global Credit Rating, 2020).

1.1.2.2 Global Competitiveness Report of the World Economic Forum

The World Economic Forum publishes its Global Competitiveness Report annually. This report evaluates countries based on the Global Competitiveness Index (GCI), which maps the competitiveness landscape of 141 economies via 103 indicators organized under 12 pillars. This index uses a scale between 0 and 100 for each indicator, and the final score shows how close each economy is to the ideal state (100) on the competitiveness frontier.

Performance Indicators

The report evaluates and measures countries using 103 indicators that are spread across 12 pillars. The 12 pillars are: business dynamism, financial system, health, Information and Communications Technology (ICT) adoption, infrastructure, innovation capability, institutions, labor market, macroeconomic stability, market size, product market, and skills.

UAE Global and Regional Ranking

The UAE was ranked first in the Arab region, and 25th globally, in the Global Competitiveness Report 2019 issued by The World Economic Forum. According to the report, which assesses a country's competitiveness within 141 economies, the UAE's global rank climbed two positions since the previous report in 2018. The UAE led the world in mobile-broadband subscriptions, low inflation, debt dynamics, and credit gap as shown in Figure 3.

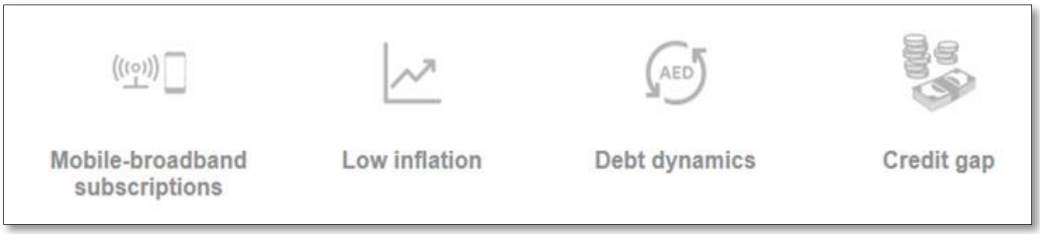


Figure 3: Areas in which the UAE is Highly Ranked

The UAE came in second globally with regard to ICT adoption, electricity access, mobile-broadband subscriptions, and internal labor mobility. The UAE was third worldwide in the government's responsiveness to change, and fourth for the following indicators: efficiency of legal framework in challenging regulations, legal framework's adaptability to digital business models, burden of government regulation, future orientation of government, pay and productivity, fiber Internet subscriptions, public-sector performance, and venture capital availability.

The UAE came in fifth for the rankings of Internet users, distortive effect of taxes and subsidies on competition, and growth of innovative companies; it occupied the sixth place in domestic competition and the efficiency of its legal framework while settling disputes. It also took seventh place in security, quality of road infrastructure, trade openness, efficiency of air transport services, attitude toward entrepreneurial risk, and organized crime impact on businesses.

The UAE ranked eighth globally in the government's ability to ensure policy stability, critical thinking in teaching, ease of finding skilled employees, entrepreneurial culture, and transport and infrastructure. The UAE ranked ninth in homicide rates per 100,000 population, hiring and firing practices, prevalence of non-tariff barriers, financing of Small and Medium Enterprises SMEs, state of cluster development, and companies embracing disruptive ideas (Global Competitiveness Report, 2020).

1.1.2.3 IMD World Competitiveness Yearbook

The Institute for Management Development (IMD) World Competitiveness Yearbook (WCY) is issued annually by the World Competitiveness Centre. The WCY evaluates and assesses 63 countries on 338 indicators, which are bundled under four factors: government efficiency, economic performance, business efficiency, and infrastructure. Each of these four factors are further sub-divided into five factors for a total of 20 sub-factors; these are detailed in Figure 4.

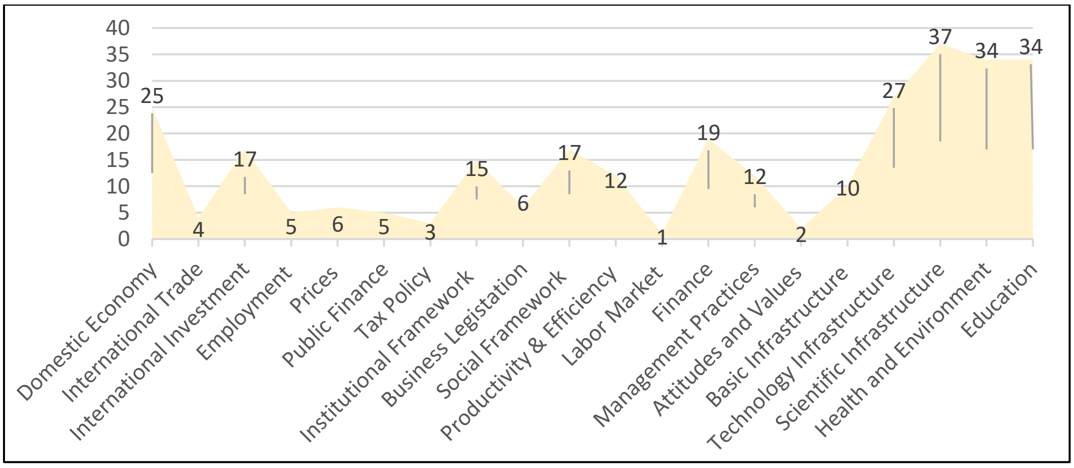


Figure 4: The UAE's Performance with Respect to the IMD's 20 Sub-factors

The UAE occupied ninth place in the IMD WCY 2020. The UAE is the only Arab country that has continued to maintain its position among the top 10 countries for four years in a row. It is far ahead of many other developed countries, such as Finland, Germany, Ireland, Luxembourg, the United Kingdom, the United States of America. The UAE's performance under the four main factors occupied third position for government efficiency, fourth for economic performance, seventh for business efficiency and 28th for infrastructure as Figure 5 shows.

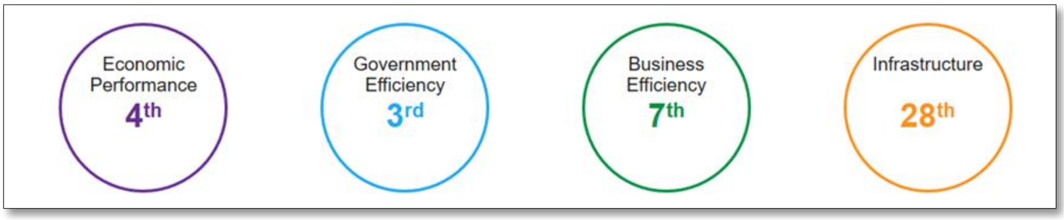


Figure 5: The UAE 's Performance with Respect to the IMD's Main Factors

The UAE showed a global-rank improvement in seven of the 20 sub-factors: labor market (first), attitudes and values (second), employment (fifth), pricing (sixth), social framework (17th), technology infrastructure (27th), and health and the environment (34th). The UAE was also ranked first across 23 indicators, including: bureaucracy absence, redundancy costs, immigration laws, low central government foreign debt, percentage of collected personal income tax, percentage of collected indirect tax revenues, real personal taxes, tax evasion, the percentage of females in parliament, competent senior managers, labor force out of the total population, industrial disputes and foreign labor force, working hours, dependency ratio, public-private partnership, and environmental laws. In addition, the UAE was ranked fifth in

59 indicators and tenth in 106 indicators (IMD World Competitiveness Yearbook, 2020).

1.1.2.4 The United Nations E-Government Survey

The United Nations E-Government Survey reviews the development rate of digital transformation for the governments of the 193 member states of the UN. It addresses the various programs that use ICT to provide faster and better services to the public under the various segments of society. The UN E-Government Survey is published biennially and is issued by the UN's Department of Economic and Social Affairs (UNDESA). The survey measures and evaluates e-government's effectiveness in delivering its services to the public; it also identifies patterns in the performance and development of e-governments. The UN E-Government Development Index (EGDI) is used by the survey to track the progress of e-government development. The EGDI assesses the development of e-government at the national level using three sub-indexes: Online Services Index (OSI), E-Participation Index (EPI) and Telecommunication Infrastructure Index (TII) (UN E-Government Survey, 2020a).

Arabic Version of the UN E-Government Survey

As the UAE aims to leverage global experiences and benchmarks to develop and enhance the digital transformation in Arab countries, the Telecommunications and Digital Government Regulatory Authority (TDRA) of the UAE translated and, along with the UN, issued an official Arabic version, of the UN E-Government Survey. TDRA partnered with UNDESA to produce and disseminate the Arabic version of the Survey in 2018, when TDRA successfully issued the first Arabic version of the UN E-Government Survey in 2018.

TDRA's decision to release the Arabic language survey was based on several considerations, such as the Arabic language uniting the culture and knowledge of about

450 million people. Moreover, Arabic is the official language of 25 countries and the national language of minorities across six countries. In addition, as the survey highlights global and regional cooperation in general, and digital transformation in particular, it is essential to achieve excellence and leadership in digital transformation, particularly in e-government development, digital participation, digital services, and ICT development, in order to enhance the digital lifestyle. Therefore, the UAE is keen to share its experiences with others and to broadcast distinguished global experiences to everyone in the Arabic region (Arabic Version of the E-Government Survey, 2020)

UN E-Government Survey

The 2020 UN E-Government Survey focused on the country's role of serving the UN's Sustainable Development Goals for 2030 as well as the role of digital transformation programs in bridging the gap between various sectors of society. The survey addressed the government programs that engaged customers during the development of services, as well as programs and policies for everyone's benefit. The following section covers the UAE's achievements and ranking in the UN E-Government Development Index (EGDI) of 2020.

United Nations E-Government Development Index 2020

As previously mentioned, the EGDI evaluates and measures the capacity and readiness of national institutions to apply ICTs in order to deliver public services. The UAE ranked 21st globally in the overall UN EGDI, maintaining its place among the 25 leading countries. At the worldwide level, Denmark topped the EGDI.

Online Services Index 2020

The Online Services Index (OSI) has a model of e-services' maturity consisting of four stages. The first stage is when the government provides the public with online information. The second stage entails the enhancement of information, where the government provides more policies, regulations, laws, reports, statistics, and downloadable publications. During the third stage, the government provides procedural services, achieved via mutual interaction between the government and the user or customer. The fourth stage provides more advanced and connected services. In the OSI, the UAE ranked first in the Gulf Cooperation Council (GCC) and the Arab regions, fourth place in the Asiatic region, and eighth place globally.

E-Participation Index 2020

The E-Participation Index (EPI) is a supplementary index to the UN E-Government Survey. It extends the survey's dimensions by focusing on the government's usage of online services to disseminate information to its residents with a tool called e-information sharing, as well as engaging in decision-making processes (e-decision-making) and interacting with stakeholders (e-consulting).

According to the e-Participation Index, the UAE moved up one global position to 16th in 2020. The USA, Republic of Korea, and Estonia ranked the highest in the EPI.

Telecommunication Infrastructure Index 2020

The Telecommunication Infrastructure Index (TII) praised the telecom infrastructure strength in the UAE and its mobilization of emerging technologies in order to provide advanced government services to its citizens. The report also highlighted several strategies set forth by the UAE government that are related to digital government transformation, such as Smart Dubai 2021, Artificial Intelligence Strategy, and the Emirates Blockchain Strategy 2021. The UAE ranked seventh globally in TII. Table 1 shows a comparison of the UAE's rankings in the past three editions of the UN E-Government Survey.

Table 1: UAE's Rankings in the UN E-Government Survey, 2016, 2018, and 2020

Index	2016	2018	2020
E-Government Development Index (EGDI)	29	21	21
Online Services Index (OSI)	8	6	8
E-Participation Index (EPI)	32	17	16
Telecommunication Infrastructure Index (TII)	25	2	7

Source: Telecommunication Infrastructure Index (TII) (25 Apr 2021)

1.1.2.5 Global Digital Competitiveness

The published issues of the IMD World Digital Competitiveness Center’s report on the digital competitiveness between countries measures their capabilities to explore and adopt digital technologies that change government practices. The IMD World Digital Competitiveness Ranking’s 2019 report showed that the UAE ranked first in the Arab region and 12th worldwide, advancing five positions from 2018. The UAE took first place in the Arab region across all three main factors of IMD World Digital Competitiveness: technology, future readiness, and knowledge. Globally, the UAE ranked second under the technology factor, ninth under the future readiness factor, and 35th under the knowledge factor.

The report justified the UAE’s progress on the basis of improvements in training, education, and in the regulatory framework of starting a business, as well as the effectiveness of scientific legislation, and a positive shift in IT integration—mainly because of the improvement in delivering models of government services through electronic channels (IMD World Digital Competitiveness Ranking Report, 2019).

Table 2 demonstrates key figures and indicators for UAE, which confirm its strong capabilities, competencies, and readiness for providing m-government services across the seven emirates (Abu Dhabi, Ajman, Dubai, Fujairah, Ras Al-Khaimah, Sharjah, and Umm Al-Quwain). M-government services can be accessible to residents via their mobile devices using data plans offered by the two national telecom service providers in the UAE—Etisalat and Emirates Integrated Telecommunications Company (known as DU).

Table 2: Key Findings for UAE Worldwide Rank

Indicators	Ranking
Mobile-broadband subscriptions per 100 population	1
ICT adoption	2
Mobile-cellular phone subscriptions per 100 population	2
Government's responsiveness to change	3
Fiber Internet subscriptions per 100 population	4
Efficiency of legal framework in challenging regulations	4
Burden of government regulation	4
Legal framework's adaptability to digital business models	4
Future orientation of government	4
Percentage of Internet users of the adult population	5

Source: Global Competitiveness Index (2019) Edition

Today, m-government applications are available on both the Apple App Store and Google Play. There are more than 100 mobile applications of both federal and local government entities. In addition, about 1,800 government services are available online. Furthermore, the UAE is the first government in the world to introduce an app store complete with all of its government apps (UAE Government Apps). UAE’s m-government is working on one single app that will enable end users to access more than 4,000 local and federal government services. Five years ago, during the World Government Summit, the UAE government announced the launch of the “Best M-Government Service Award”. This is an annual global award that aims to strongly motivate and encourage government units to begin developing and providing innovative solutions and initiatives through smartphone applications. It will also guarantee full round-the-clock access to efficient, easy-to-use, and transparent government services in order to meet users’ needs and exceed their expectations.

1.2 Background of the Problem

The main driver enforcing and deploying m-government in the UAE is His Highness (H.H.) Sheikh Mohammed bin Rashid Al Maktoum, vice-president and prime minister of the UAE and ruler of Dubai. In 2013 he ambitiously said, “A successful government reaches out to the people rather than wait for them to come to it” (Wam, 2013).

In May of 2013, His Highness encouraged all federal and local government agencies to open service channels via mobile phones and devices and make them fully available and functional round-the-clock by 2015. The main purpose was to facilitate government services and make them more accessible. In addition, this would ensure a more convenient means of obtaining services for citizens. This was also helped at an eminently substantial reduction in waiting time at the government customer service centers during working hours.

The m-government initiative draws its strength from the UAE’s accomplishments associated with infrastructure and economic development, a substantial mobile phone market, and a high level of individual use. In addition, the UAE has one of the world’s leading infrastructures in the communication field. The m-government initiative was declared and launched at the Mobile Government Forum in 2013 and was chosen at a time when mobile phone usage was at its peak. It was projected that about 14 million phones would be used in the UAE—an average of slightly below two phones per capita (Wam, 2013).

In May of 2015, after the given period for implementing and deploying m-government was finished, H.H. Sheikh Mohammed bin Rashid Al Maktoum met with officials to review the report on the results of the transition to m-government. The report showed an overall transition of 96.3% as shown in Figure 6 (Wam, 2015).

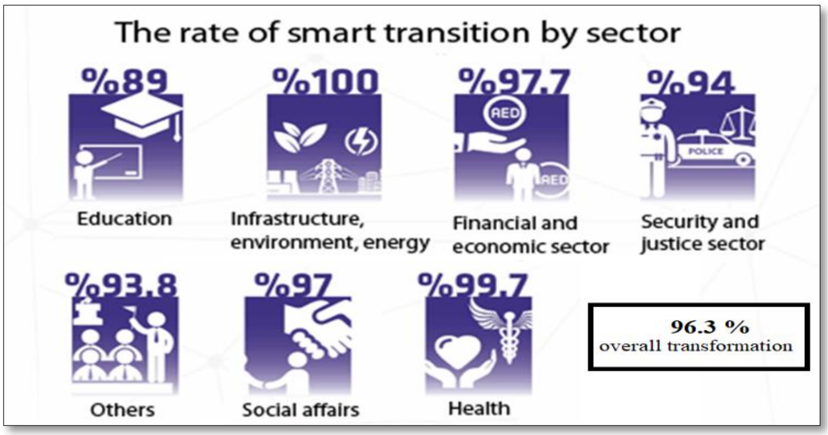


Figure 6: Rate of M-government Transition by Sector.

However, the final report also showed a low number of m-government users in 2015. Despite the fact that the UAE government had allocated about AED 200 million for the implementation of the m-government project (as declared by Hamad Al Mansoori, general director of the UAE m-government), the main successful measure of the project—the actual use of m-government—was not achieved (The Official Portal of the UAE Government, 2015).

Debusmann (2015) reported that 65% of UAE citizens surveyed had never used m-government applications, although 96% had smartphones. Moreover, the survey found that 71% of respondents had installed fewer than 10 m-government apps, which indicates that there is an adoption problem of m-government services in the UAE (Khaleej Times, 2015).

Staying consistent with the results at the UAE level, the same conclusion has been found across several studies. For example, although the role of m-government applications is critical in providing and maintaining effective governmental services, and the fact that huge investment is needed for the development of most m-government applications they fail to be accepted by e- and m-government end users (Abdelghaffar

& Magdy, 2012; Alampay, 2003; Bélanger & Carter, 2008; Carter & Belanger, 2004; Chen et al., 2016; Gang, 2005; Jyoti & Yogesh, 2005; Kettani & Moulin, 2014; Kumar & Sinha, 2007; Lallana, 2004b; Lawson-Body et al., 2014; Liang & Lu, 2013; Liu et al., 2014; Nasri & Abbas, 2015; Osman, 2013; Rabaai, 2015; Reddick, 2014; Song & Cornford, 2006; Wang, 2014).

Although, there is evidence that m-government applications are highly beneficial for both governments and users (Al-Khouri & Bal, 2007; Al-Mamary et al., 2015). From the user's perspective, m-government services are more convenient compared to e-government or customer service centers, because it gives them access at any time and from any place through their smart devices (Almarashdeh & Alsmadi, 2017). Also, m-government services contribute to saving users money, time, and effort by providing access to government services and information anywhere and at any time (Almaiah & Alismaiel, 2019; Almaiah et al., 2016; Alshehri et al., 2012). From the government's perspective, these services make modifying and delivering new content or information to users relatively easy compared to previous approaches, and enables the government to reach a wider audience—in particular, citizens of rural areas and those who are not computer literate (Almaiah et al., 2020). However, the success of any system, including m-government, is determined by and mainly dependent upon the number of individuals that use it (Bélanger & Carter, 2008; Carter & Bélanger, 2005). In m-government services, user acceptance is vital in achieving success (Almaiah & Alismaiel, 2019; Almaiah et al., 2016; Alshehri et al., 2012).

1.3 Statement of the Problem

Organizations are adopting new technology and enjoying visible benefits therefrom despite the fact that technology requires huge investment to develop and acquire. However, non-acceptance by end users continues to be a problem. With regard to m-government, this problem has been noted across several studies and contexts. The literature of m-government adoption using TAM has mainly focused on measuring the intentional behavior of using m-government applications. Furthermore, most researchers have used the TAM without including the external variables that affect its two main beliefs. Therefore, there is a need to measure the effects of external factors on actual use of m-government services (Eid et al., 2020). The aim of this research is to investigate the actual use of m-government; specifically, it seeks to identify the most significant factors that affect the actual use of m-government services in Abu Dhabi.

1.4 Significance and Contributions of the Study

1.4.1 Significance and Contributions of the Study from the Literature

As previously mentioned, the main challenge faced by m-government in the UAE is user acceptance of m-government applications or services. Heeks (2008) argued that there is a need to study and understand factors affecting the adoption of e-government services, similarly to m-government services. He stated that only 15% of e-government implementations are successful, which indicates a high failure rate. The key issue with the high failure rate of e-government developments is the lack of knowledge about factors that may help end users to accept e-government services (Sang & Lee, 2009). However, most previous literature on e-government has concentrated on factors affecting the acceptance of e-government services, overlooking the factors affecting users' acceptance of m-government services (Hung et al., 2013). In addition, it is inappropriate for m-government application to be built and developed based only on non-mobile services' delivery factors or e-government acceptance factors, while overlooking those of m-government services (Hung et al., 2013; Liu et al., 2014; Wang, 2014). To date, research on m-government applications is very limited (Almarashdeh & Alsmadi, 2017; Amailef & Lu, 2013; Bertot et al., 2010; Chen et al., 2016; Jaeger, 2003; Kraemer & King, 2003; Liu et al., 2014; Vogel et al., 2010; Welch et al., 2005; Wu et al., 2009). A similar conclusion was found with regard to the UAE as Almuraqab and Jasimuddin (2016) stated, there is a scarcity of studies in the UAE context regarding factors that affect the adoption of m-government. Likewise, Eid et al. (2020) recommended investigation of the factors that influence actual usage of m-government services in the UAE.

Among the few m-government studies to date, there have been two main focuses: the supply side and the demand side (Sultana et al., 2016). The supply side focuses on examining the challenges faced by m-government implementation from the government's perspective; for example, financial resources, skilled personnel, IT infrastructure, and resistance to change (Lai & Chuah, 2010). On the other hand, demand-side studies focus on the adoption of m-government services from the demand or user perspective (Hung et al., 2013); for example, trust, perceived usefulness, perceived ease-of-use, prior experience, and attitude (Sultana et al., 2016). However, there are fewer studies on the demand side versus the supply side (Hung et al., 2013; Wang & Chen, 2012). The present research aims to fill this gap by studying residents' acceptance of m-government particularly from the demand side. This study also aims to solve a critical challenge faced by m-government in the UAE as the m-government topic is aligned with national agendas and strategies such as UAE National Agenda, UAE Vision 2021, National Innovation Strategy, The Emirates Blockchain Strategy 2021, Telecommunications and Digital Government Regulatory Authority (TDRA) Strategy, and Abu Dhabi Economic Vision 2030.

1.4.2 M-government Alignment with UAE Strategies

1.4.2.1 UAE National Agenda

In 2014, H.H. Sheikh Mohammed bin Rashid Al Maktoum launched a seven-year UAE National Agenda in order to translate Vision 2021 into reality. The UAE National Agenda was developed by more than 300 officials from 90 local and federal government entities. The agenda included a set of national indicators across seven sectors: healthcare, economy, education, police and security, housing, infrastructure, and government services. The National Agenda focused on six national priorities as the key emphases of government strategy: cohesive society and preserved identity, safe public and fair judiciary, competitive knowledge economy, a first-rate education system; world-class healthcare; and sustainable environment and infrastructure (National Agenda, 2014).

The cohesive society and preserved identity pillar strives to preserve a unified society that is proud of its identity has a strong sense of belonging. Therefore, the UAE promotes an inclusive environment that integrates all segments of society while preserving the UAE’s unique heritage, culture, and traditions, and reinforces social and family cohesion. Furthermore, the National Agenda aims to make UAE among the best countries in the world according to the Human Development Index.

The safe public and fair judiciary pillar aims to make the UAE the safest place to live in the world. Thus, the UAE seeks to reinforce its citizens’ sense of security by trying to achieve a leading position in the areas of security, reliability of police services, emergency preparedness, and road safety. In addition, the National Agenda emphasizes the importance of a fair and active legal system that guarantees the rights of individuals and businesses, and makes the UAE’s judicial system among the fairest and most efficient systems in the world.

The competitive knowledge economy pillar aims to make the UAE a major economic player at the international level. Consequently, this pillar concentrates on forming the UAE into the economic, tourism, and commercial capital chosen by more than two billion people. This is expected to be achieved by transitioning the UAE to a knowledge-based economy—investing in innovation, research, and development—while working on strengthening the regulatory framework set for the key sectors and encouraging sectors that add high value. These will improve the business environment of the country and increase its attractiveness to foreign investors.

The first-rate education system pillar emphasizes development that will involve a conversion of the entire current education system and its teaching methods. The National Agenda aims to equip all education entities—such as schools and universities—and their students with smart devices and systems as a basis for all teaching methods, projects, studies, and research. There will be significant investment in promoting and reinforcing preschool enrollment, as this stage is critical in shaping children's personalities and, consequently, their future. Moreover, the National Agenda's goal is to enable UAE students to rank among the best in reading, mathematics, and science, as well as to have strong Arabic language ability.

The world-class healthcare pillar emphasizes the important role of preventive medicine and seeks to reduce lifestyle-related diseases such as cardiovascular diseases and diabetes, ensuring a healthier and longer life for its citizens. Moreover, the Agenda aims to increase the healthcare system's readiness to efficiently deal with health risks and epidemics. This will help the UAE rank among the best countries in the world in terms of healthcare service quality.

The sustainable environment and infrastructure pillar works to ensure sustainable development while preserving the environment, as well as attaining a balance between social and economic development. To do so, the Agenda focuses on improving air quality, protecting water resources, increasing clean energy involvement, and implementing green growth plans. The Agenda also highlights the importance of infrastructure and aims to make the UAE among the best countries in the world in terms of its quality of airports, road infrastructure, ports, and electricity. In addition, leading telecommunications infrastructure will allow the UAE to become a forerunner in the provision of smart services. Therefore, the Agenda sets the standard for all governments by making the UAE the forerunner in the provision of Smart services.

1.4.2.2 United Arab Emirates Vision 2021

H.H. Sheikh Mohammed bin Rashid Al Maktoum launched UAE Vision 2021 at the closing of a cabinet meeting in 2010. The Vision is set to make the UAE among the world's top-ranking countries across various indicators by its Golden Jubilee (Year of the 50th – The UAE turns 50 in 2021). In order to translate this Vision into reality, its pillars are plotted into four national priorities per the key focus sectors of government action. The four pillars are: united in prosperity, united in knowledge, united in destiny, and united in responsibility. M-government falls under united in prosperity and united in knowledge. United in prosperity has four categories: first-rate education, long and healthy lives, well-rounded lifestyles, and well-preserved natural environment. M-government is part of the well-rounded lifestyles category, as the UAE government works to provide residents with world-class infrastructure, leisure resources, and services. It also creates a rich environment where citizens can enjoy well-rounded and fulfilling lives. United in knowledge comprises three categories: knowledge-based and highly productive, sustainable and diversified economy, and harnessing the full potential of human capital. M-government is part of the knowledge-based and highly productive category, as government services and legal frameworks will be designed to provide efficient environment for businesses so that they can grow, thrive, and commercialize innovative ideas (UAE Vision, 2010).

1.4.2.3 National Innovation Strategy

In October 2014, H.H. Sheikh Mohammed Bin Rashid launched a National Innovation Strategy that aimed to make the UAE one of the most innovative nations in the world within a timeframe of seven years. The National Innovation Strategy is divided into seven sectors where innovation is a key factor of excellence: renewable energy, education, transport, health, water, technology, and space. The first phase of the strategy includes 30 national initiatives to be achieved within three years. These initiatives include: new legislation, innovation incubators, private sector incentives, international research partnerships, investment in specialized skills and an innovation drive within government (National Innovation Strategy, 2014).

1.4.2.4 The Emirates Blockchain Strategy 2021

According to Forbes ® and IBM ®, blockchain is defined as a shared, immutable real-time ledger used for recording the history of financial transactions, physical assets, contracts, supply chain info, etc. It also offers a permissioned network with known identities. There is no one in charge of the entire chain—it is open to everyone—and each user can see the details of each record, called a block.

The blocks are encrypted and time-stamped. The only individual who can edit a block is the one who owns it. Individuals or owners gain access to their block via a private key that only they own. When there are changes to an individual block, everyone's distributed blockchain is edited, updated, and synced in real time.

The Emirates Blockchain Strategy was launched in April 2018 and aims to take advantage of blockchain technology and convert 50% of UAE government transactions into the blockchain platform by year 2021. Blockchain technology will help by saving time, effort, and resources. Moreover, blockchain will enable individuals to complete their transactions at a time and place that suits their lifestyle, work, and needs. Blockchain technology will be used for digital transactions and will give each user a unique identification number that points to their information on the secured chain. Data and information stored on the blockchain cannot be changed or hacked, which will ensure the digital security of national transactions and documents, eventually reducing operational costs and expediting decision making.

By adopting blockchain technology, the government expects to save about AED 11 billion in document and transaction processing, as well as 398 million printed documents and 77 million work hours, annually (UAE Government, 2018).

1.4.2.5 TDRA Strategy

In 2012, H.H. Sheikh Mohammed bin Rashid Al Maktoum, approved the TDRA strategy and set a period of two years for institutions and federal ministries to provide and launch comprehensive electronic services to public users. While TDRA is working on the m-government initiative, the federal e-government strategy will still be implemented by the TDRA (TDRA Strategy, 2012).

His Excellence, Hamad Obaid Al Mansoori, the TDRA general director, has emphasized the importance of developing a smart data strategy as it is considered one of the major initiatives of the national m-government transformation project. The strategy aims to enhance the efficiency of data usage and to increase the number of workshops offered, since they are a vital platform for sharing knowledge and ideas that will aid in smart government transitions. Moreover, the TDRA strategy aims to enhance the level of cooperation efforts between government entities to achieve a unified sharing of best practices. This will allow TDRA to develop effective strategies that support the direction of UAE Vision 2021 and the vision of UAE leadership in building a smart nation.

1.4.2.6 Abu Dhabi Economic Vision 2030

Abu Dhabi Government has announced a long-term plan for the transformation of the emirate's economy, including a reduced reliance on the oil sector as a source of economic activity over time and a greater focus on knowledge-based industries in the future. Entitled 'Abu Dhabi Economic Vision 2030', it identifies the following as the Government's immediate economic priorities:

- Building an open, efficient, effective and globally integrated business environment.
- Adopting a disciplined fiscal policy that is responsive to economic cycles.
- Establishing a resilient monetary and financial market environment with manageable levels of inflation.
- Driving significant improvement in the efficiency of the labour market.
- Developing a sufficient and resilient infrastructure capable of supporting anticipated economic growth.
- Developing a highly skilled, highly productive work force.
- Enabling financial markets to become the key financiers of economic sectors and projects.

1.4.3 Summary of this Study Significance and Contributions

This research is trying to bridge the following gaps:

- There is a lack of information about factors that may help end users accept e-government and m-government services.
- There is a gap in the literature of e-government acceptance factors. However, m-government cannot rely on the factors studied in the e-government acceptance context due to the different technologies involved.
- In general, research on m-government applications is very limited.
- In particular, research investigating the adoption of m-government services has focused on two areas:
    - The supply-side (government)
    - The demand-side (end user)
- There are very few studies focused on the demand-side viewpoint (user perspective).
- This study aims to solve a critical challenge faced by m-government in the UAE. Solving this challenge is crucial because m-government aligns with several national agendas and strategies, such as:
    - UAE National Agenda.
    - UAE Vision 2021.
    - National Innovation Strategy.
    - The Emirates Blockchain Strategy 2021.
    - TDRA Strategy.
    - Abu Dhabi Economic Vision 2030.

1.5 Research Objectives

The main purpose of this research is to understand the actual use of m-government by Abu Dhabi citizens and residents. Moreover, this study aims to build an integrated model based on TAM that can empirically examine the relations between service characteristics, technology characteristics, past experience, attitude toward m-government use, behavioral intention to use m-government, and actual use of m-government applications.

The research aims to contribute to the m-government field by attaining the following objectives:

- Identify service characteristics and factors that affect the formulation of m-government usefulness for Abu Dhabi citizens and residents.
- Identify technology characteristics and factors that affect the formulation of m-government usefulness for Abu Dhabi citizens and residents.
- Link m-government ease-of-use constructs with usefulness, attitude toward usage, and behavioral intention to use m-government.
- Link m-government usefulness constructs with attitude toward usage and behavioral intentions to use m-government.
- Examine the relationships between service characteristics factors, technology characteristics factors, ease-of-use, usefulness, past user experience, attitude toward usage, behavioral intention to use, and actual use of m-government.
- Test and interpret the hypothesized relationships derived from the literature review and demonstrate these as a conceptual framework.

1.6 Research Questions

The research questions are:

- What are the factors that affect the actual use of m-government services from the user's perspective?
- What are the factors that can convey m-government usefulness to users?
- To what extent does m-government ease-of-use affect its perceived usefulness?
- What impacts do m-government ease-of-use and usefulness have on users' usage of and behavioral intention to use m-government?
- To what extent does past user experience affect their actual use of m-government?
- What practical lessons can this study provide to support and enhance the UAE's application of m-government?

1.7 Motivation of the Researcher

One day, a childhood friend Mariam Al-Falasi, currently the Section Head of IT Applications at Musanada, invited the researcher to a business lunch with Dr. Fatima Al-Qaydi—who holds a PhD in Computer Engineering—to discuss a business opportunity to establish a mobile applications company. After starting the company with Mariam and Fatima, the researcher was curious to know what factors would impact someone to use our mobile applications. Therefore, the researcher studied several scholarly articles until she discovered a gap with respect to m-government applications adoption. Since the researcher is a government employee with a role in engineering and projects, she could imagine the cost of the wasted energy, work, and capital for such a project. Therefore, she decided to investigate the critical challenge faced by governments in identifying the factors that could affect a user's choice to adopt m-government applications.

1.8 Assumptions and Limitations

Assumptions are significant facts that are not confirmed but are assumed to be true, while limitations are features that might set barriers for a study; they are out of the researcher’s control (Gay et al., 2011). Therefore, this research has recognized the following assumptions and limitations:

1.8.1 Assumptions

- Study respondents had used at least one m-government application during the last year from filling the questionnaire.
- Study respondents understood all questions well and filled in the questionnaire truthfully and honestly. Their answers were based on their actual experiences with m-government applications.
- The number of study respondents is adequate for analysis and to draw conclusive results.

1.8.2 Limitations

- The study is limited to m-government application users.
- The data were collected over a certain period of time before the COVID-19 pandemic; therefore, the results are dependent on the conditions that existed during that time.

1.9 Dissertation Outline

The remainder of the research is structured as follows: In the next section, the literature review is discussed, followed by the methodology used to conduct this study. The subsequent section defines the statistical analysis. Then, a deep discussion of the research findings is presented. Finally, concluding remarks are made on the study's implications and limitations, and suggestions are made for future research.

1.10 Definition of Terms

The definitions on Table 3 are provided to familiarize the reader with the meaning given to the following terms of this study. It should be noted that some definitions are customized and developed to serve the purposes of this research.

Table 3: Research Definition of Terms

Terms	**Definitions**
Accuracy	Russell and Taylor (2003) defined the service quality accuracy as service performed correctly every time requested. It also defined as the user's perception of the conformity of the service or information provided with its actual attributes of content and timing (Aloudat et al., 2014). Information or service accuracy is referred to correctness, reliability and understandability of the information or services delivered by m-Government system (Wixom & Todd, 2005).
Attitude	"The individual's degree of evaluative affect toward the target behavior" (Fishbein & Ajzen, 1975, p. 216). The individual's favourable or unfavourable emotions and feelings toward a given behaviour (Fishbein, 1963; Herrero Crespo et al., 2006; Premkumar et al., 2008). The individual's positive or negative feelings about performing a specific behaviour (Al-Adwan et al., 2013; Fishbein & Ajzen, 1975; Teo et al., 2008).

Table 3: Research Definition of Terms (Continued)

Terms	**Definitions**
Behavioral Beliefs	" The person's subjective probability that performing the target behavior will result in salient consequence i" (Fishbein and Ajzen 1975, p. 29).
Behavioral Intention	"The individual's subjective probability that he or she will perform a specified behavior" (Fishbein & Ajzen, 1975, p. 288). The strength of one's intention to perform or act a specific behaviour (Al-Hujran et al., 2011).
Complexity	"The degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers & Shoemaker, 1971, p. 154).
Convenience	Kim et al. (2002) defined electronic service convenience as anything that adds to user's comfort or saves work and time, it could be a useful, helpful or handy device, article, service, etc. Torkzadeh and Dhillon (2002) defined convenience as measure examines effort and time. Berry et al. (2002) conceptualize e-service convenience as the users' perception of the effort and time in using or buying a service. Russell and Taylor, 2003 defined the service quality convenience as ease of obtaining information or service.
Currency	Perceived service currency is defined as the user's perceived quality of getting up-to-the-minute service or information (Aloudat et al., 2014). A degree to which the information or a service is up-to-date (Redman, 1997).
Evaluation	"An implicit evaluative response to the consequence" (Fishbein & Ajzen, 1975, p. 29).

Table 3: Research Definition of Terms (Continued)

Terms	**Definitions**
External Variables	Range of factors that are expected to impact users' technology acceptance behavior (Holden & Rada, 2011). Venkatesh and Davis (1996) have defined the external variables that could impacted the beliefs of the user towards a system.
M-Government	The use of wireless and mobile communication technologies under government administration to deliver transactional and informational services for the benefit of government stakeholders (Mojtahed et al., 2015).
Motivation to Comply	"The person's motivation to comply with the expectation of specific referent individuals or groups" (Fishbein & Ajzen, 1975, p. 302).
Normative Beliefs	"The perceived expectations of specific referent individuals or groups" (Fishbein & Ajzen, 1975, p. 302).
Past User Experience	The past exposure or interactions of a user to a system as well as the accumulated knowledge that is gained by system usage (Fazio & Zanna, 1981; Karahanna et al., 1999; Thompson et al., 2006).
Perceived Behavior Control	The perception of control over performance of the behavior (Ajzen, 1991).
Perceived Ease of Use	The degree to which an individual believes that using a certain information system would be free from effort Davis (1989). The level to which an individual believes that using this technology would require less mental and physical effort (Venkatesh et al., 2003).

Table 3: Research Definition of Terms (Continued)

Terms	**Definitions**
	Individual's subjective perception of the effortlessness needed for using a computer system (Radner & Rothschild, 1975).
Perceived Usableness	The degree to which "the information format is unambiguous, clear or readable" (Larcker and Lessig, 1980, p. 123).
Perceived Usefulness	The degree to which an individual thinks that utilizing this new system will help them in making their life easier (Davis, 1989). The degree to which an individual believes that using this technology would help in attaining gains in job performance (Venkatesh et al., 2003)
Privacy	Westin (1967) defined information privacy as the claim of individuals, groups, or organizations to determine for themselves how, when and to what extent their information is communicated to others. Privacy concerns appears whenever personally identifiable information is requested, collected and stored, either in digital form or otherwise. The possibility that information may be stolen, fraud committed or data corrupted may become a reality (Suh & Han, 2002).
Responsiveness	Perceived service responsiveness is defined as the user's perception of receiving a prompt information or service in general and in the case of an emergency in specific (Lee, 2005; Liljander et al., 2002; Parasuraman et al., 1988; Yang et al., 2003). Russell and Taylor (2003) defined the service quality responsiveness as a quick reaction to special requests or circumstances.

Table 3: Research Definition of Terms (Continued)

Terms	Definitions
Risk	Pavlou and Gefen (2004), and Van der Heijden et al. (2005) defined perceived risk as the individual belief of the adverse consequences and the potential loss of using mobile services. Perceived risk is also described as the subjective anticipation of a loss (Sweeney et al., 1999). Susanto and Goodwin (2010) defined perceived risk in the context of m-Government, as the extent to which the user considers that using m-government services could lead to any problem. This includes problems regarding the technology itself, possible financial threats, privacy and security. IT risks are related to the probability that the used system lacks the protection from different forms of damages (Straub & Welke, 1998). Perceived risk is defined by Warkentin, Gefen, Pavlou, and Rose (2002) as the user thought that he or she could suffer a loss during seeking an outcome through IT system. Gefen et al. (2003) defined perceived risk as a user subjective expectation of facing or suffering loss in pursuit of an outcome.
Security	Shareef et al. (2011) visualizes perceived security based on Carter and Bélanger (2005) studies as the protection of users from any type of financial or non-financial threat or risk during electronic transactions. It includes any type of identity thefts, abuse of credit card, non-payment, overcharging, etc.

Table 3: Research Definition of Terms (Continued)

Terms	Definitions
Subjective Norm	"The person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein & Ajzen, 1975, p. 302).
Technology Readiness	The people's propensity to use and embrace of new technologies for completing tasks in home and at work (Parasuraman et al., 2001).
Trust	(Carter & Bélanger, 2005; Teo et al., 2008) defined two types of trust, Trust in government and Trust in technology: Trust in government is defined as the degree to which the user believes that the interaction with the government can be trusted (Carter & Bélanger, 2005). Trust in technology is defined as the degree to which the user believes that the interaction with the technology underlying the system can be trusted (Carter & Bélanger, 2005).

1.11 Chapter Summary

The factors examined in this research may be of significance in determining and defining end user acceptance, and actual use, of m-government services and applications in the UAE. The research evaluates end users' acceptance and usage of m-governments by identifying factors that play a significant role from the end users' perspectives. This research will provide a clear understanding of the impact of service and technology characteristics factors and end user factors on user acceptance and actual use of m-government. By proposing a framework that has not yet been empirically tested (especially in the UAE context). To the best of the researcher's knowledge, this research can be considered the first to propose an integrative model that will provide a new approach to evaluating the end user’s acceptance and actual use of m-government.

Chapter 2: Literature Review

2.1 Overview

Webster and Watson (2002) identify the main objectives of the literature review as developing a theoretical framework, defining key terms, providing and clarifying definitions and explaining terminology, identifying research models, establishing the area of study, and providing case studies.

Chapter 2 presents the literature review of this research based on Technology Acceptance Model (TAM) and examines the existing literature on TAM, its main variables, TAM extensions, and a comparison between TAM and other theories. This chapter also deals with prior reviews of technology adoption in general and m-government in particular. The literature has been sourced from journals, online materials by scholars and academicians, websites, and textbooks.

The rest of this chapter is organized as follows: Section 2.2 discusses m-government; Section 2.3 considers TAM and its suitability for this research; Sections 2.4–2.7 investigate TAM constructs and external variables; and Sections 2.8 and 2.9 discuss the theoretical framework and research hypotheses.

2.2 M-government

2.2.1 Overview

The evolution of Information and Communication Technology (ICT) has influenced the way governments interact with citizens, businesses conduct their operations, the processes of the public sector, and the culture and values around the potential capabilities of ICT (Mukherjee & Biswas, 2005).

Section 2.2.2 will define m-government and attempt to answer the following question: Why would governments shift towards m-government? It will also provide examples of research on m-government conducted within the context of the UAE and discuss the dependent or measurable variable of this research; that is, the actual use of m-government.

2.2.2 Definitions of M-government

The Cambridge Dictionary defines e-government, but not m-government. According to the dictionary, e-government is the use of the Internet by governments to provide services to people and get them involved in making decisions (Audi, 1995). Similarly, m-government can be defined as the use of the mobile Internet by governments to provide services to people and get them involved in making decisions.

The United Nations (UN) defines e-government as the utilization of ICTs by the government for the provision of information and public services to residents (UN E-Government Survey, 2020b). Accordingly, m-government can be defined as the utilization of ICTs by the government for the provision of information and public services to residents.

The literature contains a rich bank of definitions for m-government, such as the use of wireless and mobile communication technologies under government administration to deliver transactional and informational services for the benefit of government stakeholders (Mojtahed et al., 2015).

Yildiz (2009) defines m-government as the provision of government services and information through mobile technologies. According to Mahmood (2021), m-government is a feature of connected government that contains government applications and services that are accessed only through mobile phones, laptops, and other smart mobile devices such as personal digital assistants, notebooks, etc. M-government is also used to refer to the use of different mobile platforms (e.g., notepads, cell phones) to deploy government services and information to people in a manner independent of time and location (Scholl, 2005). Another definition of m-government states it as the use of wireless and mobile technologies under government administration to deliver better information and services to firms and citizens (Östberg, 2003; Quintanilla, 2015). M-government is also defined as the use of mobile devices to provide services to businesses and citizens. The m-government portal is mainly used to increase the efficiency and speed of service delivery by making public services more accessible to citizens (Gerger, 2021). M-government also involves the deployment of government administration and services on mobile devices (Ayo et al., 2012). M-government also includes a range of government applications and services that are available on mobile devices; m-services were founded to reduce complexity and uncertainty (Roggenkamp, 2004). Shambare (2019) defined m-government as a variation of e-government that relies on mobile telephony for interactions between the government and citizens.

Therefore, m-government is considered an extension of the e-government to mobile ICT platforms. It encapsulates the strategic use of government applications and services only provided using wireless Internet infrastructure and mobile devices. Government services are described as available “anywhere, anytime” and the ubiquity of mobile devices mandates their utilization in government functions (Oreku & Mtenzi, 2012).

Moreover, de Kervenoael and Kocoglu (2012) described m-government as a mode of e-government or a subset of e-government (Lallana, 2004a), where access to public services is achieved through mobile devices such as mobile phones. Here, m-government is not considered a separate part of e-government; however, it is a value-added channel of e-government that uses mobile technologies (Mengistu et al., 2009) to reach users, government agencies or firms in different circumstances with regard to place and time. Some studies consider m-government a sub-dimension of e-government (Georgescu, 2011; Jahanshahi et al., 2011), while others do not, but argue that e-government is not a prerequisite of m-government (Goyal & Purohit, 2012).

As mentioned earlier, m-government is a new direction to and a complementary component of e-government. It can also be defined as a new strategy, as its implementation leverages service delivery to citizens, businesses and all government agencies (Althunibat et al., 2010; Kushchu & Kuscu, 2003). M-government refers to the strategy and its implementation to provide information and services to government employees, organizations, citizens and businesses through mobile devices (Ishmatova & Obi, 2009; Lee et al., 2005, 2006).

2.2.2.1 Definition of M-Government as Used in this Research

When governments provide services to citizens through mobile devices, it is known as m-services. M-services are the third generation of delivering government services. According to Mengistu et al. (2009), there are different generations of government service provisions, as follows:

Traditional Services: Human-delivered services with face-to-face communication through which information and products are delivered to the service provider or the customer. Tools: Human-delivered services, face-to-face contact.

E-Services: Electronic services delivered via the Internet or information networks that enhance the internal processes of organizations and businesses as well as customer support processes. Tools: Value-added networks, wired Internet, desktops, etc.

M-Services: Mobile services that deliver e-services to users without access restrictions (such as time and place) depending on mobile technologies and wireless networks. Tools: Mobile handsets, CDMA, PDAs, etc.

U-Service: Ubiquitous services that deliver intelligent services to citizens with real-time access to desired and important information from anywhere at any time. Tools: RFID, WiBro, USN, portal devices, etc.

M-governments operate m-services on four levels of interactions (Bataineh et al., 2009; Deep & Sahoo, 2011; Mengistu et al., 2009):

1. M-government to citizen (mG2C) interactions.

2. M-government to business (mG2B) interactions.

3. M-government to employee (mG2E) interactions; that is, interactions between the government and its employees.

4. M-government to government (mG2G); that is, interactions between the government and its agencies.

mG2C services enable citizens to interact with their government in a way that is responsive to their communication and needs preferences. mG2C services allow citizens to ask questions, request services, stay updated on government information, complete transactions, report problems, submit comments, access data and request emergency assistance. mG2C is the most developed type of interaction across the world (Ntaliani et al., 2008). Therefore, this research focuses on mG2C interaction, which enables citizens to access government services anytime and anywhere.

2.2.3 Why M-Government?

M-government is considered important for residents, as it has a strong potential to improve their lives by making government services more accessible through the use of mobile phones instead of the conventional method of visiting governmental agencies and customer service offices to fill in service forms or request updated information. Additionally, the availability of government services on mobile phones is comparatively better than e-government, since it allows services and information to be delivered to residents at anytime, anywhere and from any Internet-enabled device (Ishmatova & Obi, 2009; Lallana, 2004a; Lee et al., 2006; Liu et al., 2014; Wang, 2014), thus saving effort, cost and time, since mobile technology decreases availability barriers as well as costs for residents to access data, documents and information related to government decisions and actions. This provides greater opportunities for transparency, and consequently, leads to more accountable and trusted government actions (Bertot et al., 2010).

Dixit (2009) listed several attractive features that make m-government a better option compared to e-government. These include the ease of use of mobile devices for the average citizen, and the ability to search and access information, which allows for easy learning. Similarly, mobile technologies require easier, faster and cheaper infrastructure setup. Thus, a new mobile technology network can be easily fitted and installed in countries facing infrastructure issues and economic constraints. Finally, m-government has reinforced the efforts of e-government by aiding in escalating and expanding the scope of e-governance in several areas and as well as channels of communication between the government and citizens.

M-government appears to be a promising solution to overcome administrative inefficiency and help rural residents and businesses who are removed from decision- and policy-making centers.

M-government offers at least six different advantages for all mobile users in general and rural inhabitants in particular: reachability and ubiquity, affordability, low technology-literacy requirement, personalized information delivery, on-time information delivery, and emergency management.

Reachability and ubiquity: In many developing economies, the number of mobile phone subscribers is much higher than the number of computer or fixed line subscribers. This suggests that m-government will have broader reachability if mobile phone subscribers use m-government services. Consequently, the government will be able to deliver information and services to users regardless of time, place, distance and adverse natural conditions (Goncalves et al., 2014; Ntaliani et al., 2008). According to Ntaliani et al. (2008), m-government services can deliver several specific solutions and support to citizens, such as mobility and ubiquity, which is considered the primary advantage of m-government. This feature creates a sense of government ubiquity as citizens can access government services and information whenever and wherever it is convenient for them regardless of the working hours of government agencies.

Affordability: Compared to the cost of Internet infrastructure and computers in rural regions, sending government information through mobile phones is a much more affordable and economical solution for both the government and users (Halewood & Surya, 2012). This is another important benefit for users in rural areas, particularly those with lower incomes, as mobile phones are affordable compared to other Internet technology tools (Fasanghari & Samimi, 2009).

Low literacy requirement: Many individuals in rural areas have low technology literacy and cannot properly use a computer. However, they could easily use a mobile phone (Halewood & Surya, 2012). Ease of use is another feature of m-government, primarily due to the improved level of personalization and customization, which makes them very handy and able to be easily adopted.

Personalized information delivery: Cell phones have a highly personalized nature and could represent the user's profile over a long period of time. This makes it easy for m-government to deliver personalized services and information to users in rural areas.

On-time information delivery: Mobile phones can offer quick access and real-time information (i.e., seasonal agricultural technology and weather forecasts) to effectively support farmers in their decision-making regarding when to conduct an on-time diagnosis of a disease (Ntaliani et al., 2008). Therefore, m-government has the ability to provide on-time information delivery, which is a specific benefit of mobile devices, in addition to fast access. On-time information can efficiently serve users who seek crucial and certified information.

Emergency management: The portable and personalized features of mobile phones enable governments to deliver crucial information to specific users at the right time (Ntaliani et al., 2008). Governments can use mobile technology to precisely broadcast disaster warnings and information about, for instance fires, hurricanes and disease. Besides, location-based government services allow m-government to determine and provide services based on a person's exact location, which creates new opportunities for both parties. Therefore, m-government improves emergency management systems by using mobile and wireless technologies to transmit and broadcast crucial and timely information to end users.

The trend towards m-government and its applications has been further aided by the development of the capabilities of mobile technologies and their associated infrastructures, systems and devices as well as their acceptance in both developed and developing countries (Al-Khamayseh & Lawrence, 2006; Carroll, 2005).

Finally, m-government offers a new level of effectiveness, immediacy and convenience with regard to delivering services, as it provides a dynamic means for people, particularly the younger population, to interact with government agencies and local authorities (Althunibat et al., 2014). Citizens are generally interested in accessing government services through their mobile devices instead of visiting government offices or agencies (Ndou, 2004).

2.2.4 M-Government Research in the UAE

The literature indicates few studies on m-government and e-government in the context of the UAE. The first study example of m-government research in the UAE pertain to ElSherif et al., (2016) who studied the satisfaction and usage m-government services in the UAE through a holistic mode that measures service usage depending on services satisfaction that is determined by two factors, i.e., service quality and efficient transactions. The data was collected from across the UAE, and the researchers have collected 127 responses. In terms of efficient transactions, the study found that speed, privacy and trust are the main determinants of m-government services usage; in terms of service quality, the study found that availability and accessibility as well as reliability and accuracy are important elements to determining m-government services usage.

The second study example is Almuraqab (2017), who empirically studied the factors that influence user intention to use m-government services in the UAE by employing a structural model that integrates TAM, Diffusion of Innovation (DOI) and trust model. The researcher ran the analysis using 83 responses, and the results indicated significant support for the impact of four factors—perceived ease of use, trust in technology, compatibility and social influence—but it did not support the other two factors—perceived usefulness and trust in government.

The third study example is Eid et al. (2020), who examined the factors that affect the intention to use m-government services in the UAE. The researchers used TAM to study user intention, and the analysis was run using a sample size of 326. The study proposed to identify factors that affect UAE citizens' and residents' acceptance of m-government and examined the interrelationships between m-government service and technology characteristics, perceived ease of use, perceived usefulness, attitude and behavioral intention to use m-government. The results indicated that the suggested m-government model is vital to attain acceptance of m-government services.

The fourth study example is the work of Ahmad and Khalid (2017), who studied the adoption of m-government services from users' perspectives in the UAE. The researchers studied the factors that predict end-users' intention to adopt m-government services. The study employed and extended TAM by including factors such as trust, cost, perceived usefulness in information technology, social influence, variety of services and demographic profiles. The sample size was 120 and the findings revealed that social influence and trust positively impacted users' intention to adopt m-government services.

In terms of e-government research in the UAE, the first study example is Mouakket (2010), who conducted an empirical study of a sample of 502 respondents from Dubai City. He extended TAM with a set of external variables, namely, website features, security issues, quality of Internet connection and computer self-efficacy. Structural equation modeling (SEM) analysis strongly supports the extended TAM in predicting citizens' attitude to use e-government. The analysis also revealed the significant effect of perceived ease of use (PEOU) and perceived usefulness (PU) on citizens' attitude.

The second study example is Dahi and Ezziane (2015), who examined the factors that affect the adoption of e-government among Abu Dhabi citizens using extended TAM. The empirical analysis of 845 participants showed that all studied factors, i.e., PU, PEOU, trust and subjective norms, have significantly influenced citizens' intentions to use e-government.

Most of the previous research have focused mainly on measuring the behavioral intention as an indicates of the actual usage. However, this research is measuring the actual use of m-government.

2.2.5 Actual Use of M-government

Over the past two decades, the IT usage behavior of individuals has attracted scholars to investigate this subject from various theoretical perspectives, such as Innovation Diffusion Theory (IDT) (Rogers, 1995), Task–Technology Fit (TTF) model (Dishaw & Strong, 1999), Theory of Planned Behavior (TPB) (Ajzen, 1985), Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) and Technology Acceptance Model (TAM) (Davis et al., 1989). These researches have studied the antecedents that motivate individuals to accept or reject a new IS.

This research investigated the actual behavior of using m-government applications and services by TAM. According to Cheema et al., (2013) and Davis et al. (1989), actual usage of information technology systems is shaped by behavioral intention. Individuals who have higher intention to adopt or use a specific information technology will have a higher possibility of using the system. Individuals' intention are affected by their attitude which, in turn, is affected by their PU and PEOU, i.e., if they believe that the system will facilitate or improve their job performance or if they believe that the system usages will be free of effort.

Prior research demonstrated that user intension could strongly predict users' actual use of new information systems or technologies such as smartphones, e-commerce, e-wallet and m-commerce (Bailey et al., 2017; Severi & Ling, 2013; Sun & Chi, 2018; Zhou, 2011b).

Recent research (e.g., Ahmad & Khalid, 2017; Liang et al., 2017; Liu et al., 2014; Shareef et al., 2012) have investigated the adoption of m-government. For instance, Liu et al. (2014) conducted a study to understand m-government adoption in rural areas in China and found that factors from extended TAM along with integrity determined the acceptance of m-government. In addition, Shareef et al. (2012) posited and addressed the factors that could help with understanding citizens' adoption of m-government services. The theoretical framework of their research for capturing users' adoption of m-government was substantially different from the one used to capture users' behavior of e-government adoption (Sharma et al., 2018).

2.3 Research Theory

2.3.1 Overview

In the 1970s, with increasing demands and needs for new technologies among organizations, there was a simultaneous increase in the failures of system adoption. Therefore, predicting system acceptance became an interesting area of study for several researchers. However, most studies done had failed to provide reliable measures that could explain system acceptance by end-users (Davis, 1989).

Davis (1985) proposed TAM, suggesting that system acceptance and actual use are impacted by system features and capabilities mediated by the user's motivational processes a shown in Figure 7.

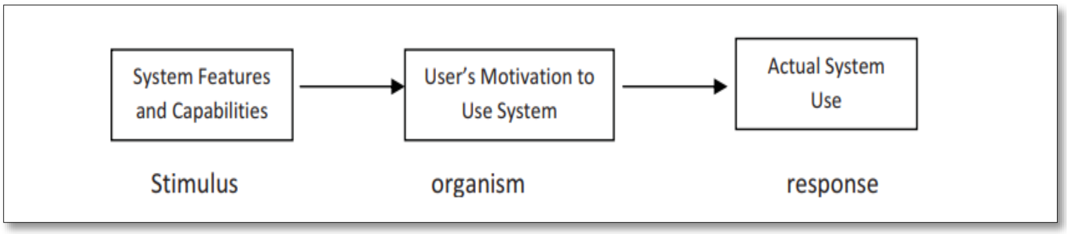


Figure 7: Conceptual Model for Technology Acceptance

Davis further refined the theory of reasoned action model by (Fishbein & Ajzen, 1975) to propose TAM. Davis (1985) further suggested that users' actual use of a system can be explained by three factors: attitude towards using the system, perceived ease of use and perceived usefulness. Davis hypothesized that users' attitudes toward a system was a major determinant in whether the user will accept (use) or reject the system. The users' attitude, in turn, was considered to be impacted by two major beliefs: perceived ease of use and perceived usefulness, with perceived ease of use having a direct impact on PU. Finally, both beliefs were hypothesized to be impacted by external variables, i.e., the system design characteristics X_1, X_2, X_3, as shown in Figure 8.

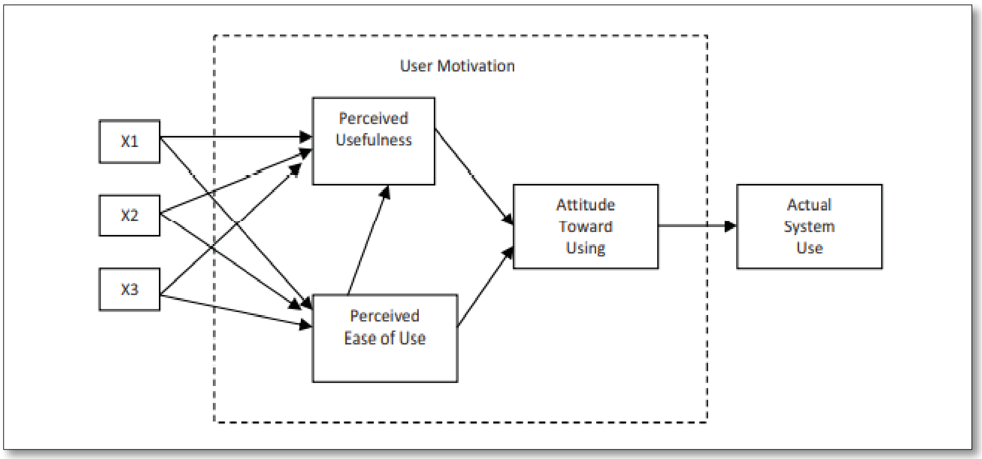


Figure 8: Original TAM by Davis.

This section is organized as follows: A brief description of the theory of reasoned action proposed by Fishbein and Ajzen (1975), followed by a discussion of TAM and how the constructs of TAM, perceived usefulness and perceived ease of use, were developed and validated. Then, the final version of TAM will be explored and discussed. Finally, the section will discuss why TAM was selected as the theoretical framework for this research.

2.3.2 Introduction to Theory of Reasoned Action

Information Systems (IS) researchers have proposed behavioral intention models based on social psychology as a potential theoretical foundation for the determinants of user behavior (Christie, 1981; Swanson, 1982). Davis (1985) was looking for a solid social psychology model to build his proposed TAM. Consequently, he chose Fishbein and Ajzen (1975) model as the reference paradigm within which to develop TAM. The Theory of Reasoned Action (TRA) model was originally proposed by Fishbein (1967) and extensively refined and analyzed by Fishbein and Ajzen (1975). TRA was introduced after studying previous research in social psychology, attitude theories and persuasion models. The primary aim of the TRA is to understand and explain a person’s behavior by investigating their underlying motivation to perform that action (Doswell et al., 2011). Therefore, TRA is a well-researched behavioral intention model that has demonstrated great success in explaining and predicting behaviors across a wide range of domains.

TRA describes the relationship between attitude and behavior of individual actions. This theory is used to predict and anticipate individuals' behavior based on their attitude as well as their behavioral intention. TRA states that an individual’s intention to perform a specific behavior is the main predictor of whether this individual will perform that behavior (Glanz et al., 2015). The theory also assumes that the decision made by the individual to involve in a specific behavior is mainly dependent on the expected consequences resulting from this behavior. Furthermore, the normative component or social norms about the behavior plays the central role in whether or not the individual will pursue the behavior. According to TRA, intention of performing a certain behavior foregoes the actual behavior (Ajzen & Madden, 1986). The intention of performing a behavior is identified as behavioral intention, and it arises due to a belief that this behavior will generate a particular result. Behavioral intention plays an important role in the theory, because these intentions are determined by two factors, i.e., behavioral attitudes and subjective norms (Colman, 2015). The stronger intention towards a certain behavior increases the efforts to perform that behavior, which also increases the possibility for the behavior to be performed. TRA suggests a relationship between the attitude and behavior, where the attitude is a predictor of the behavior. However, some critics claimed that attitude is not a good predictor of individual behaviors. TRA was subsequently amended and enhanced in the following decades to bridge the gap between attitude and behavior using two theories, viz., the Theory of Planned Behavior (TPB) and Reasoned Action Approach (RAA).

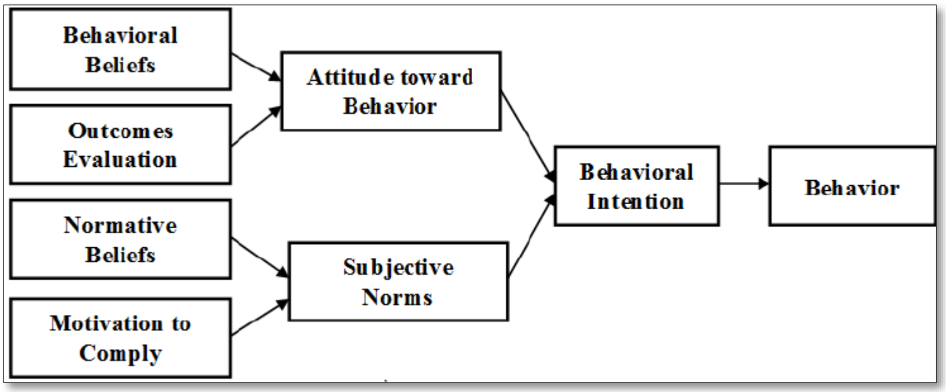


Figure 9: TRA Model

The model illustrated in Figure 9 is defined using three main equations. The first specifies that an individual's intention to perform a certain behavior is the immediate causal determinant of performing that behavior. An individual's behavioral intention is jointly determined by two factors—the individual's attitude toward the behavior and the perceived social effect of important people to that individual (Davis, 1985).

The TRA model has seven antecedents to actual behavior: behavioral intention, attitude toward that behavior, subjective norms, beliefs, evaluation, normative beliefs and motivation to comply.

2.3.2.1 Actual Behavior

TRA primarily aims to describe and predict an individual's intention to perform a specific behavior. TRA requires that behavior to be clearly defined by four concepts—action, target, context and time (Montano et al., 1997). According to TRA, behavioral intention is the main motivator of any behavior, whereas the two crucial factors of behavioral intention are an individual's attitudes and norms (Fishbein & Ajzen, 1975). By investigating both attitudes and subjective norms, scholars can gain a deeper understanding as to whether or not an individual will perform the intended behavior (Fishbein & Ajzen, 1975).

2.3.2.2 Behavioral Intention

Behavioral Intention (BI) has been defined as "the individual's subjective probability that he or she will perform a specified behavior" (Fishbein & Ajzen, 1975, p. 288). BI is the most proximate predictor of a behavior (Ajzen, 1991). BI is determined by both variable attitudes and subjective norms regarding performing the act. Attitudes are defined as the degree to which an individual holds the attitude towards a behavior, and subjective norms are defined as the social norms associated with the behavior. Accordingly, the stronger the individual's attitude and the more positive the subjective norms, the stronger the behavioral intention. However, attitude and subjective norms are unequally weighted in predicting behavior, since it varies and depends on the individual and the situation. Since these factors might have different impacts on BI, a weight is associated with each factor (Miller, 2005). The weights are estimated through multiple regression to reflect the relative causal impact of the attitudinal and normative components in a given situation, and they are expected to vary across situations. Research has shown that a direct previous experience with a certain activity results in an increased weight of the attitude component of the BI function (Manstead et al., 1983).

In the formula below, A indicates the attitude toward a behavior and SN indicates a subjective norm associated with the behavior.

$$BI=A+SN$$

or

$$BI = w_1 A + w_2 SN$$

Where;

BI = Behavioral Intention

A = Attitude toward behavior

SN = Subjective Norm regarding behavior

w_1, w_2 = importance weights

2.3.2.3 Attitudes

Attitude is defined as "the individual's degree of evaluative affect toward the target behavior" (Fishbein & Ajzen, 1975, p. 216). Attitudes are one of the main determinants of behavioral intention and refer to the way an individual feels towards a certain behavior (Albarracin & Ajzen, 2007). These attitudes are mainly influenced by two factors—the strength of behavioral beliefs about performed behavior outcomes and the evaluation of those outcomes (Fishbein & Ajzen, 1975). Attitudes about a particular behavior can be neutral, positive or negative (Fishbein, 1967). TRA specifies that there is a direct relation between attitudes and behavior outcome; for instance, if a person believes that a specific behavior will yield a satisfactory result, such as this person is more likely to have a very positive attitude to this behavior. On the other hand, if a person believes that a particular behavior will generate an unpleasant result, that person is likely to have a very negative attitude to this behavior (Albarracin & Ajzen, 2007; Fishbein & Ajzen, 1975).

For instance, the attitude of a person towards a certain behavior (A) can be measured by summing all their salient beliefs (b_i) about the consequences of doing that behavior and all the evaluation (e_i) of those consequences, as per the formula below:

$$A = \sum_{i=1} n\, b_i e_i.$$

Where;

n = number of salient beliefs

b_i = belief that performing the behavior will result in consequence i

e_i = evaluation of consequence i

2.3.2.3.1 Behavioral Belief

Beliefs were defined by (Fishbein & Ajzen, 1975, p. 29) as the "person's subjective probability that performing the target behavior will result in salient consequence i."

Behavioral belief provides a better understanding of an individual's behavior motivation in terms of the behavior‘s consequences (Ajzen, 2012). It stipulates that individuals tend to associate the performance of a certain behavior with a specific set of outcomes or consequences (Albarracin & Ajzen, 2007). For example, an individual believes that studying for a university exam course for a month will allow them to pass the exam after failing it in the first attempt, when they did not study at all. Hence, in this case, the behavioral belief is that a one-month study is associated with exam success while not studying at all is equated with exam failure.

2.3.2.3.2 Evaluation

Evaluation refers to "an implicit evaluative response to the consequence" (Fishbein & Ajzen, 1975, p. 29). The outcome evaluation also refers to the way individuals evaluate and perceive the potential outcome of the performed behavior (Fishbein & Ajzen, 1975). Such evaluations are perceived in a binary "good/bad" manner (Montano et al., 1997). For instance, an individual could evaluate the outcome of quitting smoking as good if their behavioral belief is that it would lead to better breathing and lungs. Likewise, an individual could evaluate the same behavior as bad if their behavioral belief is that it would lead to weight gain and worse mood.

2.3.2.4 Subjective Norms

Subjective norm is defined as "the person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein & Ajzen, 1975, p. 302). Subjective norms are another key factor of behavioral intention besides attitudes and refers to the way perceptions and judgments of relevant groups or individuals, such as friends, peers and family members, may affect one's performance of the behavior (Fishbein, 1967). Ajzen defines subjective norms as the perceived social pressure that affects the individual's decision to perform or not perform the behavior (Albarracin & Ajzen, 2007). According to TRA, individuals develop specific beliefs or normative beliefs (nb_j) regarding the acceptance or otherwise of certain behaviors (Fishbein & Ajzen, 1975). These beliefs form and shape the individual's perception of the behavior and define their intention to perform or not perform the behavior (Albarracin & Ajzen, 2007; Fishbein & Ajzen, 1975). For instance, if recreational drug use is acceptable within someone's peer group, it will be more likely for this person to engage in the activity. On the other hand, if someone's family members perceive recreational drug use to be unacceptable, it will be less likely for them to be involved in this behavior. However, subjective norms also take into account an individual's motivation to comply (mc_j) with their social group's perceptions, which might differ from the individual's motivations and the situation itself (Fishbein & Ajzen, 1975).

Subjective norm can be measured by summing all the normative beliefs (nb_j) regarding acceptance or otherwise of a certain behavior and the motivation to comply (mc_j) with those normative beliefs, as below:

$$SN = \sum_{j=1,\, m} nb_j mc_j$$

Where;

nb_j = Normative belief that referent j wants subject to perform behavior

mc_j = Motivation to comply with referent j

m = Number of salient referents

2.3.2.4.1 Normative Beliefs

The normative beliefs construct is defined as “the perceived expectations of specific referent individuals or groups” (Fishbein & Ajzen, 1975, p. 302). It is also defined as an individual’s perception of social normative pressures and relevant others’ beliefs about whether or not they should perform a certain behavior. The normative beliefs construct has a direct relationship with behavior performance: typically, the more likely it is for the referent group to accept the behavior, the more likely the person is to perform the behavior. Similarly, the less likely it is for the referent group to accept the behavior, the less likely it is that the person will perform the behavior (Montano et al., 1997).

2.3.2.4.2 Motivation to Comply

Motivation to comply is defined as “the person’s motivation to comply with the expectation of specific referent individuals or groups” (Fishbein & Ajzen, 1975, p. 302). It deals with when an individual’s decision of whether or not to perform the behavior is subject to the referent groups’ social norms surrounding the behavior, which mainly relies on the individual’s motivation regarding obeying social pressures. Therefore, the individual will surrender to social pressures and perform the behavior if it is believed to be acceptable by the referent groups or withstand the social pressures of performing the behavior if it is believed to be unacceptable (Montano et al., 1997).

Thus, TRA is a very general theory designed to explain and predict nearly any human behavior (Fishbein & Ajzen, 1980, p. 4), and therefore, Davis (1985) decided to use TRA to study the behavior determinants of computer use specifically, as a special case. Davis (1985) presented TAM as an adaptation of TRA. Thus, TAM is less general than TRA and is intended to be used to study, explain and predict computer usage behavior. Additionally, because Davis (1985) developed TAM by incorporating the results and findings accumulated from over a decade of IS research, researchers consider it well-suited to model computer user acceptance.

2.3.3 Technology Acceptance Model

2.3.3.1 Overview

Davis (1985) developed his model and its main two constructs, PU and PEOU, through six main stages: (1) For user acceptance testing of a new information system to be viable, the chosen related motivational model of the user must be valid. Therefore, a well-established, fairly general theoretical model of human behavior from the psychology perspective, i.e., the Fishbein model (Fishbein & Ajzen, 1975; 1967), was selected as a foundation to build TAM; (2) several adaptations to the Fishbein model were explored and introduced in order to render it applicable to the studied context; (3) published literature in the Human Factors and Management Information Systems fields was studied to demonstrate that empirical support exists for the proposed model elements, whereas, simultaneously, the proposed model exceeds existing theoretical specifications, integrating and building upon previous research in a cumulative manner (Keen, 1980); (4) measures for the model's psychological variables, PU and PEOU, were developed and pre-tested; (5) a field survey of 112 IBM employees in Toronto, Canada, was carried out to validate the measures of the model's constructs as well as to test the model's structure; and (6) a laboratory user acceptance experiment of two IBM PC-based graphics systems, Chart-Master and Pen-draw, involving 40 MBA student as subjects was conducted to test the ability to substitute videotape presentation for hands-on interaction in user acceptance tests to further test the proposed model's structure, evaluate the specific graphics systems being tested, and test several theoretical refinements and extensions to the proposed model.

The later development of TAM by Davis et al. (1989) included behavioral intention as a predictor of actual system use. Moreover, BI is directly influenced by the user's attitude and PU of a system. Thus, Davis et al. (1989) model is used as the theoretical foundation for this study.

2.3.3.2 Development of TAM Based on TRA

As mentioned earlier, TRA provides a valuable model to explain and predict the actual behavior of an individual (Fishbein & Ajzen, 1975).

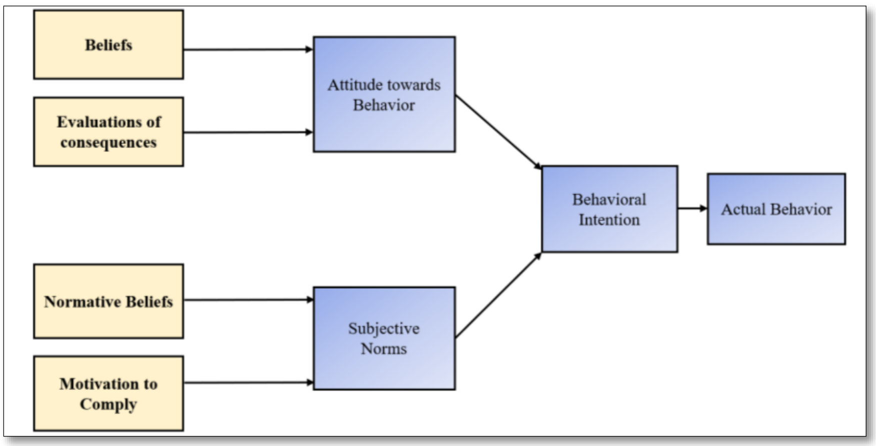


Figure 10: TRA Model by Fishbein & Ajzen (1975)

Ten years later, Davis (1985) used the same model (showed in Figure 10) and adapted it to the context of IS to develop TAM. Davis wanted to predict the actual use of a system, which is a “behavior”, and therefore, the TRA is the most suitable model to be used to explain and predict that behavior. However, Davis introduced two major changes to the TRA model: first, he removed subjective norm from the model, which he justified by stating that Fishbein and Ajzen (1975) themselves had declared that the subjective norm construct is the least understood part of the TRA model, since “Very little research...has dealt with the formation of normative beliefs” and “it is frequently argued that normative beliefs may be incorporated under the attitudinal component” and therefore, it has an uncertain theoretical status (Fishbein & Ajzen, 1975, p. 304). Moreover, Davis justifies that, as during a user acceptance test, subjects will typically be seeing the target systems, which are generally new system prototypes, for the first time and will, therefore, not be able to receive cues from individual or group referents from which to draw normative inferences. This suggests that no relevant perceived social normative impact would exist at the time of user acceptance testing (Davis, 1985) as illustrated in Figures 11-12.

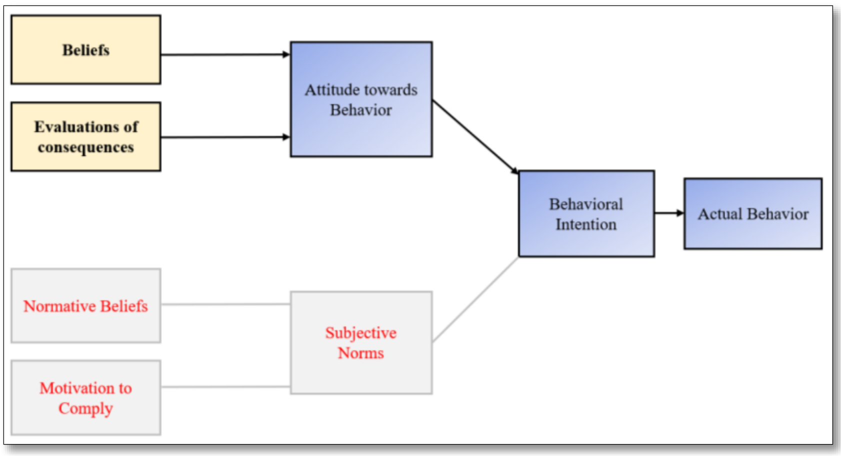


Figure 11: TAM Development Based on TRA—1

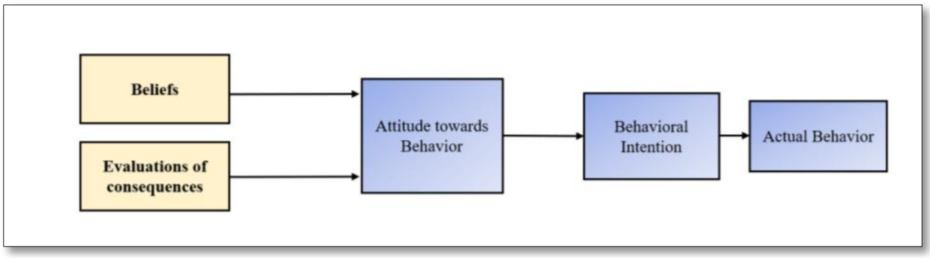


Figure 12: TAM Development Based on TRA—2

The second change was omitting behavioral intention from the TRA model, the main reason being that intention is a decision that the person forms through a process of mental deliberation, conflict and commitment, which takes a significant period of time (Einhorn & Hogarth, 1981; Janis & Mann, 1977; Warshaw & Davis, 1985). In general, the time period required is proportional to how important the decision is. The decision of whether or not to accept and use a new information system in one's job would normally be viewed as a fairly important decision. During the user acceptance testing, measurements of subjects' motivation to use a new information system would be carried out directly after system demonstration to the user. Therefore, the time required for the user to form a behavioral intention would not be expected to elapse prior to measurement. Fishbein and Ajzen (1975, pp. 370-371) discuss two conditions within which the ability of the behavioral intention construct to predict actual behavior will be reduced. The first condition is when the time between the measurement of an individual's intention and the observation of their actual behavior increases; then, the possibility that their behavioral intention may change also increases, reducing the overall predictiveness of the original intention. Second, to the extent that the target behavior is out of the actor's volitional control, their reduced ability to perform their intention translates into reduced behavioral predictiveness. Lack of volitional control may arise in cases where the individual lacks the ability or the resources to carry out an intended behavior.

Davis (1985) theorized that attitudes will impact the actual usage of the system at the time of measurement, based on (Fishbein & Ajzen, 1975) observation that beliefs (attitudes) are generally formed rapidly in response to stimuli (e.g., p. 411–509) and that, “as a person forms beliefs or attitude about an object or system, he automatically and simultaneously acquires an attitude toward that object” (p. 216), unlike behavioral intention, which needs longer to be formed.

Davis also supported his hypothesis with attitude researchers who investigated and validated the direct attitude–behavior relationship (Ajzen & Fishbein, 1977; Davidson & Jaccard, 1979; Fazio & Zanna, 1978; Wicker, 1969). Consequently, Davis (1985) considered only the person’s attitude towards a given behavior in his TAM as shown in Figure 13.

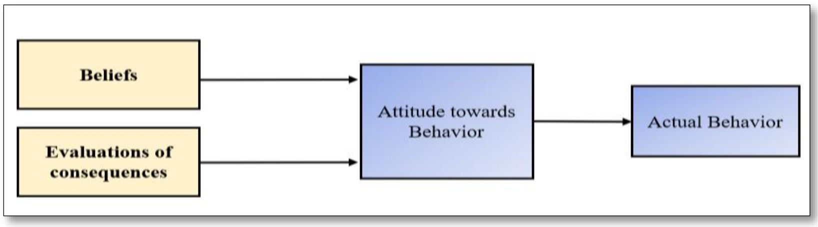


Figure 13: TAM Development Based on TRA—3

The third change Davis introduced to the TRA model was that, instead of including several individual salient beliefs that determine the attitude towards a behavior, Davis (1989) included only two distinct beliefs, perceived usefulness and perceived ease of use, which were sufficient to predict the attitude of a user towards the use of a system. Davis (1989) arrived at this conclusion after relying on several other related studies, to identify the two main beliefs (refer to Section 2.3.3.3 for more details).

Davis hypothesized that PEOU will have a strong direct impact on PU, as any system that is easier to use will naturally result in increased performance for the user. This hypothesis has been supported by several empirical studies (Abdullah et al., 2016; Al-Sharafi et al., 2016; Davis, 1993; Jantan et al., 2001; Moon & Kim, 2001). Moreover, both beliefs are hypothesized to be impacted by external variables as shown in Figure 14.

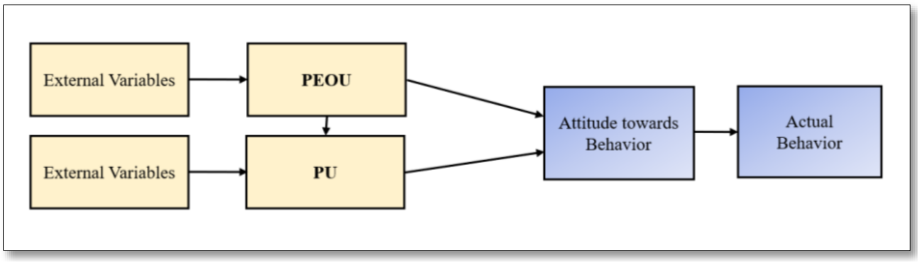


Figure 14: TAM Development Based on TRA—4

Davis relied on related Management Information Systems (MIS), non-MIS and Human Factors literature to investigate the model hypotheses and identify and develop the two beliefs of the model. He found empirical support across the three categories of literature reviewed for all six of TAM’s relationships proposed in the model, except the PEOU and PU link, which none of the reviewed studies addressed as shown in Figure 15.

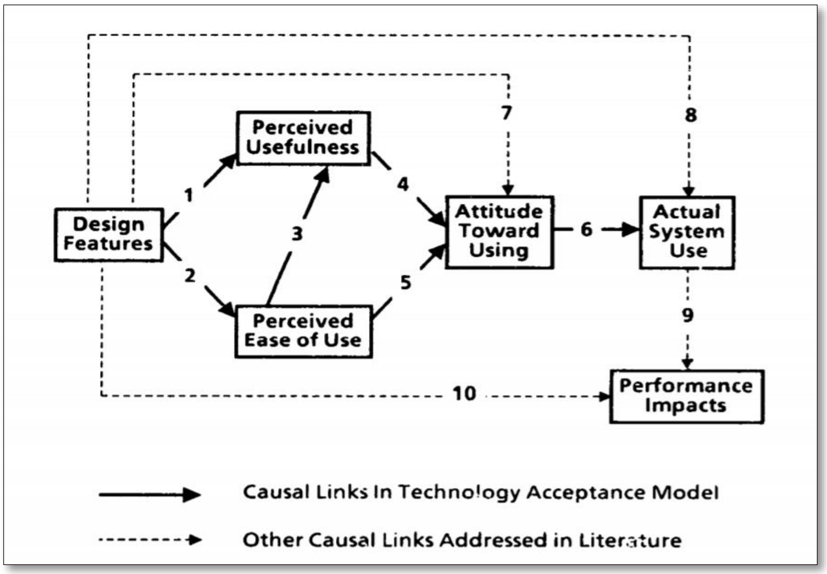


Figure 15: Six Causal Links in TAM

Significant relationships were found between system characteristics and both PU (Lucas Jr, 1981; Magers, 1983; Miller, 1977) and PEOU (Bewley et al., 1983; Magers, 1983; Miller, 1977; Poller & Garter, 1983). Attitude was significantly impacted by both PU (Ginzberg, 1981; Ives et al., 1983; Schultz & Slevin, 1975) and PEOU (Ives et al., 1983; Schewe, 1976). Finally, a significant attitude-usage relationship was found (Fuerst & Cheney, 1982; Lucas Jr, 1975, 1978; Maish, 1979; Robey, 1979; Robey & Zeller, 1978; Swanson, 1974) as shown in Figure 16.

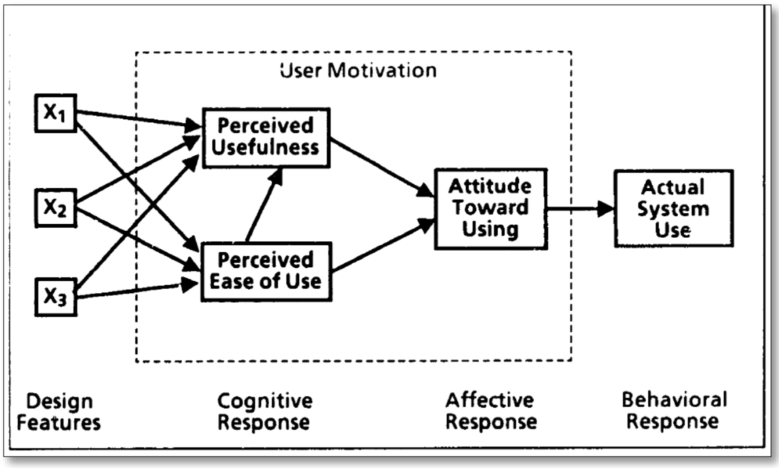


Figure 16: TAM by Davis (1985)

2.3.3.3 TAMs' Beliefs Development

Davis (1985, 1989) studied the existing literature to identify TAM's beliefs, PU and PEOU, and developed the items that measure them. Davis (1985) identified the process used in assessing PU and PEOU scales through three key psychometric properties: reliability, content validity and common method variance. First, an initial pool of candidate items was generated for each construct from the existing literature. Next, pre-test interviews were carried out to perform a content analysis of the items. The items generation and pre-test were done to increase the content validity of the measures. The survey provided the data required to assess reliability, convergent and discriminant validity. Cronbach (1951) alpha reliability coefficient computed. Campbell and Fiske (1959) multitrait-multimethod technique was applied, which provided circumstantial evidence of content validity and permitted an assessment of the extent of common method variance in the measures.

Several studies have highlighted the importance of PU and PEOU in predicting an individual's behavior. Below are some examples of the studies used by Davis (1989) to determine the two beliefs of his TAM.

The impact of PU and PEOU on system usage was introduced by the work of Schultz and Slevin (1975) and Robey (1979). Schultz and Slevin (1975) conducted an exploratory factor analysis study of 67 questionnaire items, which generated seven dimensions, one of which was performance, and concluded that PU (or perceived performance) predicts self-predicted use of a decision model. Four years later, Robey (1979) replicated Schultz and Slevin (1975) work by using their questionnaire, and confirmed the high correlation between PU and system usage.

Swanson (1982) found that PU and PEOU were both significant behavioral determinants. The researcher hypothesized that users will use information reports based on a trade-off between two aspects: perceived information quality and associated cost of access. In Swanson's (1987) exploratory factor study, information quality factors that are "important," "relevant", "useful" and "valuable" load strongly on the "value" dimension equivalent to PU, whereas access quality factors that are "convenient", "controllable", "easy" and "unburdensome" load strongly on the "accessibility" dimension similar to PEOU.

Bandura (1982) presented the importance of considering PU and PEOU in predicting behavior and suggested that behavior would be best predicted by self-efficacy and outcome judgments. In Bandura's work, self-efficacy was equal to PEOU and was defined as the user's judgments of how well they can perform courses of action to deal with prospective situations. On the other hand, the outcome judgments were similar to PU and it was defined as the extent to which a certain behavior, once it is successfully executed, is believed to be associated with valued outcomes.

Similarly, Hill et al. (1987) found that both self-efficacy (PEOU) and outcome beliefs (PU) had an impact on individual decisions to learn a computer language.

Alternately, Tornatzky and Klein (1982) supported the importance of PEOU in their meta-analysis of innovation adoption. They investigated the relationship between innovation adoption and its characteristics and found that innovation complexity was one of the three main factors that had the most significant relationships across a wide range of innovation types. Complexity, defined by Rogers & Shoemaker (1971) as "the degree to which an innovation is perceived as relatively difficult to understand and use" (p. 154), parallels PEOU quite closely (Davis, 1989).

Larcker and Lessig (1980) echoed the distinction between PU and PEOU after conducting a factor analysis of six items that were used to rate four information reports. Two distinct factors were identified: (1) perceived importance, which Larcker and Lessig define as "the quality that causes a particular information set to acquire relevance to a decision maker" and the extent to which information elements are "a necessary input for task accomplishment" (p. 123) and (2) perceived usableness, that is defined by Larcker and Lessig as the degree to which "the information format is unambiguous, clear or readable" (p. 123). Three items load on each of the two dimensions, which are similar to PU and PEOU as defined above, respectively.

After referring to numerous studies, Davis (1985, 1989) concluded that, among many variables that influence the decision of system use, previous research suggests two determinants for individuals to use or not use a system, based on whether they believe the system will aid them in performing better at their job, i.e., PU, and their beliefs regarding the expected efforts required to use a system, i.e., PEOU.

After defining the two beliefs, Davis proceeded to develop measurement scales for PU and PEOU. He began with psychometric scales used mainly in psychology

(Davis, 1989). These scales cause an individual to respond to different questions within a given context. Responses obtained from these questions can be analyzed and used as indications of an individual's internal beliefs regarding the studied context. Davis developed the psychometric scales for both PU and PEOU in three stages: a pretesting phase, an empirical field study and a laboratory experiment. And after each stage, he refined and modified the scales.

For the pre-testing phase, Davis defined 14 statements for each belief, PU and PEOU, which were generated on the basis of their conceptual definitions, then pre-tested to select the items that best fit the content domains. Davis used the Spearman–Brown Prophecy formula to choose the number of items for each scale. This formula is used to estimate the number of items needed to achieve a given reliability. The formula suggested that 10 items are needed for each construct to achieve a reliability of at least .80 (Davis, 1985). He decided to generate 14 items for each construct to allow for item elimination, as listed in Tables 4-5 (Davis, 1989). Consequently, he interviewed 15 expert computer users to evaluate the 14 items that he thought would be suitable for measuring the beliefs of a system. Davis used an electronic mail system as an example in this interview.

Table 4: Initial Scale Items for Perceived Usefulness (PU) (Davis, 1989, p. 324)

Item No.	**Psychometric items to measure Perceived Usefulness (PU)**
1.	“My job would be difficult to perform without electronic mail.”
2.	“Using electronic mail gives me greater control over my work.”
3.	“Using electronic mail improves my job performance.”
4.	“The electronic mail system addresses my job-related needs.”
5.	“Using electronic mail saves me time.”
6.	“Electronic mail enables me to accomplish tasks more quickly.”
7.	“Electronic mail supports critical aspects of my job.”
8.	“Using electronic mail allows me to accomplish more work than would otherwise be possible.”
9.	“Using electronic mail reduces the time I spend on unproductive activities.”
10.	“Using electronic mail enhances my effectiveness on the jab.”
11.	“Using electronic mail improves the quality of the work do.”
12.	“Using electronic mail increases my productivity.”
13.	“Using electronic mail makes it easier to do my job.”
14.	“Overall, I find the electronic mail system useful in my job.”

Table 5: Initial Scale Items for Perceived Ease of Use (PEOU) (Davis, 1989, p. 324)

Item No.	Psychometric items to measure Perceived Ease of Use (PEOU)
1.	"I often become confused when I use the electronic mail system."
2.	"I make errors frequently when using electronic mail."
3.	"Interacting with the electronic mail system is often frustrating."
4.	"I need to consult the user manual often when using electronic mail."
5.	"Interacting with the electronic mail system requires a lot of my mental effort."
6.	"I find it easy to recover from errors encountered while using electronic mail."
7.	"The electronic mail system is rigid and inflexible to interact with."
8.	"I find it easy to get the electronic mail system to do what I want it to do."
9.	"The electronic mail system often behaves in unexpected ways."
10.	"I find it cumbersome to use the electronic mail system."
11.	"My interaction with the electronic mail system is easy for me to understand."
12.	"It is easy for me to remember how to perform tasks using the electronic mail system."
13.	"The electronic mail system provides helpful guidance in performing tasks."
14.	"Overall, I find the electronic mail system easy to use."

The pre-test phase evaluates the semantic content of the items and classifies them in clusters or groups of similarities, such as items free from ambiguity, accurately enough to measure whether either belief could be easily identified. Consequently, some items that did not cluster with other items were eliminated, and some of the existing remaining ones were rephrased. The pre-test phase resulted in a 10-item scale for each belief, as shown in Tables 6-7.

Table 6: Revised Scale Items for PU (Davis, 1989, p. 326)

Item No.	**Revised scale items for PU**
1.	“Quality of Work”
2.	“Control over Work”
3.	“Work More Quickly”
4.	“Critical to My Job”
5.	“Increases Productivity”
6.	“Job Performance”
7.	“Accomplish More Work”
8.	“Effectiveness”
9.	“Makes Job Easier”
10.	“Useful”

Table 7: Revised Scale Items for PEOU (Davis, 1989, p. 326)

Item No.	**Revised scale items for PEOU**
1.	“Cumbersome”
2.	“Ease of Learning”
3.	“Frustrating”
4.	“Controllable”
5.	“Rigid and Inflexible”
6.	“Ease of Remembering”
7.	“Mental effort”
8.	“Understandable”
9.	“Effort to become Skillful”
10.	“Easy to Use”

To test the new 10-item scale's reliability and validity, Davis (1989) carried out a field study with a sample of 112 IBM employees in Toronto, Canada. Davis asked the respondents to use the 10-item scale to rate the usefulness and ease of use of the two systems being used within their organization, i.e., PROFS electronic mail and the XEDIT file editor. Each item has a rating from 1 to 7 on a Likert scale, with 1 reflecting that the respondent strongly agreed with the psychometric measure statement or item and 7 reflecting that the respondent strongly disagreed with the statement.

Responses were then subjected to further analysis using principal component analysis, multitrait-method analysis and factor analysis to determine the reliability and validity of the 10 items tested. All the tests showed a high reliability and validity for the 10-item scale.

Davis (1985) further asked the respondents to describe their attitude toward the two systems they were rating. He used a scale developed by Fishbein and Ajzen (1975) to operationalize attitude towards behavior. The scale is designed to measure five different attitude types that a user may have toward a certain system. It has seven points, with a mid-point "neutral" tag, as shown below.

All things considered, my using electronic mail in my job is:

Neutral

Good :__:__:__:__:__:__:__: Bad

Wise :__:__:__:__:__:__:__: Foolish

Favorable :__:__:__:__:__:__:__: Unfavorable

Beneficial :__:__:__:__:__:__:__: Harmful

Positive :__:__:__:__:__:__:__: Negative

PU and PEOU were measured using the 10-item measurement scale. Respondents were instructed to circle the number on the rating scales in the following format:

Scale/Item	Strongly Agree			Neutral		Strongly Disagree	
Example: "I find the electronic mail system cumbersome to use"	1	2	3	4	5	6	7

Moreover, the respondents were asked to self-report their actual usage of the two systems on a categorical scale with six positions with the following labels:

Don't use at all	Use less than once each week	Use about once each week	Use several times a week	Use about once each day	Use several times each day

Findings showed that system usage significantly correlated with beliefs for both systems in use at IBM. Davis refined both scales further to develop shorter scales in order to make them more practical for use as shown in Tables 8-9. He reduced the number of scale items to six using the Spearman–Brown Prophecy formula, which obtained a 0.97 reliability measure.

Table 8: Revised scale for PU (Davis, 1989, p. 331)

Item No.	**Scale Items**
1.	“Work More Quickly”
2.	“Job Performance”
3.	“Increases Productivity”
4.	“Effectiveness”
5.	“Makes Job Easier”
6.	“Useful”

Table 9: Revised scale for PEOU (Davis, 1989, p. 331)

Item No.	**Scale Items**
1.	“Easy to Learn”
2.	“Controllable”
3.	“Clear and Understandable”
4.	“Flexible”
5.	“Easy to Become Skillful”
6.	“Easy to Use”

Davis (1989) used the new scales to conduct a laboratory study with 40 respondents from evening MBA students at Boston University to validate his TAM. He chose two IBM PC-based graphics systems, Chart-Master and Pen-draw, which the respondents had never used before. Davis was excited to find whether any correlations existed between the new scale items and the usage prediction of the two new systems. He gave the respondents hands-on experience for one hour with each system, then asked them to rate their PEOU and PU for both systems.

Similarly, he used the measurement scales developed by Fishbein and Ajzen (1975) to measure the attitude of the respondents towards the two systems. Finally, Davis captured the respondents' self-predicted future use of both systems by asking them to answer a question at the end of the experiment that required the respondents to rate their usage prediction of the system on two seven-point scales, the first with likely–unlikely endpoint adjectives and the other with improbable–probable endpoint adjectives (Davis, 1985).

The findings obtained from this experiment showed a positive correlation between the new scales and self-predicted future use. Additionally, the new scales exhibited excellent psychometric characteristics. Cronbach's alpha reliability for PU was .97 in Study 1 (using 10-item scales and .98 in Study 2 (using 6-item scale). Reliability for PEOU was .91 in Study 1 and .94 in Study 2. The findings mutually confirm the psychometric strength of the new scales. As theorized, both PU and PEOU were significantly correlated with the self-reported system use; PU was correlated .63 with self-reported current use in Study 1 and .85 with self-predicted use in Study 2, while PEOU was correlated .45 with self-reported current use in Study 1 and .69 with self-predicted use in Study 2.

Davis (1985) further used regression analysis to analyze and determine a significant relationship between the constructs of his TAM.

2.3.3.4 TAM by Davis, Bagozzi and Warshaw (1989)

Davis's (1985) TAM was later developed by Davis et al. (1989) to empirically examine the ability of TRA and the modified TAM to predict and explain user rejection and acceptance of computer-based technology. Davis et al's. (1989) modified TAM by re-included the BI variable and the hypothesis that it is directly influenced by the PU of a system as shown in Figure 17. Davis et al. (1989) suggested that there are some cases where, when introducing a system perceived useful, an individual could create a strong behavioral intention to use that system without creating or forming any attitude. Davis et al. (1989) were particularly interested in how well the introduced model can predict and explain future user behavior from simple measures taken after a short period of user interaction with a system. This scenario is developed from the idea of pre-purchase trial usage or interaction with a prototype system under development (e.g., Alavi and Henderson, 1981). After presenting the major characteristics of the TRA and modified TAMs, a longitudinal study with 107 MBA students was conducted to empirically assess how efficiently both models explain and predict voluntary usage of a word processing system. Then, the prospects for synthesizing the elements of the two models were addressed in order to arrive at a more complete view of the determinants of user acceptance or actual system use.

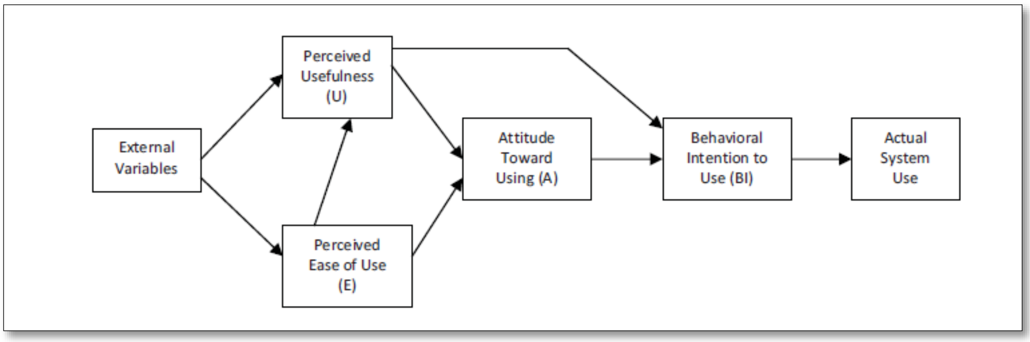


Figure 17: Modified Version of TAM

Davis et al. (1989) conducted the longitudinal study to predict user behavior for using a word processing system after a one-hour exposure to the system. They measured it again after 14 weeks. In both measures, the results indicated a strong correlation between reported behavioral intention and self-reported system usage.

Moreover, PU was found to have greatest influence on user intention. PEOU was also found to have a small but significant impact on behavioral intention, which declined over time.

While conducting the above study, Davis et al. (1989) compared the performance of TAM against TRA and found that the belief constructs of both TRA and TAM provided a good prediction of participants' intention to use the word processor.

The study yielded three main insights: (1) Both models postulated that BI is a major determinant of an individual's computer use, (2) PU is a major determinant of an individual's BI to use computers, and (3) PEOU is a significant secondary determinant of an individual's BI to use computers.

After the one-hour introduction to the computer system, individuals' BI were jointly determined by PU (*fi* = 0.62) and PEOU (*fi* = 0.20) while, at the end of 14 weeks, BI was directly affected by PU alone (*fi* = 0.79), with PEOU affecting BI only indirectly via PU (*fi* = 0.24).

BI measured after a one-hour introduction to the system were correlated 0.35 with behavior 14 weeks later. This answers the study question and provides a solution to developers who wish to evaluate their systems at a very early stage of the system development but cannot gain extensive user experience with system prototypes to assess its potential acceptability. This is also promising while assessing user reactions to systems used on a trial basis prior to purchase decisions. BI and usage, measured contemporaneously, correlated 0.63 compared with 0.35. Given that BIs are subject to change between the time of BI measurement and actual behavior, one would expect that the BI behavior correlation diminishes with increased elapsed time (Fishbein & Ajzen, 1975). Additionally, at the time of first measurement, given the limited experience of users with the system, individuals’ BI would not be expected to be extremely stable and well-formed.

Overall, the BI-behavior predictive correlations obtained in IS research have varied widely, from -0.23 up to the 0.79 correlation found by Robey (1979). The 0.35 and 0.63 correlations obtained in Davis et al's. (1989) study compare favorably with previous IS findings.

The Subjective Norm (SN) of TRA model found that it has little impact on the BI variable. Davis et al. (1989) expressed two possible justifications for this outcome. The first is the weakness of the SN measurement scale from a psychometric perspective, and the second is that word processors systems are usually very personal; therefore, the decision to use will be less influenced by the perceptions of other groups. This is further strong evidence for Davis's (1985) exclusion of SN during the development of the TAM.

Finally, Davis et al. (1989) concluded that, compared to TRA, TAM provided a simpler tool and an inexpensive method to be implemented, as the belief constructs were context-independent, whereas, in order to use TRA, it is necessary that the salient beliefs specific to word processors are developed before formulating the scales for measuring the beliefs.

2.3.3.5 Replicating TAM and Testing its Consistently

Adams et al. (1992) undertook one of the earliest initiatives to replicate TAM, conducting both laboratory and field studies to test the reliability and validity of PU and PEOU across five different applications—voice mail, email, word perfect, Harvard graphics and Lotus 123. The sample consisted of MBA students who self-reported use data that was used as a measure for actual use for the five applications.

They found that TAM maintained its consistency in explaining and predicting system adoption for the five applications.

Hendrickson et al. (1994) tested the scale reliability of the items used to measure PU and PEOU in TAM. The study's sample was 123 undergraduate students who were introduced to two new systems—a spreadsheet application and a database. The respondents were asked to self-report their usage of the two systems in order to perform a test–retest analysis. Their results indicated that, for both constructs, the scale items exhibited a significant test–retest reliability result.

Subramanian (1994) also replicated TAM with customer dialup and voice mail systems in a field study with a sample size of 179 knowledge workers and found that the TAM maintained its consistency in explaining and predicting systems adoption.

Venkatesh and Davis (1996) confirmed the validity and reliability of scale items of PU and PEOU constructs in the TAM by trying to verify whether grouping both scale items introduced errors in predicting system usage. They carried out a laboratory experiment with a sample size of 195 students and found no significant differences between the reliability and validity of the scale items before or after the grouping. Hence, they concluded that previous measures of reliability and validity were not due to items grouped under each construct. They also noticed that the respondents were more confused when the scale items for PU and PEOU were mixed. Therefore, Davis and Venkatesh recommended using the initial measurement scales for TAM.

2.3.4 TAM Suitability for this Research

2.3.4.1 Why TAM?

TAM is one of the most widely used theoretical framework in technologies adoption research. Previous studies have often used TAM to gain in-depth insights and understanding of the utilization and usage of different information technology applications (Lederer et al., 2000). Additionally, TAM is considered one of the most widely researched models in the area of user behavior in different contexts (Nguyen et al., 2018). Moreover, it is an improved version of TRA originally presented by Davis. While TRA is considered to be a very strong intention model that has been proven to be very successful in studying and explaining behavior in different contexts (Fishbein & Ajzen, 1975), TAM was initially developed to provide a better understanding of the causal relationship among external variables and the user acceptance of PC-based applications (Fenech, 1998).

According to Davis et al. (1989), TAM is significantly more specific and defined than TRA and is applicable only to the field of information technology usage behavior. Across most models that have been proposed, examined and studied for IT user acceptance, TAM is probably the most widely accepted (King & He, 2006; Williams et al., 2009).

The model has demonstrated good predictive validity for the use of several information technologies (Kleijnen et al., 2004; Luarn & Lin, 2005; Nysveen et al., 2005; Pikkarainen et al., 2004; Wang et al., 2003), including e-mail (Adams et al., 1992; Eid, 2009; Gefen & Straub, 2000; Karahanna & Straub, 1999), Word processor (Chau, 1996), the world wide web (WWW) (Eid, 2009; Lederer et al., 2000; Moon & Kim, 2001), e-commerce (Gillenson & Sherrell, 2002; O’cass & Fenech, 2003; Shih, 2004; Vijayasarathy, 2004), online business management applications (Hernández

Ortega et al., 2006), Internet banking (Cheng, Lam, & Yeung, 2006; Lee, Jeun, & Jung, 2009), online services (Cho, 2006), mobile technology (Schierz et al., 2010), mobile computing (Son et al., 2012), smartphones (Joo & Sang, 2013), mobile games (Ha et al., 2007), education (Padilla-Meléndez et al., 2013), Internet use (Porter & Donthu, 2006), mobile cloud services (Park & Kim, 2014), Internet banking adoption (Martins, Oliveira, & Popovič, 2014), e-learning (Park, 2009) and software measure adoption (Wallace & Sheetz, 2014).

TAM has become very popular and has been cited in most studies concerned with user acceptance of information technology (Lee et al., 2003). TAM helps researchers and practitioners investigate why a particular technology may be accepted or rejected. It has been tested widely with a range of samples across situations has and demonstrated valid and reliable results in explaining IS acceptance (Davis & Venkatesh, 1996; Mathieson, 1991). Several extensions to TAM have also been introduced and tested (e.g., (Henderson & Divett, 2003; Lai, 2016; Lai & Zainal, 2015; Lai & Ahmad, 2014; Lu et al., 2003; Venkatesh & Davis, 2000; Venkatesh et al., 2002).

TAM incorporates information technology research findings accumulated over the last three decades, and therefore, may be especially suited for modeling IS acceptance, which is the reason for including it in this study. Studying user intention to use an IT system or application has always been the best-known approach to evaluate the success of the introduced application (Eid, 2009). In addition, behavioral intention has been primarily and continually reported to play a strong role in determining the actual usage and adoption of new systems (Ajzen, 1985, 1991; Almrashdah et al., 2010; Venkatesh et al., 2003; Venkatesh et al., 2012; Yu, 2012).

There are several theories used to investigate IT adoption or usage behavior of individuals, such as IDT (Rogers, 1995), TTF model (Goodhue & Thompson, 1995), theory of planned behavior (Ajzen, 1991), UTAUT (Venkatesh et al., 2003), TRA (Fishbein & Ajzen, 1975) and TAM (Davis et al., 1989). These theories have studied the antecedents that motivate individuals to accept or reject a new IS.

Rogers (1995) proposed that the diffusion of innovation theory established the foundation for conducting studies on innovation acceptance and adoption. Rogers synthesized studies from over 508 diffusion research and proposed his theory of innovations adoption among individuals and organizations. The theory explains that "the process by which an innovation is communicated through specific channels over time among the social system members" (Rogers, 1995, p. 5).

It is also known that, as part of the process of the social system, members communicated an innovation through certain channels that, over time, became identified as diffusion. Rogers's (1995) diffusion of innovation theory described that the innovation adoption occurred after passing through several stages, including understanding and followed by persuasion, decision, implementation and, finally, confirmation, which led to the development of (Rogers, 1995) S-shaped adoption curve of innovators that consist of early adopters, early majority, late majority and laggards, as illustrated in Figure 18.

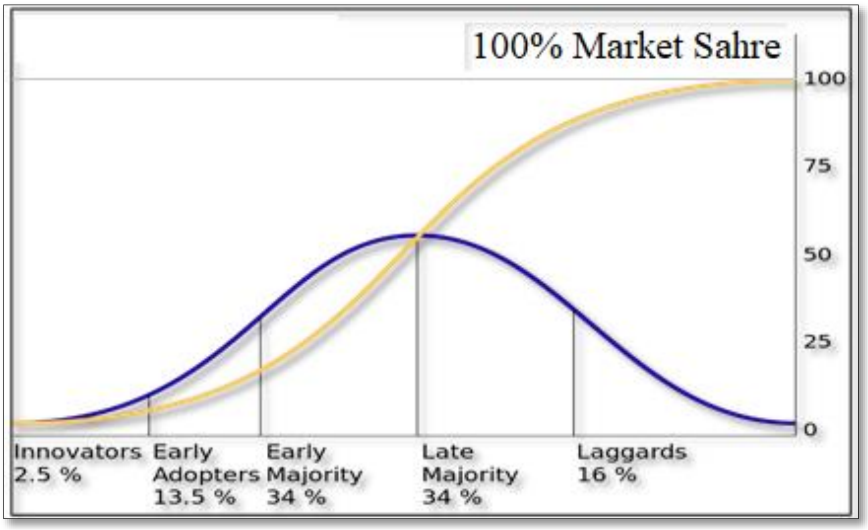


Figure 18: S-shaped Adoption Curve of Innovators

Parasuraman et al. (2001) defined technology readiness (TR) as people's propensity to use and embrace new technologies to complete tasks at home and work. Based on individuals' TR score as well as TR level, Parasuraman et al. (2001) classified technology users or consumers into five TR parts: explorers, pioneers, skeptics, paranoids and laggards. Similarly, Rogers (1995) divided his S-shaped adoption curve of innovators into early adopters, early majority, late majority and laggards. Diffusion of innovation theory is market-focused, therefore, it is significant for the success of organization implementation.

Goodhue and Thompson (1995) argued that a good fit between task and technology increases utilization likelihood as well as performance impact, as the technology meets the task wants and needs of users more closely. TTF theory highlights individual impact, which refers to effectiveness, improved efficiency and/or higher quality, as shown in Figure 19. The TTF model is appropriate for studying the actual usage of a technology specifically testing the actual use of new technology for the purpose of gathering feedback. TTF is suitable for measuring newly launched mobile applications already in app stores such as Google Play Store or Apple Store.

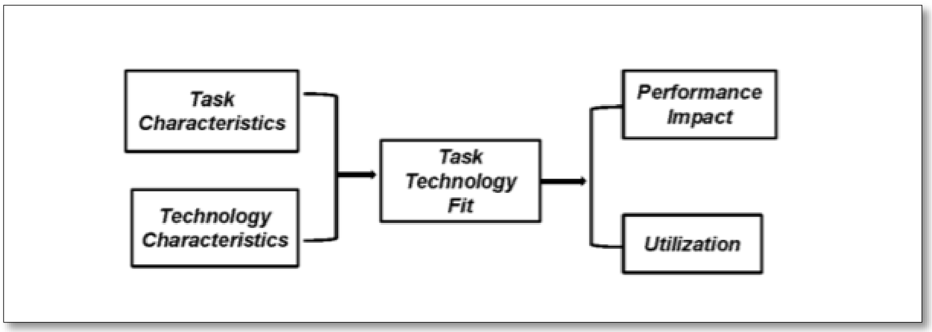


Figure 19: Task–Technology Fit

Ajzen (1985) developed the theory of planned behavior, which is built on TRA (Fishbein & Ajzen, 1975), with one more factor affecting the individual intention, as shown in Figure 20. The first two factors (attitude and subjective norms) are the same as TRA while the third factor is perceived control behavior (PBC), which is defined as the perception of control over performance of the behavior (e.g., Can I apply for the driving license, and what are the requirements?). PBC is also affected by two beliefs, control beliefs and perceived facilitation. Control beliefs include beliefs such as the perceived availability of skills, resources and opportunities. Perceived facilitation belief is defined as the individual's evaluation of available resources to achieve a given set of outcomes.

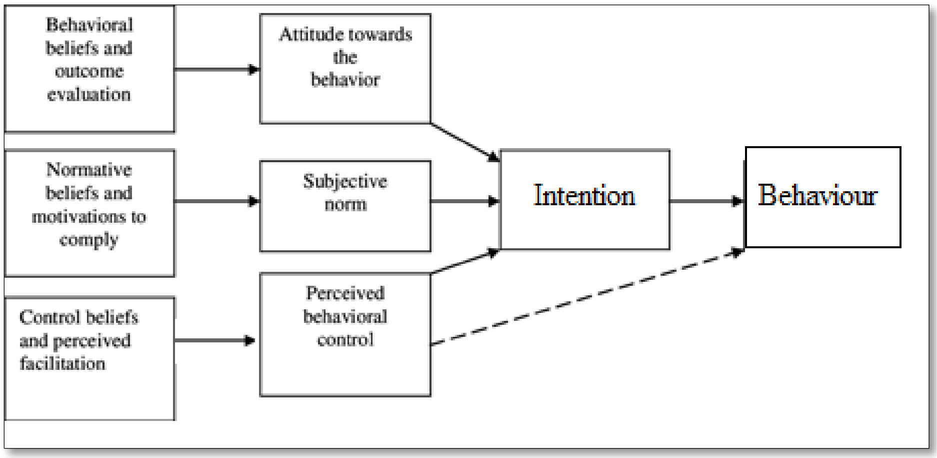


Figure 20: Theory of Planned Behavior

Venkatesh et al. (2003) developed the UTAUT based on previous models/theories, as shown in Figure 21. There are four predictors of users' behavioral intention: performance expectancy, effort expectancy, social influence and facilitating conditions. UTAUT also has four important moderators: age, gender, experience and voluntariness of use. Behavioral intention as well as facilitating conditions are the main determinants of usage behavior. Performance expectancy is similar to PU, while effort expectancy is similar to PEOU. As for the social influence, (Venkatesh et al., 2003) validation tests concluded that social influence construct was not significant in determining usage behavior in the voluntary contexts.

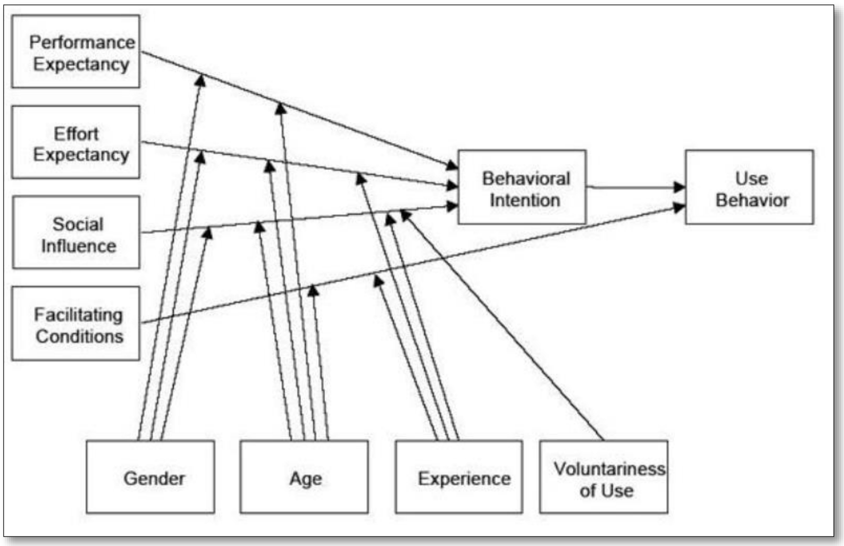


Figure 21: Unified Theory of Acceptance and Use of Technology

Fishbein and Ajzen (1975) developed TRA and it became one of the most popular theories used to determine individuals' behaviors, as shown in Figure 22.

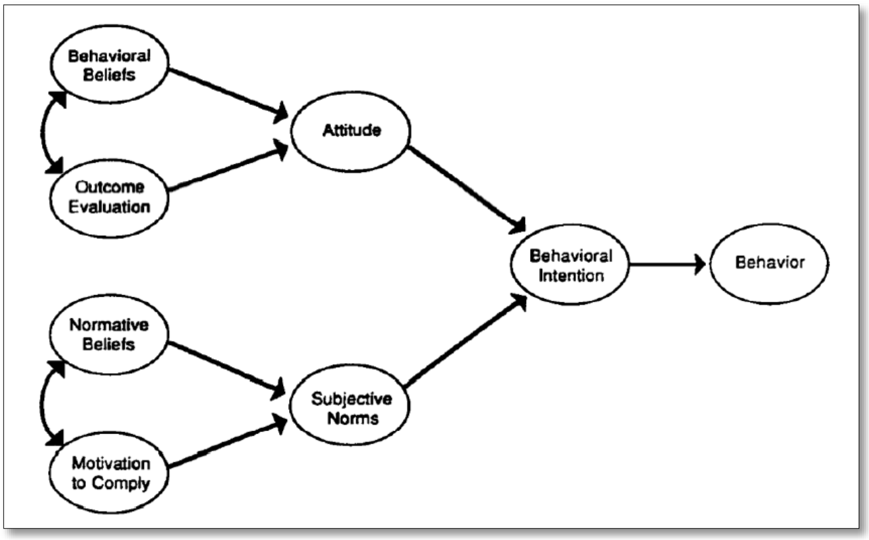


Figure 22: Theory of Reasoned Action

TAM is specifically tailored to model individuals' behavior in the context of information systems or technologies by Davis (1985). Later, TAM was modified and refined by Davis et al. (1989), as shown in Figure 23.

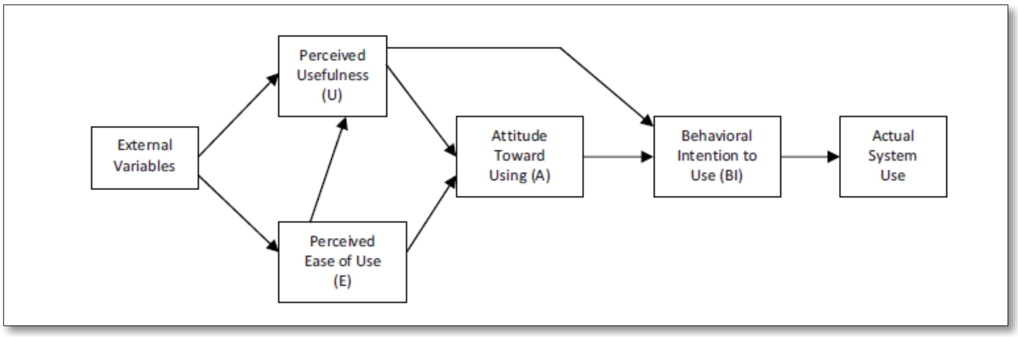


Figure 23: Technology Acceptance Model

2.3.4.2 Comparing TAM with TRA and TPB

As mentioned earlier, Davis et al. (1989) compared the performance of TAM against the performance of TRA to predict the intention of using a word processing system, and concluded that TAM is a simpler tool and an inexpensive method to measure system usage. Further, several empirical studies have proved the effectiveness, efficiency and validity of TAM and its superiority to TRA (Adams et al., 1992; Chau, 1996; Davis, 1985; Davis et al., 1989; Hendrickson et al., 1994; Hubona & Cheney, 1994; Igbaria et al., 1995; Mathieson, 1991; Segars & Grover, 1993).

Han (2003), Lai and Zainal (2015), and Lai and Ahmad (2014) also found that TAM's capability was more favorable compared to TRA and TPB. Mathieson (1991) compared TAM with the TPB developed by Ajzen (1985) to use a spreadsheet application and found that TAM was a simpler model that could be applied to any IS. Moreover, TAM was easier to apply in practice compared to TPB.

2.3.4.3 Comparing TAM with Other Technology Adaption Theories

Igbaria et al. (1995) found that TAM is one of the easiest to use but the most influential computer usage prediction models. Similarly, Chau (1996) defined TAM as one of the most powerful of over 20 computer usage prediction models that Saga and Zmud (1993) reviewed. Likewise, in a meta-analysis done on TAM with about 88 published studies, King and He (2006) found it to be a robust and valid model.

Adams et al. (1992), Davis et al. (1989), Venkatesh and Davis (2000), and Venkatesh and Morris (2000) confirmed that TAM demonstrates a highly predictive of information technology adoption and use, and therefore, it is the most widely used model of IT adoption.

2.4 TAM Constructs

2.4.1 Overview

Several scholars have extended TAM through other constructs in attempts to improve its usage predicting ability. For instance, Liu et al. (2014) extended the TAM to include both long-term and short-term PU. The findings reflect that perceived short-term usefulness has the most significant effect on user behavioral intention to use the IT application. Eid (2009) also extended the model to include individual, organizational and system characteristics. The results show that the proposed factors have a strong impact on both PEOU and PU. TAM theorizes that some external factors affect the actual usage of the IT technology by enhancing PU and PEOU of the system.

As such, this research uses the service characteristics and technology characteristics as the external factors that affect users' PU of the IT application or m-government.

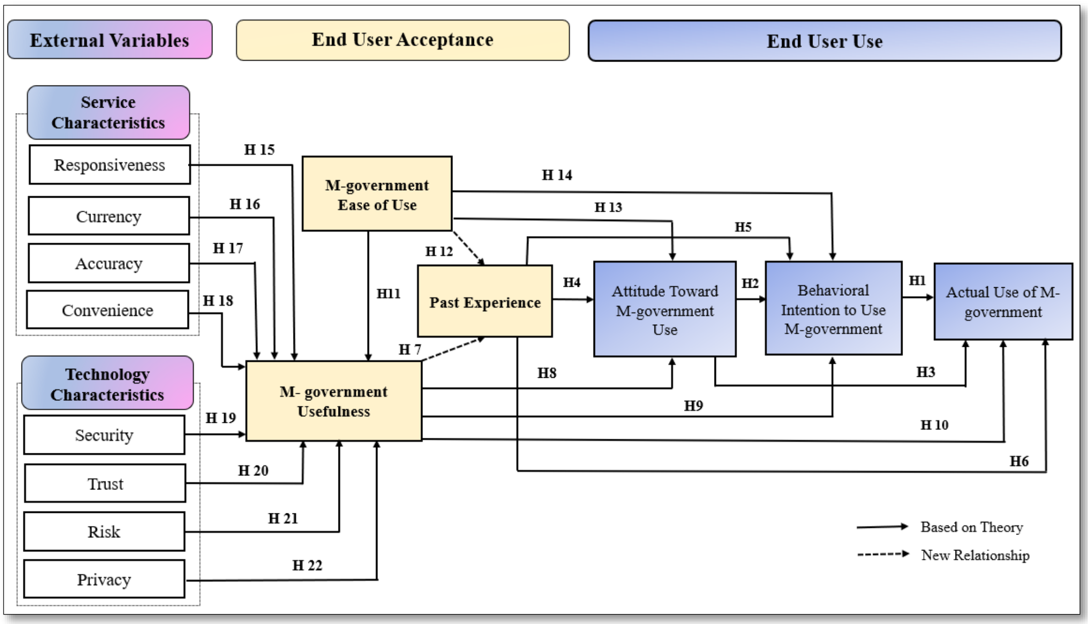


Figure 24: Research Framework

TAM hypothesizes that actual computer usage is determined by BI, whereas BI is jointly determined by both the person's attitudes toward using the IT system and its PU. As mentioned earlier, TAM is an adaptation of TRA, but especially tailored to model user acceptance in the area of information technology systems. TAM uses TRA as a theoretical foundation for identifying the causal linkages between PU and PEOU, and how these beliefs relate to users' attitudes toward using the system, intentions to use it and actual IT application acceptance behavior (Davis et al., 1989).

TAM assumes that PU and PEOU are impacted by external variables. However, the external variables impact PU only in this research. Several scholars have concluded that the impact of PEOU on system usage is insignificant, such as Davis (1989, 1993), who found that PU was 50% more influential than PEOU in determining use. Besides, Davis et al. (1989) concluded that PU predicts behavioral intentions to use while PEOU is secondary to predicting behavioral intentions and acts through PU. In addition, Subramanian (1994) found that PU and not PEOU is a determinant of predicted future usage. Moreover, Keil, Beranek, and Konsynski (1995) found that PU is the more important factor than PEOU in determining system use. Similarly, Igbaria et al. (1997) concluded that PU has a strong effect on system use. Likewise, Pikkarainen et al. (2004) found that the PU of an information system was the most significant factor in determining its usage. Furthermore, Eriksson et al. (2005) found that PU had a significantly stronger relation with predicting system usage than between PEOU and system usage. Additionally, Guriting and Ndubisi (2006) concluded that PU had a significant and strong relation with system usage, greater than that between PEOU and usage. Hu et al. (1999) specified that PU was found to be a significant determinant of both attitude and behavioral intention, whereas PEOU was not a significant determinant of them. Bugembe (2010) stated that PU was the most significant and important determinant of a new system adoption compared to all other variables.

Moreover, several empirical studies have supported the proposition that PU is the key predictor of information technology usage (Davis et al., 1989; Davis et al., 1992; Davis & Venkatesh, 1996; Gefen et al., 2003; Gefen & Straub, 1997, 2000; Hsu & Lu, 2004; Igbaria et al., 1997; Ikart, 2005; King & He, 2006; Marangunić & Granić, 2015; Venkatesh, 2000; Venkatesh & Bala, 2008; Venkatesh & Davis, 2000; Venkatesh et al., 2000; Wang et al., 2003; Williams et al., 2015).

2.4.2 Constructs Grouping

The theoretical framework of this research has 14 constructs grouped under three pillars: external variables, end-user acceptance and end-user use. External variables have eight constructs under two categories: service characteristics and technology characteristics. Service characteristics constructs comprise responsiveness, currency, accuracy and convenience, while technology characteristics constructs comprise security, trust, risk and privacy. End-user acceptance constructs are perceived m-government usefulness, perceived m-government ease of use and past experience. End-user use constructs comprise attitude towards m-government, behavioral intention to use m-government and actual use of m-government.

2.5 End-User Use

2.5.1 Overview

In this section, behavioral intention to use m-government and attitude to use m-government and their relationships with actual use of m-government will be explored and discussed.

2.5.2 Behavioral Intention to Use M-government

2.5.2.1 Overview

According to Davis et al. (1989), BI has a strong role in shaping the actual usage of information technology system. Section 2.5.2 is organized as follows: it will define behavioral intention, followed by a discussion of behavioral intention to use m-government and its relationship with actual use.

2.5.2.2 Definition of Behavioral Intention to Use M-government

In marketing, BI is described as an indicator of whether the customer will continue dealing with or defect from the business or the company (Zeithaml et al., 1996). BI can be defined as the strength of one's intention to perform a specific behavior (Al-Hujran et al., 2011). Fishbein and Ajzen (1975), in their TRA theory, asserted that behavior can be predicted by the intention of doing that behavior. The BI to use something can be interpreted as the willingness of the user to use the system. Therefore, behavioral intention to use m-government could be defined as the strength of one's intention to use m-government applications and services.

2.5.2.3 Relationship Between Behavioral Intention to Use M-government and Actual Use of M-government

Studying user intention to use an IT system or application has always been the best-known approach to evaluate the success of the introduced application (Eid, 2009). In addition, behavioral intention has been mainly and continually reported to play a strong role in determining the actual usage and adoption of new systems (Ajzen, 1985, 1991; Almrashdah et al., 2010; Venkatesh et al., 2003; Venkatesh et al., 2012; Yu, 2012). Furthermore, a user's intention to use m-government services is related to actual use of the services (Almrashdah et al., 2010; Yu, 2012).

Information system and technology literature has extensively reported on behavioral intention as playing a strong role in forming and shaping the actual usage and adoption of a new systems (Ajzen, 1991; Alalwan et al., 2017; Alkhunaizan & Love, 2013; Gao & Deng, 2012; Jaruwachirathanakul & Fink, 2005; Lim et al., 2011; Lu & Lin, 2002; Martins et al., 2014; McKenna et al., 2014; Venkatesh et al., 2003; Venkatesh et al., 2012; Wiratmadja et al., 2012; Yun et al., 2013; Zheng et al., 2012).

Similar results were found in a TAM meta-analysis study by (Turner et al., 2010), which confirmed that behavioral intention is a strong predictor of actual system use.

BI is a key factor that predicts the usage of a new technology. BI has a positive effect on actual use of the proposed technology (Ajzen, 1991). BI is an antecedent of behavior (Ajzen, 1985), and a user's intention to use mobile services is a good predictor of the real usage of the services (Almrashdah et al., 2010; Yu, 2012). Researchers in information technology acceptance are the greatest supporters of the hypothesis that BI to use a system is the antecedent of actual system use. Most studies for validating TAM have proven the aforementioned relationship (Yousafzai et al., 2007).

In TAM, Davis et al. (1989) found a significant impact of BI on the actual use of new system. TAM hypothesizes that actual computer usage is determined by BI, whereas BI is jointly determined by both the person's attitudes toward using the IT system and its PU. As mentioned earlier, TAM identifies the causal linkages between two key factors: PU and PEOU, and how these beliefs relate to users' attitudes toward using the system, intentions to use it and actual IT application acceptance behavior (Davis et al., 1989). Therefore, BI to use m-government is hypothesized to positively impact the actual use of m-government.

2.5.2.4 Hypothesis

Based on the above discussion, the following hypothesis is proposed:

Hypothesis 1 (H1): End user BI to use m-government will positively impact the actual use of m-government.

2.5.3 Attitude Toward M-government Use

2.5.3.1 Overview

According to Davis et al. (1989), attitude has a strong role to play in shaping the behavioral intention of using information technology systems. Section 2.5.3 is organized as follows: attitude will be defined, followed by a discussion of previous research on attitude towards m-government use and its relationship with behavioral intention and actual use.

2.5.3.2 Definition of Attitude Toward M-government Use

Attitudes are defined as the way an individual responds to an object (Ajzen & Fishbein, 2005). It also reflects an individual’s favorable or unfavorable emotions and feelings toward a given behavior (Fishbein, 1963; Herrero Crespo et al., 2006; Premkumar et al., 2008). It is also defined as an individual’s positive or negative feelings about a specific behavior (Al-Adwan et al., 2013; Fishbein & Ajzen, 1975; Teo et al., 2008). Attitude is based on the salient beliefs of an individual about the consequences of performing a given behavior and the individual evaluation of those consequences (Myktyin et al., 2003).

Zhang et al. (2008) defined attitudes toward technology as an individual’s evaluation of a new technology or a specific behavior associated with the use of that technology.

Triandis (1979) described attitude as an individual’s positive or negative feelings towards innovation adaption. Therefore, attitude toward m-government use can be defined as a user’s positive or negative feelings about using m-government services.

2.5.3.3 Relationship Between Attitude Toward M-government Use and Behavioral Intention to Use M-government

Studies based on different theoretical models such as TAM, TPB and TRA have proven that attitude is a crucial prerequisite of the behavioral intention to develop a particular behavior (Fishbein & Ajzen, 1980; Mathieson, 1991; Pavlou & Fygenson, 2006; Pee et al., 2008; Taylor & Todd, 1995c). An increasing number of studies have suggested that attitude toward computer use has a strong impact on behavioral intention (Wong, 2013). Likewise, there is ample evidence that affirms that attitude can significantly impact individuals' intention to use either non-technology or technology IS (Baker et al., 2007). Yoon (2016) found that attitude is a significant antecedent of users' intention to use or adopt mobile library application.

Moreover, as per TAM, Davis et al. (1989) found a significant impact of attitude on the BI to use a new system. Therefore, attitude toward m-government use is hypothesized to positively impact BI to use m-government.

2.5.3.4 Relationship Between Attitude Toward M-government Use and Actual Use of M-government

An increasing number of studies have suggested that attitude toward computer use has a strong impact on actual behavior of using computers (Wong, 2013). Likewise, Hsu et al. (2009) have mentioned that a number of empirical studies have found a significant relationship between attitudes and actual usage.

According to TAM, the beliefs of certain system users affect their attitudes to use that system which, in turn, leads to actual system use (Davis, 1989; Joo & Sang, 2013). Therefore, attitude toward m-government use is hypothesized to positively impact the actual use of m-government.

2.5.3.5 Hypotheses

Based on the above discussion, the following hypotheses are proposed:

Hypothesis 2 (H2): Attitude toward m-government use will positively impact the end user BI to use m-government.

Hypothesis 3 (H3): Attitude toward m-government use will positively impact end user actual use of m-government

2.6 End-User Acceptance

2.6.1 Overview

This section explores and discusses past user experience, perceived usefulness of m-government, and perceived ease of use of m-government.

2.6.2 Past User Experience

2.6.2.1 Overview

Fishbein and Ajzen (1975) mentioned that an individual's positive past experience with a specific item will have a significant impact on their current behavior toward that item. Section 2.6.2 is organized as follows: definition of past user experience, previous research on past user experience and its relationship with attitude, discussion of behavioral intention, and actual use.

2.6.2.2 Definition of Past User Experience

Audi (1995) defined past experience as the process of obtaining skills or knowledge mainly through seeing, doing, or feeling things, as well as the possibility of something happening to a user that leaves a lasting effect.

In the field of consumer behavior, Hirschman and Holbrook (1982) defined customer experience as the whole event a customer experiences while interacting with a certain business. The experience is the result of an emotional stimulation caused by a user consuming goods or services (Andajani, 2015).

Past user experience is defined as a user’s exposure to or interactions with a system, as well as the accumulated knowledge gained by system usage (Fazio & Zanna, 1981; Karahanna et al., 1999; Thompson et al., 2006).

2.6.2.3 Relationship Between Past User Experience and Attitude Toward M-government Use

Several researchers (Bailey et al., 2017; Groß, 2018; Li et al., 2012; Severi & Ling, 2013; Sun & Chi, 2018; Wang et al., 2012) extended TAM to include the construct of past experience. Attitudes and beliefs correlate more strongly with the behavior of people who have had a direct experience with an object (Eagly & Chaiken, 1993; Fazio & Zanna, 1978; Regan & Fazio, 1977), suggesting a stronger impact of perceived usefulness and attitude on behavioral intention and subsequent actual behavior for experienced users (Taylor & Todd, 1995a). User attitude, perception, and intention changed significantly as the user’s direct-use experience increased (Nelson, 1990; Rivard & Huff, 1988; Schmitz & Fulk, 1991; Venkatesh & Davis, 2000; Xia & Lee, 2000). Dabholkar (1996) found past experience with similar technologies to be a main factor influencing an individual’s attitude during the adoption decisions. Lymperopoulos and Chaniotakis (2005) and Poon (2008) also found that experience is an important factor impacting an individual's attitude toward using the system.

Research shows that people who have had direct past experience with an object have attitudes related to their consequent relevant usage behaviors, while people without direct past experience have a slight or non-existent relationship to usage behaviors (Fazio & Zanna, 1978).

2.6.2.4 Relationship Between Past User Experience and Behavioral Intention to Use M-government.

It has been suggested that knowledge obtained from past behavior practices helps to form intention (Eagly & Chaiken, 1993; Fishbein & Ajzen, 1975) because past experience makes knowledge more reachable and accessible in memory (Fazio & Zanna, 1978; Regan & Fazio, 1977). This indicates that IT intention usage may be more efficiently modeled for users with prior experience.

Additionally, Karjaluoto et al. (2002) and Lassar et al. (2005) concluded that past experience with technology, personal banking, and computers, as well as individual reference groups and computer attitudes can strongly impact attitude and intention to use Internet Banking (IB). These researchers' results indicated that prior Internet usage will positively impact individuals' usage and adoption of IB. Therefore, the more experience a consumer has using the Internet and computer systems, the more likely they are to use the new related systems.

2.6.2.5 Relationship Between Past User Experience and Actual Use of M-government

Many researchers have found that previous experience is a significant factor of behavior (Bagozzi, 1981; Bentler & Speckart, 1979; Fishbein & Ajzen, 1975; Fishbein & Ajzen, 1980; Triandis, 1979). Alternatively, Abaza and Saif (2015) concluded that in Egypt, a user's past experience of the Internet had a non-significant effect on their intention to adopt m-government.

Several researchers (Bigné & Ruiz, 2003; Burton & Pulendran, 2000; Castaneda et al., 2007; Citrin et al., 2000; Dholakia & Uusitalo, 2002; Hsu et al., 2007; Liao & Cheung, 2001; Miyazaki & Fernandez, 2001; Muñoz Leiva, 2008; White, 1996) have also found that users with an online purchasing experience would be more likely to purchase products online again. Studies show that an individual's adoption and continued usage of e-commerce (Kwak et al., 2002), computer systems (O'cass & Fenech, 2003; Smith & Brynjolfsson, 2001), and mobile services (Ristola, 2010) are impacted by their previous experiences with similar information technology systems. Previous studies proved that past experience with a technology is a main factor in determining its future use (McFarland & Hamilton, 2006)

Abu-Shanab (2012) measured the effect of computer and Internet literacy on adoption of e-government in Jordan; finding that people's high extent of illiteracy was significantly related to the adoption rate (Alomari et al., 2010). Pons (2004) reported similar findings about e-government adoption in Arabic countries. Therefore, past experience of using technologies or concepts similar to m-government—such as Internet, e-commerce, e-government, or mobile services—is hypothesized to positively impact attitude toward, behavioral intention to use, and actual use of m-government.

2.6.2.6 Hypotheses

Based on the above discussion, the following hypotheses are proposed:

Hypothesis 4 (H4): Past user experience will positively impact end user attitude toward m-government use.

Hypothesis 5 (H5): Past user experience will positively impact end user BI to use m-government.

Hypothesis 6 (H6): Past user experience will positively impact the actual use of m-government.

2.6.3 Perceived M-government Usefulness

2.6.3.1 Overview

According to Davis et al. (1989), perceived system usefulness has a strong role in shaping the attitude and Behavioral Intention (BI) to use information technology systems. Section 2.6.3 is organized as follows: definition of perceived usefulness, perceived usefulness to use m-government and its relationship with past user experience, attitude toward use, BI to use, and the actual use of m-government.

2.6.3.2 Definition of Perceived M-government Usefulness

Perceived usefulness (PU) is one of TAM's main constructs. PU is defined by Davis (1989) as the degree to which an individual thinks that utilizing this new system will help them make their life easier. It is also defined as the degree to which an individual believes that using this technology will help attain gains in job performance (Venkatesh et al., 2003).

Almarashdeh and Alsmadi (2017) indicated that perceived usefulness is the evaluation of the advantages and benefits that an individual gains from a particular service or application. Therefore, perceived m-government usefulness can be defined as the evaluation of advantages and benefits that a user can gain from m-government services or applications to make their life easier.

2.6.3.3 Relationship Between Perceived M-Government Usefulness and Past Experience

Some relationships have never been investigated, measured, or tested in the literature. However, the relationship between perceived m-government usefulness and past user experience has been suggested by the tested model. Therefore, this research introduces this relationship to be examined for the first time. This procedure may result in insight that could help enhance the actual usage of m-government and open the door for future studies to explore such relationships. Therefore, the following new hypothesis is suggested:

Perceived m-government usefulness will positively impact user past experience.

To the best of the researcher's knowledge, the literature indicated the relationship between user past experience and perceived usefulness but not vice versa. According to Venkatesh and Bala (2008), increasing the user's past experience will create a better, clearer idea about the effort required to perform a certain task using the technology system (Chen et al., 2011; Wang et al., 2009). It may also create a favorable feeling about the usefulness of the system (Lee et al., 2013; Purnomo & Lee, 2013). Likewise, Lymperopoulos and Chaniotakis (2005) and Poon (2008) found that experience is an important factor impacting an individual's perception of a new technology's usefulness.

2.6.3.4 Relationship Between Perceived M-government Usefulness and Attitude Toward M-government Use

Suki and Suki (2011) investigated the relationships between PU and the attitudes of Malaysian subscribers to 3G mobile services. The researchers found that PU had a positive impact on both the attitude and the behavioral intention of the subscribers.

A number of studies investigated and examined the significant and positive influences of perceived usefulness on a user's attitude toward e-government adoption (Hung et al., 2013; Hung, Chang, & Yu, 2006; Hung et al., 2009; Lin et al., 2011; Lu et al., 2010). Wang (2014) also confirmed the positive effect of perceived usefulness on a user's attitude toward m-government adoption.

Attitude was significantly affected by both perceived usefulness (Ginzberg, 1981; Ives et al., 1983; Schultz & Slevin, 1975), and perceived ease of use (Ives et al., 1983; Schewe, 1976).

2.6.3.5 Relationship Between Perceived M-government Usefulness and Behavioral Intention to Use M-government

Abdelghaffar and Magdy (2012) indicated that users' intentions to use m-government services in Egypt were strongly impacted by their perceptions of its usefulness. Consistent with the Abdelghaffar and Magdy (2012) finding, several studies established the fact that perception of a new technology's usefulness is the main predictor of behavioral intention toward using or accepting the new technology (Alalwan et al., 2017; Alalwan et al., 2015; Hanafizadeh et al., 2014; Luo et al., 2010; Tsai et al., 2017; Venkatesh et al., 2003; Venkatesh et al., 2012; Zhou, 2012).

Althunibat and Sahari (2011) highlighted that in several other studies, a user's perceived usefulness of a technology is a strong indicator of acceptance. Previous studies proved the significant impact of PU on a citizen's intention to use e-government (Abu-Shanab, 2014; Ahmad et al., 2013; Al-Sobhi et al., 2011; Alomari et al., 2012; Dahi & Ezziane, 2015; Hussein et al., 2011; Sang et al., 2010; Suki & Ramayah, 2010), m-services (Bhatti, 2007; Jeong & Yoon, 2013; Kuo & Yen, 2009; Lee & Han, 2015; Li & Lv, 2007; Luarn & Lin, 2005; Padashetty & Kishore, 2013; Riquelme & Rios, 2010; Tang & Chiang, 2009; Teoh & Cyril, 2008; Wu & Wang, 2005) and m-government (Abdelghaffar & Magdy, 2012; Abu-Shanab & Haider, 2015; Almarashdeh & Alsmadi, 2017; Liu et al., 2014). Almarashdeh and Alsmadi (2017) stated the positive influence of perceived usefulness on users' intentions to use m-government services in Saudi Arabia. Some researchers found a significant direct impact of perceived usefulness on behavioral intention (Cheung & Sachs, 2006; Pynoo et al., 2012), while others did not (Kirmizi, 2014; Teo & Milutinovic, 2015).

2.6.3.6 Relationship Between Perceived M-government Usefulness and Actual Use of M-government

Previous research investigated and examined the importance of the perceived usefulness factor on retention behavior (Park & Kim, 2013). Generally speaking, individuals seem to be more motivated to accept and utilize new technology if they perceive that this technology will be useful in their daily lives (Alalwan et al., 2016; Davis, 1989; Venkatesh et al., 2003; Yusoff et al., 2009).

The literature showed enough evidence to conclude that IB adoption is significantly impacted—either directly or indirectly—by TAM constructs, PU, and/or PEOU (Al-Somali et al., 2009; Aldás-Manzano, Lassala-Navarré et al., 2009; Alwan & Al-Zubi, 2016; Cheng et al., 2006; Eriksson et al., 2005; Fernandes & Awamleh, 2006; Lee, 2009; Pikkarainen et al., 2004; Safeena et al., 2011; Sandada et al., 2016; Sudeep & Sankaranarayanan, 2008; Suh & Han, 2002; Wang et al., 2003; Zhang et al., 2008). While numerous researchers demonstrated the significant impact of perceived usefulness on user acceptance and adoption of new technology (Davis, 1989; Davis et al., 1992; Davis & Venkatesh, 1996; Green & Pearson, 2011; Sago, 2013; Wang et al., 2003), PU is also recognized as a significant factor affecting m-government services acceptance and is considered a key determining construct for the acceptance of technology across a range of studies (Aloudat et al., 2014; Althunibat & Sahari, 2011; Hung et al., 2013; Abaza & Saif, 2015).

2.6.3.7 Hypotheses

Based on the above discussion, the following hypotheses are proposed:

Hypothesis 7 (H7): Perceived m-government usefulness will positively impact past user experience.

Hypothesis 8 (H8): Perceived m-government usefulness will positively impact the end user attitude toward m-government use.

Hypothesis 9 (H9): Perceived m-government usefulness will positively impact the end user BI to use m-government.

Hypothesis 10 (H10): Perceived m-government usefulness will positively impact the actual use of m-government.

2.6.4 Perceived M-government Ease of Use

2.6.4.1 Overview

According to Davis et al. (1989), perceived system ease of use has a strong role in shaping the attitude and perceived usefulness of an information technology system. Section 2.6.4 is organized as follows: definition of perceived ease of use, explorations and discussions of perceived ease-of-use for m-government and its relationship with perceived usefulness, past user experience, attitude toward use, and BI to use m-government.

2.6.4.2 Definition of Perceived M-government Ease of Use

Perceived ease of use (PEOU) is one of TAM's main constructs, defined by Davis (1989) as the degree to which an individual believes that using a certain information system would be free from effort. It is also defined as the level to which an individual believes that using this technology would require less mental and physical effort (Venkatesh et al., 2003).

Radner and Rothschild (1975) defined PEOU as an individual's subjective perception of the effortlessness needed for using a computer system. This is based on the definition of the word “ease”—freedom from great effort or difficulty. Effort is the resource that an individual may allocate to the different activities for which he or she is responsible (Radner & Rothschild, 1975). Therefore, perceived m-government ease of use can be defined as the degree to which an individual believes that using m-government services or applications will be free from effort.

2.6.4.3 Relationship Between Perceived M-government Ease of Use and Perceived M-government Usefulness

Davis (1993) assumed that PEOU had a direct influence on PU, and not vice versa. This conclusion is supported by a great deal of empirical research (Abdullah et al., 2016; Al-Sharafi et al., 2016; Jantan et al., 2001; Moon & Kim, 2001).

Perceived ease of use is widely regarded as a main factor of a technology’s perceived usefulness (Davis et al., 1989; Venkatesh, 2000; Venkatesh & Bala, 2008). Many empirical studies proved the strong link between ease of use and usefulness (King & He, 2006; Ma & Liu, 2004; Mun et al., 2006; Paré et al., 2006; Schepers & Wetzels, 2007; Yarbrough & Smith, 2007). However, contrary to previous results, several researchers failed to find an effect of ease of use on usefulness (Chau & Hu, 2002; Chismar & Wiley-Patton, 2003; Hu et al., 1999).

2.6.4.4 Relationship Between Perceived M-government Ease of Use and Past Experience

Some relationships have never been investigated, measured or tested in the literature. However, the relationship between perceived m-government usefulness and past user experience has been suggested by the tested model. Therefore, this research introduces this relationship for first-time examination. This procedure may result in insight that could help enhance the actual usage of m-government and open the door for future studies to explore such relationships. Therefore, the following new hypothesis is suggested:

Perceived m-government ease of use will positively impact user past experience.

To the best of the researcher's knowledge, the literature indicated the relationship between user past experience and perceived ease of use but not vice versa. The findings of Venkatesh and Bala (2008) also suggested that previous interactions with a technology have a stronger effect on PEOU than on PU. Specifically, past user experience has a strong predictive impact on PEOU and a medium influence on PU of the system's acceptance (Castiblanco Jimenez et al., 2021).

2.6.4.5 Relationship Between Perceived M-government Ease of Use and Attitude Toward M-government Use

PEOU is a main predictor of attitude in the technology adoption research (Davis et al., 1989; Moore & Benbasat, 1991; Park et al., 2007; Plouffe et al., 2001; Pynoo et al., 2011; Taylor & Todd, 1995b; Thompson et al., 1991). A significant number of researchers in the field of e-government systems adoption found a significant positive relationship of PEOU with attitude (Hung et al., 2013; Hung et al., 2006; Hung et al., 2009; Lin et al., 2011; Lu, Shambour et al., 2010). Similarly, Almarashdeh (2016), Davis et al. (1989), and Venkatesh (2000) found that PEOU had a direct effect on attitude toward using technology and an indirect effect on BI to use new technology. Both PU (Ginzberg, 1981; Ives et al., 1983; Schultz & Slevin, 1975) and PEOU (Ives et al., 1983; Schewe, 1976) significantly affected attitude.

2.6.4.6 Relationship Between Perceived M-government Ease of Use and Behavioral Intention to Use M-Government

Previous research on technology adoption has found that PEOU plays a significant role in shaping the behavioral intention toward using new technology (Adams et al., 1992; Agarwal & Prasad, 1999; Al-Busaidi, 2012; Alalwan et al., 2017; Alalwan et al., 2015; Almarashdeh & Alsmadi, 2017; Davis, 1989; Gefen, 2003; Gefen & Straub, 1997, 2000; Hanafizadeh et al., 2014; Jackson et al., 1997; Lallmahomed et al., 2017; Lu & Gustafson, 1994; Moore & Benbasat, 1991; Pan & Jordan-Marsh, 2010; Venkatesh, 1999, 2000; Venkatesh & Davis, 2000; Venkatesh et al., 2012; Zhou, 2012). Moreover, studies identified PEOU as a key determinant for behavioral intention to use e-government services (Abu-Shanab, 2014; Carter & Belanger, 2004; Dahi & Ezziane, 2015; Hung et al., 2009; Hussein et al., 2011; Rehman, Esichaikul, & Kamal, 2012; Sang et al., 2010; Suki & Ramayah, 2010; Teoh & Cyril, 2008), m-services (Bhatti, 2007; Gu et al., 2009; Jeong & Yoon, 2013; Kuo & Yen, 2009; Li & Lv, 2007; Luarn & Lin, 2005; Padashetty & Kishore, 2013; Riquelme & Rios, 2010; Schierz et al., 2010; Tang & Chiang, 2009; Teoh & Cyril, 2008; Wu et al., 2009), and m-government services (Abu-Shanab & Haider, 2015; Alotaibi & Roussinov, 2017; Althunibat & Sahari, 2011; Liu et al., 2014; Shareef et al., 2012). However, Abaza and Saif (2015) found no significant impact of PEOU on BI to use m-government in Egypt. Similarly, Tsai et al. (2017) found that PEOU did not have any significant impact on BI.

2.6.4.7 Hypotheses

Based on the above discussion, the following hypotheses are proposed:

Hypothesis 11 - (H11): Perceived m-government EOU will positively impact the m-government usefulness.

Hypothesis 12 - (H12): Perceived m-government EOU will positively impact the past user experience.

Hypothesis 13 - (H13): Perceived m-government EOU will positively impact the end user attitude toward m-government use.

Hypothesis 14 - (H14): Perceived m-government EOU will positively impact the end user behavioral intention to use m-government.

2.7 External Variables

2.7.1 Overview

TAM is a general theory that provides an overall insight about technology acceptance and adoption, but it does not specify the determinants of PU and PEOU as the two main beliefs of TAM. Indeed, Venkatesh and Davis (2000) advised that a user's behavioral beliefs could be influenced by a range of external variables.

External variables are a range of factors expected to impact users' technology acceptance behavior (Holden & Rada, 2011). Venkatesh and Davis (1996) listed the following external variables that could impact the beliefs of a user toward a system: system characteristics, user participation in design, user training, and the nature of the implementation process.

Although some of the previous TAM research confirmed that external variables have an effect on PU and PEOU, most of the TAM researchers ignored the option to include or evaluate such variables. Consequently, most TAM research and extensions do not adequately account for the role of external variables with the studied technologies. The role of external factors or variables impacting the usage behavior within TAM has not been well addressed or investigated (Hubona & Geitz, 1997), even though Venkatesh (2000) indicated that the primary drivers of perceived ease of use of a system are mainly dependent on situational characteristics and individual difference factors. Therefore, further investigations are needed regarding the specific variables that may impact a certain technology's PU and PEOU from a user's perspective, as this can help direct technology adoption in the right direction (Mathieson, 1991). Therefore, the external factors studied in this research may be of importance in predicting and explaining user acceptance of m-government services.

The TAM studies involving Hubona present perhaps the widest evaluations of the impact of external variables on actual system usage (Burton-Jones & Hubona, 2005; Hubona & Burton-Jones, 2003; Hubona & Geitz, 1997; Hubona & Kennick, 1996). Hubona's studies centralized around understanding usage behavior; he found various direct connections and relationships between external variables and perceived usefulness, perceived ease of use, attitudes toward using the system, and the actual usage behavior of the system. Through these studies he confirmed that the PU, PEOU and attitude belief constructs are not the sole impacting factors on usage behavior. His studies also re-validated that the construct 'attitude toward using'—sometimes eliminated from TAM research—has a role in shaping usage behavior. A common theme of Hubona's studies is the necessity of further examination and investigation of the direct and indirect influences of external variables in order to better understand the generalities of their impacts (Burton-Jones & Hubona, 2005; Hubona & Burton-Jones, 2003; Hubona & Geitz, 1997).

Previous research measured the effects of external variables on the intention or adoption of e-government and m-government services. For instance, Mouakket (2010) investigated the impact of the following variables on citizen's intention to use e-government in the UAE: quality of Internet connection, computer self-efficacy, security issues, and website features. Dahi and Ezziane (2015), also in the UAE, studied the influence of subjective norms and trust on user's intention to use e-government services. Similarly, Abu-Shanab (2014) examined the impact of social influence, trust in government, trust in e-government, trust in technology, information quality, privacy, and security on the intention to use e-government services in Jordan. Alomari et al. (2012) also studied the variables' impact on adoption in Jordan, using trust in government, beliefs, website design, and complexity. Rehman et al. (2012) focused their study in Pakistan, using information quality, service quality, transaction security, and awareness as variables.

Hussein et al. (2011) and Suki and Ramayah (2010) studied the impact of external variables on the intention to use e-government services in Malaysia. The former used trust of the government, service quality, compatibility, and image, while the latter used facilitating conditions, subjective norms, self-efficacy, external influence, and interpersonal influence. In addition, Sang et al. (2010) used relative advantage and trust to examine user intention to use e-government in Cambodia. Bélanger and Carter (2008) used trust of the Internet to measure the same in the USA.

With regard to m-government services, there are also several studies. Althunibat and Sahari (2011) examined the impact of social influence, perceived compatibility, perceived risk, cost of service, service quality, trust in government, and trust in technology on the intention to use m-government services in Malaysia. Similarly, Abu-Shanab and Haider (2015) used social influence, perceived responsiveness and perceived compatibility to measure intention in Jordan. Shareef et al. (2012) used perceived reliability, perceived security, and perceived relative advantage to measure adoption in India. Abdelghaffar and Magdy (2012) used compatibility, social influence, awareness, and face-to face interactions to measure intention to use m-government services in Egypt.

Al-Hujran (2012) investigated the success factors for m-government service implementation in Jordan. The results indicated that public awareness, trust, infrastructural constraints, cost, and lack of legal framework are the main factors affecting m-government services implementation.

Sandy and McMillan (2005) reviewed the available literature on m-government and identified six critical factors that impact the successful adoption of m-government services by end users: cost, education, process re-engineering, acceptance, access, and security.

Al-khamayseh et al. (2006) investigated the success factors of m-government in Europe. As a part of their study, they carried out a survey using stratified purposive sampling. They identified 18 factors and asked the experts to rank them per their importance and significance for m-government success. Privacy and security came first and legal issues— such as liberalization of the telecommunications sector—ranked last. The following factors were ranked second to seventeenth: infrastructure, user preferences and needs, quality and user-friendly applications, coherent e-government framework, acceptance, cost, standards and data exchange products, coherent m-government framework, high mobile penetration rate, infrastructure management, m-government awareness, accessibility, solid strategy, IT literacy, m-government portal and exclusive gateway, and partnership with the private sector.

Carroll (2005) adopted a different approach to address the success factors of m-government. She believes that there are several difficulties in studying and investigating the success of yet-to-be developed services. The conventional technique of asking what respondents think or whether they want to use a particular service is inadequate. This is because individuals espoused theories that were often different to their theories in action. Therefore, what people believe they need or do frequently deviates from what they are actually observed to do. Typically, current usage is studied and utilized as the starting point to predict or envision future usage through designer introspection, future scenarios, or workshops (Carroll et al., 2003). An alternative approach is to study current practices to derive general lessons of m-technology's use in the provision of public sector services. Such an approach is beneficial in defining a possible space to focus future studies, for example, acting out scenarios or prototypes. The findings produced the following six suggestions for m-government: There are important advantages to using personalized technologies when providing government services. As more interaction channels are added, trust must be built so that all channels are perceived to be trustworthy by the end user. Current m-government initiatives focus more on one-way G2C interaction. Users want to be able to control traffic on their mobile devices and limit incoming information to meet their local, real-time needs. Use practices around mobile technologies are diverse. Lastly, mobile phones are the technology of choice.

El-Kiki and Lawrence (2007b) conducted a survey to extract expert opinions of the barriers to m-government adoption and suggestions to overcome them. The analysis of responses identified three main areas for concentration to overcome adoption barriers: organizational, technical, and social. The barriers raised included economic, financial, and legal issues such as: reliability, open source, vision, inter-operability, scalability, accountability, transparency, participation, awareness, openness, accessibility, pricing, privacy, security, trust, and usability, as well as a lack of leadership.

As mentioned, this research uses eight constructs as external variables that fall under two categories: service characteristics and technology characteristics. The service characteristic constructs are responsiveness, currency, accuracy and convenience, while the technology characteristic constructs are security, trust, risk, and privacy.

2.7.1.1 Overview of Service Characteristics

Service quality is defined as “attitude or global judgement related to the superiority of the service” (Parasuraman et al., 1988). Therefore, service quality is a result of evaluation, judgment, and a subjective understanding of its merits. Researchers stated that proper design and implementation of the m-government services channel is a major factor in accepting m-government (Akter et al., 2013; Al-Busaidi & Al-Shihi, 2012; Al Thunibat et al., 2010; Sharma et al., 2017; Tam & Oliveira, 2016). Generally, in the literature of information technology systems, service quality is one of the main dimensions for measuring the success of an information system (DeLone & McLean, 1992). This dimension includes some service quality attributes, such as accuracy, currency, precision, timeliness, completeness, reliability, and relevancy (Bailey & Pearson, 1983; Ives et al., 1983; Kriebel, 1979). Other attributes, such as interpretability and accessibility, are also used in the information quality literature (Wang et al., 1993; Wang et al., 1995).

On one hand, Germanakos et al. (2005) argued that introducing mobile services to users is not enough, as the user is also demanding quality of service. He mentioned several aspects of service quality, such as availability, flexibility, accessibility, quality, security, and privacy.

On the other hand, Choi et al. (2004) confirmed that the quality-of-service characteristic is a significant predictor of behavioral intention to consume a service. From their own experiences, they know that the superior service quality is what retains customers. The relationship between service quality and behavioral intention is intuitive; a large amount of evidence supported this relationship (Boulding et al., 1993; Cronin & Taylor, 1992; Zeithaml et al., 1996).

2.7.1.2 Overview of Technology Characteristics

Research showed significant relationships between system characteristics and both perceived usefulness (Lucas, 1981; Magers, 1983; Miller, 1977) and perceived ease of use (Bewley, 1983; Magers, 1983; Miller, 1977; Poller & Garter, 1983).

Sternad and Bobek (2013) described the lack of attention to a system's technological characteristics as a serious deficiency in most IT studies. In fact, lack of a good technological infrastructure is pointed out as a pivotal barrier for e-learning systems implementation (Engelbrecht, 2005; Selim, 2007).

DeLone and McLean (2003) proposed an IS success model that includes technical system quality. This refers to technical success qualities and characteristics, such as accuracy and efficiency of the communication system (Rabaai, 2009). Technical system qualities were found to have a significant positive impact on a user's satisfaction within an e-learning context (Alsabawy et al., 2013; Conboy et al., 2009; Hassanzadeh et al., 2012; Islam, 2012; Kim et al., 2012; Motaghian et al., 2013; Saba, 2012; Tajuddin et al., 2013; Wang & Chiu, 2011; Wu et al., 2008) and to have an important effect on a user's intention to use the e-learning system (Cheng, 2012; Islam, 2012; Li, Duan et al., 2012; Ramayah et al., 2010; Wang & Chiu, 2011).

2.7.2 Responsiveness

2.7.2.1 Definition of Perceived Responsiveness

Perceived service responsiveness is defined as the user's perception of receiving prompt information or service in general, and specifically in the case of an emergency (Lee, 2005; Liljander et al., 2002; Parasuraman et al., 1988; Yang et al., 2003). Russell and Taylor (2003) also defined service quality responsiveness as a quick reaction to special requests or circumstances.

2.7.2.2 Relationship Between Perceived Responsiveness and Perceived M-government Usefulness

Due to the absence of physical presentation through online services, the service response has different properties and aspects with regard to e-government. In e-government, service responsiveness is generally assumed to be a recovery quality item. This is due to the fact that the user assumes that a customer service representative will resolve any problem promptly. Therefore, if e-government users do not find the services to be responsive, they may be less likely to adopt e-government; rather, they will prefer to approach a physical government entity to seek services. Russell and Taylor (2003) defined the service quality dimensions as: time and timeliness, courtesy, consistency, completeness, accessibility and convenience, accuracy, and responsiveness.

Research carried out in a developing country also confirmed that service response has a significant impact on citizens' adoption of e-government (Shareef, Kumar, Kumar, and Dwivedi (2009). On the other hand, Lee et al. (2005) specified the importance of providing timely information or responsiveness as one of the service quality characteristics for m-government. Responsiveness could be related to PU**,** as customers or users are likely to see value or ‘perceived usefulness’ in IB systems if they find the performance of IB services to be responsive in processing their requests and resolving their issues in a timely, efficient manner (Ezzi, 2014). According to Aloudat et al. (2014), an end user’s perception of the usefulness of an m-government application is highly influenced by the degree to which the user perceives the service to be responsive.

Therefore, the research framework hypothesizes responsiveness to be a service characteristic factor that impacts perceived usefulness of m-government applications.

2.7.2.3 Hypothesis

Based on the above discussion, the following hypothesis is proposed:

Hypothesis 15 - (H15): Perceived responsiveness of m-government services will positively impact its PU.

2.7.3 Currency

2.7.3.1 Definition of Perceived Currency

Perceived service currency is defined as the user's perceived quality of getting up-to-the-minute service or information (Aloudat et al., 2014). It is also defined as the degree to which the information or a service is up-to-date (Redman, 1997).

2.7.3.2 Relationship Between Perceived Currency and Perceived M-government Usefulness

Research has identified the service quality attributes as: accuracy, currency, precision, completeness, reliability, and relevancy (Bailey & Pearson, 1983; Ives et al., 1983; Kriebel, 1979). For example, Hung et al. (2013) suggested that the currency quality feature is expected to give insight into the extent to which m-government is generally considered to be sufficiently trustworthy for utilization by end users. According to Aloudat et al. (2014), the end user perception of how useful the m-government application is will be highly influenced by the degree to which the user perceives the service to be current.

Therefore, the research framework hypothesizes currency as one of the service characteristic factors that impacts perceived usefulness of an m-government application.

2.7.3.3 Hypothesis

Based on the above discussion, the following hypothesis is proposed:

Hypothesis 16 - (H16): Perceived currency of m-government services will positively impact its PU.

2.7.4 Accuracy

2.7.4.1 Definition of Perceived Accuracy

Russell and Taylor (2003) defined the service quality of accuracy as a service performed correctly every time it is requested. It is also defined as the user's perception of the conformity of the service or the information provided with the actual attributes of content and timing (Aloudat et al., 2014). Information or service accuracy is referred to correctness, reliability, and understandability of the information or services delivered by m-government systems (Wixom & Todd, 2005).

2.7.4.2 Relationship Between Perceived Accuracy and Perceived M-government Usefulness

Jayawardene et al. (2015) identified the accuracy feature as the first and foremost requirement that several users expect when obtaining information or services. Research has identified the service quality attributes as: accuracy, currency, precision, completeness, reliability, and relevancy (Bailey & Pearson, 1983; Ives et al., 1983; Kriebel, 1979). Others mentioned that services should be performed or information should be provided with little to no error at all (El-Kiki & Lawrence, 2006; Jahanshahi et al., 2011; Mallat et al., 2004). On the other hand, Russell and Taylor (2003) defined the service quality dimensions as: time and timeliness, courtesy, consistency, completeness, accessibility and convenience, accuracy, and responsiveness.

According to Aloudat et al. (2014), the end user perception of how useful the m-government application is would be highly influenced by the degree to which the user perceives the services to be accurate. Likewise, some researchers indicated the previous service characteristics as important determinants for the acceptance of m-government applications. For instance, Hung et al. (2013) suggested that the accuracy quality feature is expected to give insight into the extent to which m-government is generally considered sufficiently trustworthy to be utilized by end users.

Therefore, the research framework hypothesizes accuracy as one of the service characteristics factors that impacts perceived usefulness of m-government applications.

2.7.4.3 Hypothesis

Based on the previous discussion, the following hypothesis is proposed:

Hypothesis 17 - (H17): Perceived accuracy of m-government services will positively impact its PU.

2.7.5 Convenience

2.7.5.1 Definition of Perceived Convenience

Kim et al. (2002) defined electronic service convenience as anything that adds to a user’s comfort or saves work and time (a useful, helpful, or handy device, article, service, etc.). While Torkzadeh and Dhillon (2002) defined convenience as a measure that examines effort and time, Berry et al. (2002) conceptualized e-service convenience as a user’s perception of the effort and time it takes to use a service or buy a product. Russell and Taylor (2003) defined the service quality of convenience as the ease of obtaining information or a service.

2.7.5.2 Relationship Between Perceived Convenience and M-government Usefulness

Russell and Taylor (2003) defined the service quality dimensions as accuracy, responsiveness, accessibility and convenience, courtesy, time and timeliness, completeness, and consistency. Moreover, Johnson and Kaye (2002) showed convenience as a unique factor to the Internet due to its transactional and interactive abilities. Scholars have identified the convenience factor as a significant motivation and determinate for Internet use (Johnson & Kaye, 2002).

Several published works in the information and technology systems field emphasized the service of convenience and showed that users or consumers use online services because of their convenience levels (Ahmad, 2002; Degeratu et al., 2000; Easterbrook, 1995; Hul et al., 1997; Lohse & Spiller, 1998; Morganosky & Cude, 2000; Tanskanen et al., 2002).

Barbara and Johnson (2001, as cited in (Johnson & Kaye, 2002) identified service convenience as a significant driver for Internet use. Yoon and Kim (2007) extended TAM with perceived convenience construct, and concluded that perceived convenience affected users' acceptance of a wireless LAN (local area network). Hossain and Prybutok (2008) also found that perceived convenience affected usage intention with respect to radio frequency identification (RFID).Wireless and RFID are frequently used mobile technologies (Wang et al., 2009) and therefore perceived convenience could be an important predictor of acceptance of mobile technologies in general (Chang et al., 2012).

The convenience construct has not been well defined or operationalized in the literature (Yoon & Kim, 2007). The construct of convenience should be studied as a multidimensional construct (Brown, 1990). Brown proposed a conceptual framework

– within the marketing context – to study the product and service's convenience. According to Brown (1990), the convenience construct has five dimensions: time, place, execution, use, and acquisition. The first dimension, “time”, is defined as the product or service that may be provided at the most convenient time for the customer. The second dimension, “place”, is defined as the product or service that may be provided in the most convenient place for the customer. The third dimension, “execution”, is defined as having someone to provide the product or service for the consumer. The fourth dimension, “use”, is defined as the product or service that may be made convenient for the customer to use. The last dimension, “acquisition”, is defined as a company making a product or service easier for a consumer to purchase or deliver their products or services (financially or otherwise). On the basis of Brown’s work, Yoon and Kim (2007) excluded the use and acquisition dimensions because it is not easy to distinguish convenience in ‘use dimension’ from the ‘ease of use’ construct used with TAM, and ‘acquisition’ convenience is not relevant or applicable to the use of technology. Based on the convenience perspective provided by Yoon and Kim (2007), Chang et al. (2012) investigated the convenience construct with time, place, and execution dimensions.

In their research on e-banking, Liao and Cheung (2002) found that perceived convenience is a significant quality characteristic that positively impacts the perceived usefulness of e-banking, since users can e-bank over the Internet at any time (in any proper equipped location). Another study carried out by Tsai et al. (2017) adopted TAM to investigate the user’s intention toward location-based m-commerce on the Internet of things. Convenience, promotion, entertainment, information, and interactivity are all proposed by Tsai et al. (2017) as significant determinants of both

PU and PEOU, which in turn predict the BI of the user. Tsai et al. (2017) noticed that PU is predicted by convenience, information, entertainment, and inter-activeness.

Yoon and Kim (2007) found that perceived convenience positively affected PU. Similarly, Chang et al. (2012) found that perceived convenience of pursuing a task during the English mobile learning positively affected PU of the English mobile learning. Likewise, perceived convenience of online purchase has a significant impact on its PU (Cho & Sagynov, 2015).

Therefore, the research framework hypothesizes convenience as one of the service characteristics factors that impacts perceived usefulness of m-government applications.

2.7.5.3 Hypothesis

Based on the above discussion, the following hypothesis is proposed:

Hypothesis 18 - (H18): Perceived convenience of m-government services will positively impact its PU.

2.7.6 Security

2.7.6.1 Definition of Perceived Security

Shareef et al. (2011) understand perceived security based on Carter and Bélanger (2005) as the protection of users from any type of financial or non-financial threat or risk during electronic transactions. This includes any type of identity theft, abuse of credit cards, non-payment, overcharging, etc.

2.7.6.2 Relationship Between Perceived Security and Perceived M-government Usefulness

Several studies investigated the most critical technology characteristics to m-government acceptance. Many noted that application security standards play a critical role in m-government implementation and success (Heeks & Lallana, 2004; Okenfeld, 2002; Smith et al., 2010; Zalesak, 2003). According to Hong and Tam (2006), security issues have become an important problem in virtual environments, which has impacted users' acceptance of IT applications. Although more and more studies indicated that the first element taken into consideration before using any IT system is security (Fang et al., 2005), recent research showed that perceived security is an important factor influencing users' acceptance of e-commerce or m-commerce (Chellappa & Pavlou, 2002). However, few studies considered perceived security as a significant variable in e-government or m-government fields (Almuraqab, 2017; Wang, 2014). Therefore, scholars should pay greater attention to the security factor in unstable environments such as mobile applications (Almuraqab, 2017). This research extends the TAM model by adding perceived security.

Researchers considered different variables to measure users' acceptance of a new electronic service. For instance, in terms of e-banking, several researchers claimed that security and privacy are the most significant factors that may influence a user's adoption (Jahangir & Begum, 2008). One of the most important things for citizens is protecting their transactions and contact details against unauthorized access or parties (El-Kiki & Lawrence, 2007a).

M-government services generally request personal information from many citizens; therefore, lack of information security might lead to low service acceptance (Bertot et al., 2012; Schaupp & Bélanger, 2005). Information systems security has become an expected challenge that has a major impact on users' acceptance and adoption of information systems (Hong & Tam, 2006).

Lanwin (2002) argues that there are several hindrances that could slow down m-government introduction, namely, infrastructure and security. Fang et al. (2005)

stated that more and more studies showed that the first element considered before using an information system is security. Perceived security acts as a significant element for users to trust service systems and their providers, therefore performing the behavior of continued use (Rosati & Saba, 2004).

Alawneh et al. (2013) proposed that security, privacy, accessibility, service quality, and trust may affect the satisfaction level of using e-government. Many researchers investigated e-government adoption and showed that security, privacy, risk, and uncertainty are predominant factors for adoption (Al-Adawi et al., 2005; Balasubramanian et al., 2003; Belanger et al., 2002; Parent et al., 2005; Shareef et al.,2010; Shareef et al., 2008; Soat, 2003; Welch & Pandey, 2005). Sohn (2017) successfully provided statistical evidence confirming the impact of security on the PU toward searching and purchasing from mobile online stores.

Therefore, the research framework hypothesizes security as one of the technology characteristics factors that impacts perceived usefulness of m-government applications.

2.7.6.3 Hypothesis

Based on the above discussion, the following hypothesis is proposed:

Hypothesis 19 - (H19): Perceived security of m-government based technology will positively impact its PU.

2.7.7 Privacy

2.7.7.1 Definition of Perceived Privacy

Westin (1967) defined information privacy as the claim of individuals, groups, or organizations to determine for themselves how, when, and to what extent their information is communicated to others. Privacy concerns appear whenever personally identifiable information is requested, collected, and stored—either in digital form or otherwise. The possibility that information may be stolen, fraud committed, or data corrupted may become a reality (Suh & Han, 2002).

2.7.7.2 Relationship Between Perceived Privacy and Perceived M-government Usefulness

Security deals with the concerns surrounding personal information protection, with three specific aims: integrity, authentication, and confidentiality (Belanger et al., 2002; Camp, 1999; Chellappa, 2008). Integrity assures that information is trustworthy, accurate, and not altered during transit and storage; authentication addresses the user's identity verification and eligibility to access their data; and confidentiality requires that data use is restricted to authorized purposes by authorized persons. Culnan and Williams (2009) argued that organizations can successfully secure the stored data of personal information and still make different decisions about the subsequent use of the personal information, which results in information privacy problems. Consequently, as Ackerman (2004) suggested, security is essential for privacy, but security is not a guarantee against subsequent use that minimizes the risk of disclosure, or to reassure users. The proliferation of mobile technologies and internet has made privacy an urgent subject for emerging technologies, such as mobile applications, e-commerce, cloud services, and location-based services (Aloudat et al., 2014; Cazier et al., 2008; Van Slyke et al., 2006; Yang & Lin, 2015).

Smith et al. (1996) have identified and defined four privacy concerns: collection, unauthorized secondary use, errors in storage, and improper access of collected data. Collection is the extensive amount of personal identifiable information that is collected by the government while using m-government services. Unauthorized secondary use is defined as information collected for the purposes of m-government service being re-used for other purposes without the prior explicit authorization or consent of the individual. Errors in storage describe the concern that the protection procedures taken against accidental errors while storing personal identifiable information and utilizing m-government services are inadequate. Improper access is defined as the concern that stored personal information is accessible by unauthorized government parties. They have empirically examined and validated the measurement model of privacy as a multidimensional construct. However, Hsu and Lin (2016) found that users are more concerned with unauthorized secondary use and access of their information.

In fact, several researchers determined that the biggest barrier to e-commerce growth is the public's fears about online privacy and security (Albarran & Goff, 2000; Hoffman et al., 1999; Kaye & Medoff, 2001; Policy, 2003). The perceptions of security by technology systems users are addressed in literature, but Belanger et al. (2002) have pointed out that there is a lack of understanding about how security and privacy issues are related.

Since m-government transactions involve acquiring and transmitting data, users are often exposed to security and privacy risks (Radomir & Nistor, 2013). Assar (2015) stated that the security and privacy of m-government services are key challenges facing users in Saudi Arabia. Privacy has a positive impact on perceived usefulness of m-government services (Aloudat et al., 2014).

Therefore, the research framework hypothesizes privacy as one of the technology characteristics factors that impacts perceived usefulness of m-government applications.

2.7.7.3 Hypothesis

Based on the above discussion, the following hypothesis is proposed:

Hypothesis 20 - (H20): Perceived privacy of m-government based technology will positively impact its PU.

2.7.8 Trust

2.7.8.1 Definition of Perceived Trust

Carter and Bélanger (2005) and Teo et al. (2008) defined two types of trust—trust in government and trust in technology. Trust in government is defined as the degree to which the user believes that the interaction with the government can be trusted, while trust in technology is defined as the degree to which the user believes that the interaction with the technology underlying the system can be trusted (Carter & Bélanger, 2005). This research uses 'trust in technology' as the 'trust' factor that is one of the technology characteristic variables.

2.7.8.2 Relationship Between Perceived Trust and Perceived M-government Usefulness

M-government is relatively new as introduced in the UAE. Given the sophistication of the large range of users, lack of confidence, face-to-face interaction preference, and security and privacy concerns, users might not adequately trust using m-government. Numerous studies on technology adoption have found that users may resist using or adopting the technology due to the perceived trust factor. Trust may significantly impact individuals' behavior intention to use or utilize new technology (Venkatesh et al., 2011). Williams et al. (2011) argued that trust was a significant determinant that impacted information systems adoption in several studies.

Perceived trust plays an important role in transactions involving uncertainty, as it reduces perceived risks of using new technologies. Since m-government adoption is still at the early stage for some countries, users are still not very clear about the technical capabilities, such as security and reliability of their m-services (Anus et al., 2011). Trust stands as one of the top priorities during a government's technology development stage (Belanger & Hiller, 2006; Parent et al., 2005; Teo et al., 2008). Literature showed trust as a crucial enabler of e-commerce or e-government transactions (Carter & Bélanger, 2005; Kim et al., 2009; Kim et al., 2009; Teo et al., 2008). Other research regarded trust as an antecedent of actual behavior (Luarn & Lin, 2005; Shareef et al., 2011; Yuan et al., 2009).

Trust is discussed and studied in prior research on e-government (Parent et al., 2005; Shareef et al., 2011; Warkentin et al., 2002) and m-government (Hung et al., 2013). It is asserted as a key factor in determining a user’s intention to adopt new technology (Alalwan et al., 2015; Hanafizadeh et al., 2014; Luo et al., 2010; Zhou, 2011a, 2012). This is justified because of the particular nature of high uncertainty attached with financial services, which could be described as highly risky systems (Hanafizadeh et al., 2014; Luo et al., 2010; Zhou, 2011a).

Several researchers found the role of trust in technology of government services to be significant (Bélanger & Carter, 2008; Carter & Bélanger, 2005; McKnight & Chervany, 2001; Pavlou, 2003; Pavlou & Gefen, 2004; Warkentin et al., 2002; Welch et al., 2005). This conclusion is also found in studies on the adoption of e-government (Abu-Shanab, 2014; Dahi & Ezziane, 2015; Rehman et al., 2012; Sang et al., 2010) and m-government (Althunibat & Sahari, 2011). The importance of trust in the provided service and its underlying technologies is clearly recognized in acceptance and adoption literature (Kim, Song, Braynov, & Rao, 2001; Kini & Choobineh, 1998).

The trust construct is essential to the delivery of online government services (Hung et al., 2013). In order to succeed, e-government and m-government services should share useful information with public and private agencies—as well as with citizens—to intensify the need for trust (Dwivedi et al., 2017). Although a number of researchers (Alalwan et al., 2018; Alalwan et al., 2017; Luo et al., 2010) explored risk and trust in the e-commerce context, only a few (Dwivedi et al., 2017) tested and validated these roles in the context of m-government acceptance. However, Sharma et al. (2018) stated that to the best of their knowledge, there is no current empirical research that tested and validated the role of risk and trust toward the adoption of m-government services.

According to Aloudat et al. (2014), regardless of the mutual relationship between risk and trust, the two variables should be examined separately when investigating their impact on m-government, as they always illustrate different sets of effects (Junglas & Spitzmuller, 2006). The mobile banking literature shows the construct of "trust" as a key factor in determining and defining a consumer's perception and intention to adopt banking services through mobile devices (Alalwan et al., 2015; Hanafizadeh et al., 2014; Luo et al., 2010; Zhou, 2011a, 2012). This conclusion can be explained because mobile banking services are associated with high uncertainty—due to the nature of financial services—which heightens the risky characteristic service of mobile banking (Hanafizadeh et al., 2014; Luo et al., 2010; Zhou, 2011a).

Trust is an essential factor of m-government services' delivery (Teo et al., 2008). However, users may experience a service transaction malfunction when the underlying technology does not function as expected, which means that trust in technology positively impacts user PU (Pavlou, 2003; Wu & Chen, 2005). Moreover, Reid and Levy (2008) suggested that trust is a key factor impacting both PU and PEOU of IB in Jamaica. Others also found that trust enhances the prediction of a user's adoption of new technology and is an antecedent of PU (Dahlberg et al., 2003; Ha & Stoel, 2009).

Users' beliefs in the integrity and ability of the subject system are mainly reflected in the degree of PU. Such a relationship is noticed by myriad research in the IS and m-technology literature (Alalwan et al., 2017; Aloudat et al., 2014; Cho et al., 2007; Gefen et al., 2003; Hollingsworth & Dembla, 2013; Zarmpou et al., 2012; Zhang et al., 2010).

Trust also reduces the level of uncertainty and, consequently, establishes a positive view of the usefulness of m-government applications, thus giving predictions of a high-performance level. Therefore, trust is hypothesized to positively impact the perceived usefulness of m-government services (Aloudat et al., 2014).

Therefore, the research framework hypothesizes trust as one of the technology characteristics factors that impacts perceived usefulness of m-government applications.

2.7.8.3 Hypothesis

Based on the above discussion, the following hypothesis is proposed:

Hypothesis 21 - (H21): Perceived trust on m-government based technology will positively impact its PU.

2.7.9 Risk

2.7.9.1 Definition of Perceived Risk

Perceived risk is defined as an individual’s belief in the adverse consequences and/or the potential loss from using mobile services (Pavlou & Gefen, 2004; Van der Heijden et al., 2005). Perceived risk is also described as the subjective anticipation of a loss (Sweeney et al., 1999). Risk is usually associated with financial loss (Horton,

1976) and mobile service quality (Sweeney et al., 1999). Susanto and Goodwin (2010) defined perceived risk—in the context of m-government—as the extent to which the user considers that using m-government services could lead to a problem. This includes problems regarding the technology itself, possible financial threats, privacy, and security.

IT risks are related to the probability that the used system lacks protection from different forms of damages (Straub & Welke, 1998). Perceived risk is defined by Warkentin et al. (2002) as a user thinking that they could suffer a loss during an interaction with an IT system. Gefen et al. (2003) defined perceived risk as a user's subjective expectation of facing or suffering loss in pursuit of an outcome.

2.7.9.2 Relationship Between Perceived Risk and Perceived M-government Usefulness

A number of researchers found that individual perception of the inherent risks in e-services may be a crucial barrier to the acceptance and usage of the services (Campbell & Goodstein, 2001; Featherman & Pavlou, 2003; Horst et al., 2007; Junglas & Spitzmuller, 2006; Lee & Rao, 2005; Pavlou & Gefen, 2004; Van der Heijden et al., 2005; Xu, Teo, & Tan, 2005).

Aloudat et al. (2014), Assar (2015), Baabdullah et al. (2014), Susanto and Goodwin (2013), and Althunibat and Sahari (2011) revealed a highly unfavorable impact of perceived risk upon the user's BI to adopt e-government or m-government services. On the other hand, Pavlou and Gefen (2004) found that perceived risk level is significant to m-government implementation.

Empirical evidence has also shown that perceived system risk significantly impacts adopters' attitudes (Hung et al., 2006; Susanto & Goodwin, 2011). After analyzing a specific Malaysian e-government system called "my-EPF", Sulaiman et al. (2012) found that perceived risk was significantly but negatively associated with users' attitudes toward adopting “my-EPF”. Research based on theoretical models of e-commerce adoption also found a negative and significant impact of perceived risk on a user’s attitude (Lu et al., 2005; Teo & Liu, 2007).

Recent studies supported the idea that a user's perceptions concerning the risks associated with online transactions and payment are a main restraint to e-services adoption. Prior literature on perceived risk showed that 80% of internet users are concerned about placing their personal and financial identities on the web (Rana et al.,2015; Schaupp & Carter, 2010).

Perceived risk and perceived trust factors are identified by Hampshire (2017) as significant determinants of PU toward mobile payment (m-payment) systems. Based on data collected from UK users, Hampshire (2017) was able to argue that while trust positively correlated with PU, perceived risk hindered the level of PU in using m-payment. Risk increases uncertainty, hence, creating a negative view of the m-government service’s usefulness and giving predictions of a low level of performance. Thus, risk is hypothesized to negatively impact the perceived usefulness of m-government services (Aloudat et al., 2014).

Therefore, the research framework hypothesizes risk as one of the technology characteristics factors that impacts perceived usefulness of m-government applications.

2.7.9.3 Hypothesis

Based on the above discussion, the following hypothesis is proposed:

Hypothesis 22 - (H22): Perceived risk of m-government based technology will negatively impact its PU.

2.8 Theoretical Framework

Figure 25 shows the theoretical framework of this research based on the discussion and hypotheses.

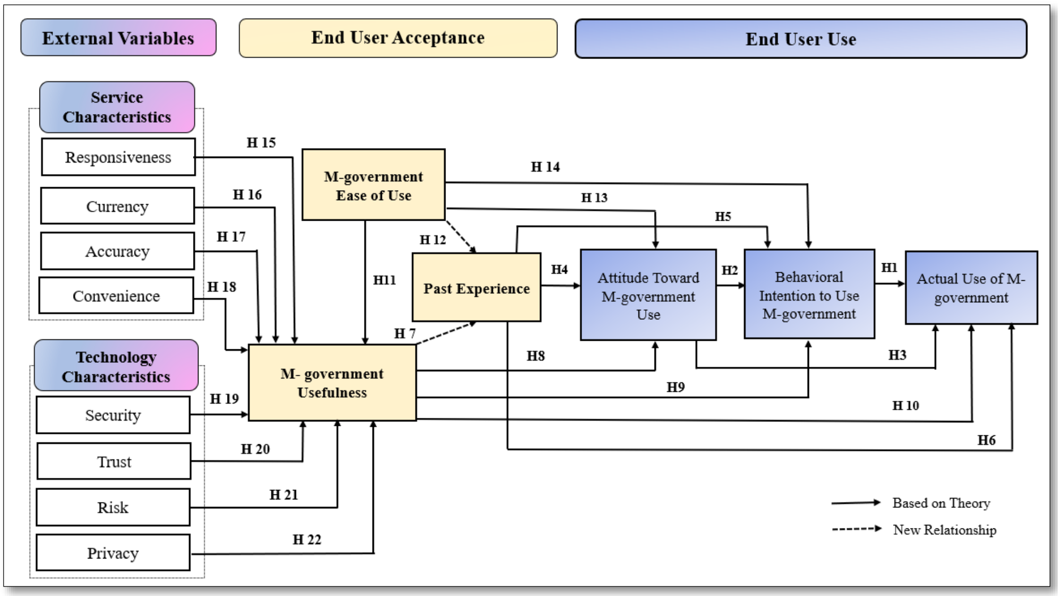


Figure 25: Theoretical Framework of Research

2.9 Research Hypotheses

Based on the literature review of m-government, the below hypotheses are proposed:

Hypothesis 1: End user BI to use m-government will positively impact the actual use of m-government.

Hypothesis 2: Attitude toward m-government use will positively impact the user BI to use m-government.

Hypothesis 3: Attitude toward m-government use will positively impact user actual use of m-government

Hypothesis 4: Past user experience will positively impact user attitude toward m-government use.

Hypothesis 5: Past user experience will positively impact user BI to use m-government.

Hypothesis 6: Past user experience will positively impact the actual use of m-government.

Hypothesis 7: Perceived m-government usefulness will positively impact past user experience.

Hypothesis 8: Perceived m-government usefulness will positively impact the end user attitude toward m-government use.

Hypothesis 9: Perceived m-government usefulness will positively impact the end user BI to use m-government.

Hypothesis 10: Perceived m-government usefulness will positively impact the actual use of m-government.

Hypothesis 11: Perceived m-government EOU will positively impact the m-government usefulness.

Hypothesis 12: Perceived m-government EOU will positively impact the past user experience.

Hypothesis 13: Perceived m-government EOU will positively impact the end user attitude toward m-government use.

Hypothesis 14: Perceived m-government EOU will positively impact the end user behavioral intention to use m-government.

Hypothesis 15: Perceived responsiveness of m-government services will positively impact its PU.

Hypothesis 16: Perceived currency of m-government services will positively impact its PU.

Hypothesis 17: Perceived accuracy of m-government services will positively impact its PU.

Hypothesis 18: Perceived convenience of m-government services will positively impact its PU.

Hypothesis 19: Perceived security of m-government based technology will positively impact its PU.

Hypothesis 20: Perceived trust on m-government based technology will positively impact its PU.

Hypothesis 21: Perceived risk of m-government based technology will negatively impact its PU.

Hypothesis 22: Perceived privacy of m-government based technology will positively impact its PU.

2.10 Chapter Summary

This chapter provided an overview of the research literature review that is based on TAM. The chapter examined the existing literature on TAM, its main constructs, and its extensions. It also showed a comparison between TAM and other technology adaption theories. Finally, the chapter presented prior reviews of technology adoption in general and m-government in particular. The following chapter presents details of the research methodology.

Chapter 3: Research Methodology

3.1 Overview

The purpose of this chapter is to present the research methodology adopted in this study. It first outlines the philosophical assumptions underpinning this research, discussing the researcher's constructivist approach. The next section defines the scope and rationale for research approach, method, paradigm, framework, strategy and time horizon. It also provides an overview of the study's questionnaire design, and sampling strategy. The chapter concludes by discussing research ethical considerations, data analysis strategy, and the chapter summary.

3.1.1 Definition of Methodology

Polit and Beck (2004) defined methodology as ways of obtaining, systematizing and analysing data. Creswell (2003) portrays methodology as a coherent set of methods that harmonize one another and that have the capability to deliver data and findings which will reflect the overall research questions and suits the researcher's purpose. Bowling (2005) explains that methodology is the complete research study's structure; the size and sample methods, the practices and techniques utilized to collect and analyse data.

Alavi et al. (2018) defined research methodology as "a set of techniques used to identify, select, process and analyze the information collected about the studied subject". These techniques are a conversion of the researchers' ontological and epistemological assumptions into procedures that allows directing the way social research is executed (Nguyen et al., 2018; Peffers et al., 2007). Methodology acts as a guideline of how and where information is coming from and how is it linked to the objectives of this study. The methodology chapter provides the reader with a road map of what is to be done and why, letting the readers understand how data is collected and analyzed (Polonsky & Waller, 2011).

Research methodologies encourage the researcher to plan the research by justifying the reasons that motivated conducting the selected study, how to articulate such research issues as the research problem, research questions, data collection approach, type and size of collected data and best analysis technique that could seek best solutions (Baker et al., 2012; Guthrie et al., 2004).

3.2 Research Philosophy

Research philosophy can be defined as the development of research assumption, its knowledge, and nature (Saunders et al., 2009). The context in which research is carried out establishes were the researcher wants to go with the research and what is sought to be achieved. It is therefore imperative that the researcher is clear about the paradigm issues that guide and enlighten the research approach, as they are reflected in the methodology applied in the research and help place the research into a broader context (Easteby-Smith et al., 2002).

One of the most important parts of the research methodology is choosing an appropriate research philosophy. Research philosophy is classified mainly as:

- Ontology, and
- Epistemology

The above philosophies are two different ways of viewing a research philosophy which enable the researcher to decide which approach should be adopted and why, that is derived from research questions (Saunders & Lewis, 2009). When research philosophy is selected, the research approach, research method, research paradigm, research strategy and time horizon will be identified accordingly. In order to narrow down the selection of research methodologies, the research paradigm that fits with the research objectives need to be identified.

3.2.1 Research Ontology

Ontology in business research can be defined as "the science or study of being" (Blaikie, 2010) and it is based on the nature of reality. Ontology is a system of belief that reflects an interpretation by an individual about what constitutes a fact in social reality (Antwi & Hamza, 2015; Blaikie, 2007; Cochemé et al., 2007; Corbetta, 2003). According to the ontology, social entities should be perceived as objective or subjective. Therefore, objectivism (or positivism or realist) and subjectivism (constructionism or interpretivism or idealist) can be specified as two important aspects of ontology (Blaikie, 2007; Teymourlouie et al., 2018). Objectivism (realist) "portrays the position that social entities exist in reality external to social actors concerned with their existence" (Blaikie, 2007; Bryman, 2016; Corbetta, 2003; Goodwin & Darley, 2008; Jonassen, 1991; Saunders & Lewis, 2009). Subjectivism (idealist), perceives that social phenomenon is created from the perceptions and consequent actions of those social actors concerned with their existence (Blaikie, 2007; Bryman, 2017; Corbetta, 2003; Foss et al., 2008; Hamati-Ataya, 2014; Lembo et al., 2015). This research follows realist ontology (or positivism or objectivism) because the reality is considered to be one, objective, and exist independently of the researcher observation and interpretation.

3.2.2 Research Epistemology

Epistemology refer to how humans acquire knowledge about the world surrounding them, as well as how they justify this knowledge to be truthful and acceptable (Antwi & Hamza, 2015; Blaikie, 2007; Harris et al., 2009; Merk et al., 2018). Epistemology in business research is a branch of philosophy deals with the sources of knowledge. The most prominent epistemological views are positivism and constructivism (Blaikie, 2007; Corbetta, 2003; Henry & Pene, 2001; Johnson et al., 2007). Positivism epistemology is linked with the objectivism (or realist) ontology. Positivism epistemology entails researchers to be disconnected from their research subjects to follow the deductive logic. This type of epistemology enables researchers to empirically discover general patterns of human behaviors (Andersson et al., 1995; Antwi & Hamza, 2015; Blaikie, 2007; Corbetta, 2003; Gordon et al., 1986). On the other hand, constructivism epistemology is linked with the subjectivism (or idealist) ontology (Young & Collin, 2004) and exists only in people's minds. It requires the researchers to be involved deeply in their studies to gain a better understanding of the external world (Sieber & Haklay, 2015; Siebers, 2001). Hence, the researchers play an active role in constructing a social reality from these subjective perceptions (Antwi & Hamza, 2015; Blaikie, 2007; Corbetta, 2003) and the outcomes of their research are constructed realities that are time- and context-specific (Johnson et al., 2007). This research will adopt objectivism epistemology as the researcher and the investigated object are assumed to be independent entities and can not affect each other.

3.3 Research Approach

The research approaches can be classified into two types that are:

- Deductive approach, and

- Inductive approach.

A deductive approach is concerned with “developing a hypothesis (or hypotheses) based on existing theory, and then designing a research strategy to test the hypothesis” (Gulati, 2009; Russell, 2010; Wilson, 2014). Generally, positivism studies follow the deductive research strategy (Saunders & Lewis, 2009).

According to Bernard (2017), inductive research “involves the search for pattern from observation and the development of theories for those patterns through series of hypotheses”. In addition, the inductive approach to the subjectivism philosophy (Saunders & Lewis, 2009). Inductive approach starts with the observations and seeks to find patterns within them and as a result of these patterns, theories are proposed towards the end of the research process (Bernard, 2017; Goddard & Melville, 2004; Lodico et al., 2010; Saunders et al., 2003).

This research adopts a deductive approach by using theoretical arguments based on existing phenomena and testing hypotheses (Saunders & Lewis, 2009). This approach is used to describe the causal relationship between variables, testing hypotheses, and generalizing the regularities in human social behavior (Saunders & Lewis, 2009). The research approach is aligned with the overall research ontology and epistemology.

3.4 Research Method

The research method can be classified into three methods which are:

- Quantitative method,
- Qualitative method, and
- Mixed method.

Mixed method has both qualitative method and quantitative method. In a mixed type of data, both inductive and deductive approaches of analysis are utilized. This type of research follows a pragmatism ontology that defines reality to be either one (quantitative method) or multiple (qualitative method) and follows the epistemology that defines the ways of acquiring knowledge to be examined using best tool or scientific designs (quantitative method), or interpreted (qualitative method).

Qualitative method focuses on obtaining data through open-ended and conversational communication. Qualitative data refers to non-numeric information such as interview transcripts, notes, video and audio recordings, images and text documents. Generally, the application of inductive approach is associated with qualitative methods of data collection and data analysis. Qualitative data requires an inductive approach to analysis.

Quantitative research designs are either descriptive (i.e., subjects usually measured once) or experimental (i.e., subjects measured before and after a treatment). A descriptive study establishes only associations between variables; an experimental study establishes causality. Quantitative research deals in numbers, logic, and an objective stance. Quantitative research focuses on numeric and unchanging data and detailed, convergent reasoning rather than divergent reasoning. Quantitative data uses the deductive approach and has the following main characteristics: data is usually gathered using structured research instruments, results are based on large sample sizes that are representative of the target population, and research study can usually be replicated or repeated, given its high reliability. Moreover, quantitative researcher has clearly defined research question to which objective answers are sought, all aspects of the study are carefully designed before data is collected, and data are in the form of numbers and statistics, often arranged in tables, charts, figures, or other non-textual forms. In addition, this type of research can be used to generalize concepts more widely, predict future results, or investigate causal relationships. Also, researcher uses tools, such as questionnaires or computer software, to collect numerical data.

The aim of a quantitative research study is to classify features, count them, and construct statistical models in an attempt to explain what is observed.

In order to have consistency between the research philosophy and research approach, quantitative method will be used for this research as this generate more objective findings and is consistent with the research's overall paradigm. The quantitative method depend on probability theory to investigate statistical hypotheses of the research questions (Harwell, 2011). The quantitative research data will be collected through a questionnaire survey to study the different levels of this research. Furthermore, it pursues a deductive logic to examine the relationship between the theory and the research (Bryman, 2004).

3.5 Research Paradigm

According to Cohen (2007), the research paradigm can be defined as a wide structure encompassing perception, beliefs, and awareness of different theories and practices used to carry out research. It is also defined as "the set of common beliefs and agreements shared between scientist about how problems should be understood and addressed" (Kuhn, 1970).

Gliner et al. (2016) describe the scientific research paradigm as the approach or thinking about the research, the accomplishing process, and the method of implementation. It is not a methodology, but rather a philosophy which provides the process of carrying out research, i.e., directs the process of carrying out research in a particular direction. Ontology, epistemology, methodology, and methods describe all research paradigms (Alghamdi & Li, 2013; Creswell & Poth, 2016; Guba & Lincoln, 1994). Smith et al. (2008) discuss three main components of the scientific research paradigm, or three ways in order to understand the philosophy of research that are epistemology, ontology, and methodology.

The three paradigms (positivist, constructivist, and critical) which are different by ontological, epistemological, and methodological aspects are also often included in the classification of scholarly paradigms (Fazlıoğulları, 2012).

This research will take a positivism paradigm, it claims that the social world can be understood in an objective way. In this research philosophy, the scientist is an objective analyst and, on the basis of it, dissociates himself from personal values and works independently. Schrag (1992) stated that positivism paradigm relies on David Hume's theory that believes in the use of the five senses to generate new knowledge about reality. The term 'positivism' reflects a firmly empirical approach in which knowledge claims are relied directly on experience. It adopts a quantitative research method in investigating the phenomena (Crossan, 2003). It also takes a scientific method that generates an objective nature of knowledge which limits and fully controls the researcher's role in data collection, data analysis and interpretation (Chilisa & Kawulich, 2012). Moreover, the positivism paradigm follows a deductive approach which means the researcher will start with the theory, deduce hypotheses from the selected theory and test them with the collected data (Regnér, 2003). Positivism approach is viewed as being unbiased, value-free, rigorous and objectivist in testing existing theories (Henderson, 2011). Consequently, and in order to study the user experience, acceptance and actual use of m-government, the research will adopt TAM theory. Since the variables to be measured are intangible and could not be measure directly, the researcher will rely on operationalization to convert the factors selected from intangible to tangible measurement as positivism approach considers reality to be tangible, therefore operationalization is crucial to solve this dispute.

3.6 Research Framework

The theoretical framework of this research draws upon two theoretical models. Firstly, TRA model which has been found to be very effective in explaining human behavior in different contexts (Fishbein and Ajzen, 1975). Secondly, TAM model which is tailored from TRA to study the human behavior in an IT context. TAM theorizes that some external factors affect the user behavioral intention to use the IT based application through enhancing both the perceived usefulness and perceived ease of use of the system. As such, this research utilizes both service characteristics and technology characteristics as external factors affecting perceived usefulness in TAM. Concisely, the researcher uses the following theory to build the research's theoretical framework: Technology Acceptance Model (TAM).

3.7 Research Strategy

According to the research paradigm, quantitative method will be applied. Therefore, there are two types of data collection that can be utilized either primary data collection or secondary data collection. In this research utilizes primary data type and the source of collecting the data will be a questionnaire. However, questionnaires can be classified as both quantitative and qualitative method depending on the nature of questions used. Closed-ended questions with multiple choice answers are analyzed using quantitative methods and they may involve pie-charts, bar-charts and percentages. While open-ended questions are analyzed using qualitative methods and they involve interpretation, discussions, and critical analyses without the use of any numbers.

Advantages of questionnaires include increased speed of data collection, low or no cost requirements, and higher levels of objectivity compared to many alternative methods of primary data collection. For this research, questionnaires with closed-ended questions will be used and it is aligned with the research method used that is quantitative.

3.8 Time Horizon

There are two types of time horizons namely:

- Longitudinal, and
- Cross-sectional.

Longitudinal study, like the cross-sectional study, is an observational study, in which data is gathered from the same sample repeatedly over an extended period of time. Longitudinal study can last from a few years to even decades depending on what kind of information needs to be obtained. The benefit of conducting a longitudinal study is that researchers can make notes of the changes, make observations and detect any changes in the characteristics of their participants. One of the important aspects here is that a longitudinal study extends beyond a single frame in time. As a result, they can establish a proper sequence of the events that occurred. A longitudinal study requires the researcher to revisit participants of the study at proper intervals. Longitudinal study is conducted with the same sample over the years. Longitudinal study can justify cause-and-effect relationship and only one variable is considered to conduct the study.

On the other hand, cross-sectional study is defined as an observational study where data is collected as a whole to study a population at a single point in time to examine the relationship between variables of interest. Cross-sectional studies allow the study of many variables at a given time. Cross-sectional studies are quick to conduct when compared to longitudinal studies. Due to the tight time frame of this study, therefore, a Cross-sectional study will be applied.

3.9 Questionnaire Design

A structured questionnaire was prepared to operationalize various constructs in the form of statements to measure participant's behavior. The study is cross-sectional in nature, as the views of m-government users from different backgrounds were collected. The unit of analysis is the individual users of m-government and an objective assessment of their views and opinions of the various model constructs was canvassed and analyzed using appropriate statistical techniques.

According to Martin (2006), the development of a questionnaire must address several issues. First, the selection of measurement scales or items for the various constructs. Second, the questionnaire formatting. Third, introducing and explaining the questionnaire to potential respondents. Forth, pre-testing the questionnaire. Finally, mode of distribution, and data gathering.

3.9.1 Selection of Measurement Scale

The essential step in developing the questionnaire is to select the proper measurement scale for each construct in the research model. According to Rosas and Ridings (2017), developing any new measurement, scale requires dedicated research to ensure the validation of the item selected that can represent such a construct. Hence, the recommendations of Burton-Jones and Lee (2017) as stated in their study that "Researchers should use previously validated instruments wherever possible, being careful not to make significant alterations in the validated instrument without revalidating instrument content, constructs, and reliability" were adhered to. This research will use validated measures that have been applied by previous researchers. All items will be measured using a five-point Likert-type scale. The procedure was as follows: To conceptualize PEOU and PU, the original scale of Davis (1989) and Agarwal and Prasad (1999) was adopted for this research. Four five-point Likert-scale questions was used to measure the PEOU and four five-point Likert-scale questions were then used to measure PU. To measure the attitude toward m-government use construct, four different sources were used (Agarwal & Prasad, 1999; Bhattacherjee, 2000; Taylor & Todd, 1995c; Van der Heijden, 2004). Moreover, attitude toward m-government use construct were operationalized using three items. Thus, three five-point Likert-type scale questions were used to measure it. Similarly, three sources were used to operationalize the BI to use m-government (Bhattacherjee, 2000; Junglas & Spitzmuller, 2006; Taylor & Todd, 1995b). Consequently, three five-point Likert-type scale questions were used to measure it. In order to conceptualize m-government service characteristics this research followed Aloudat et al's. (2014) approach that classify m-government service characteristics as a multidimensional construct which includes responsiveness, currency and accuracy. Therefore, three five-point Likert-type scale questions was used to operationalize each dimension. One more dimension was added to m-government service characteristics that is convenience which was operationalized using items adopted from Kim et al. (2002), Yoon and Kim (2007) and Torkzadeh and Dhillon (2002). Thus, five of five-point Likert-type scale questions were used to measure it. The construct m-government technology characteristics was also conceptualized as a multidimensional construct which includes; security (Almarashdeh & Alsmadi, 2017; Fang et al., 2005), privacy (Smith et al., 1996), trust (Flavián & Guinalíu, 2006; Kananukul et al., 2015; Phua, Jin, & Kim, 2017; Ruan & Durresi, 2016) and risk (Pavlou & Gefen, 2004; Phua et al., 2017; Ruan & Durresi, 2016). Hence, three five-point Likert-type scale questions were used to operationalize each dimension except for privacy which has four five-point Likert-type scale questions under three of its dimensions: unauthorized secondary use, collection, and error, and three five-point Likert-type scale questions under its last dimension: unauthorized access. In conceptualizing past user experience of using m-government construct, the scale of No and Kim (2014), Kim (2008) and Alambaigi and Ahangari (2016) were adopted and five of five-point Likert- type scale questions were used to measure it. Finally, the actual use of m-government construct was assessed using the scale adopted from Almarashdeh and Alsmadi (2017) and three five-point Likert- type scale questions were used to measure it.

Next, the operationalized measures were purified by the work of six m-government experts' panel. The panel were consisted of three academic researchers experienced in information technology applications research and three practitioners from the field of m-government.

After building and ensuring quality of the survey content, a pilot study or "pre-testing" technique was conducted where the outcome of the pilot study ensured the effectiveness of the existing scales and enabled slight modification where needed.

Table 10: Construct Measurement Items

Construct	Items	Source
Perceived Responsiveness (PR)		
PR1	M-government applications is carried out in a reasonable time.	Adopted from Aloudat et al. (2014)
PR2	If I used m-government applications, I would always expect a prompt response.	
PR3	Overall, m-government applications should offer information in a timely manner.	
Perceived Currency (PC)		
PC1	M-government applications provide up-to-the-minute information.	Adopted from Aloudat et al. (2014)
PC2	I would be concerned if the information provided to me by m-government applications was not up-to-date.	
PC3	M-government applications always have the latest information in order to be reliable	
Perceived Accuracy (PA)		
PA1	The information delivered to me through m-government applications is always accurate.	Adopted from Aloudat et al. (2014)

Table 10: Construct Measurement Items (Continued)

Construct	Items	Source
PA2	It is unacceptable to get inaccurate information when using m-government applications.	
PA3	Overall, m-government applications are reliable to be used only when they are accurate.	
Perceived Convenience (PCV)		
PCV1	Using m-government enables me to obtain services at a time that is convenient for me.	Adopted from Torkzadeh and Dhillon's (2002), Kim et al (2002) and Yoon and Kim (2007)
PCV2	Using m-government enables me to obtain services at anyplace that is convenient for me.	
PCV3	M-government is a pleasant experience.	
PCV4	M-government saves time compared with going to a traditional customer service centers.	
PCV5	I find m-government convenient for getting services.	

Table 10: Construct Measurement Items (Continued)

Construct	Items	Source
Perceived Security (PS)		
PS1	I trust the ability of m-government applications to protect my privacy.	Adopted from Almarashdeh and Alsmadi (2017)
PS2	Using m-government applications is financially secured.	
PS3	I am not worried about the security of m-government applications.	
Perceived Privacy (PP) – Unauthorized access		
PP1	M-government should devote more time and effort to preventing unauthorized access to personal information.	Adopted from Smith et al. (1996)
PP2	M-government should take more steps to make sure that the personal information in their files is accurate.	
PP3	M-government should take more steps to make sure that unauthorized people cannot access personal information	
Perceived Privacy (PP) - Unauthorized secondary use		
PP4	M-government should not use personal information for any purposes unless it has been authorized by the individuals who provided the information.	

Table 10: Construct Measurement Items (Continued)

Construct	**Items**	**Source**
PP5	When people give personal information to a m-government for some reason, m-government should never use the information for any other purpose.	
PP6	M-government should never sell the personal information in their computer databases to other companies.	
PP7	M-government should never share personal information with other companies unless it has been authorized by the individuals who provided the information.	
Perceived Privacy (PP) – Collection		
PP8	It usually bothers me when m-government ask me for personal information.	
PP9	When m-government ask me for personal information, I sometimes think twice before providing it.	
PP10	It bothers me to give personal information to so many people.	

Table 10: Construct Measurement Items (Continued)

Construct	**Items**	**Source**
PP11	I am concerned that m-government are collecting too much personal information about me.	
Perceived Privacy (PP) – Errors		
PP12	All the personal information in computer databases should be double-checked for accuracy no matter how much this cost.	
PP13	M-government should take more steps to make sure that the personal information in their files is accurate.	
PP14	M-government should have better procedures to correct errors in personal information.	
PP15	M-government should devote more time and effort to verifying the accuracy of the personal information in their databases.	
Perceived Trust (PT)		
PT1	I believe the information offered by the m-government applications is genuine.	Adopted from Phua et al. (2017)
PT2	I think m-government applications are trusted applications.	

Table 10: Construct Measurement Items (Continued)

Construct	Items	Source
PT3	I can rely on m-government applications for the information about different services.	
PT4	M-government applications serves the best interests of its users.	
Perceived Risk (PRK)		
PRK1	There is a considerable risk involved in using m-government applications.	Adopted from Phua et al. (2017) and Ruan & Durresi (2016)
PRK2	My decision to use m-government applications would be risky.	
PRK3	There is too much uncertainty associated with using m-government applications.	
Perceived M-Government Ease of Use (PMGEOU)		
PMGEOU1	Learning how to use m-government applications would be easy for me.	Adopted from Davis (1989) and Agarwal and Prasad (1999).
PMGEOU2	I found m-government services easy to use.	
PMGEOU3	M-government applications are clear and understandable.	
PMGEOU4	I find it easy to get m-government applications to do what I want them to do.	

Table 10: Construct Measurement Items (Continued)

Construct	Items	Source
Perceived M-Government Usefulness (PMGU)		
PMGU1	Using m-government applications helps me to accomplish things more quickly.	Adopted from Davis (1989) and Agarwal and Prasad (1999).
PMGU2	Using m-government applications makes my life easier.	
PMGU3	I find m-government applications useful to my life.	
PMGU4	Using the M-government applications would increase my productivity.	
Past Experience (PE)		
PE1	If I have access to the M-government, I will use it always	Adopted from No and Kim (2014), Kim (2008) and Alambaigi and Ahangari (2016)
PE2	I want to see the benefits of m-government before I apply it	
PE3	The m-government provides me a more efficient and organized tool for getting services.	
PE4	I often tell my friends about my m-government experiences.	
PE5	M-government are valuable to my overall online experiences.	

Table 10: Construct Measurement Items (Continued)

Construct	Items	Source
Attitude Toward M-Government Use (ATMG)		
ATMG1	I like the idea of using M-government applications instead of visiting the government entity.	Adopted from Agarwal and Prasad, (1999), Bhattacherjee (2000), Taylor and Todd (1995c) and Van der Heijden et al. (2004).
ATMG2	I consider using M-government applications for getting the governmental services is good idea.	
ATMG3	In general, the idea of using M-government applications might be beneficial to my family and me.	
Behavioural Intention to use M-Government (BIMG)		
BIMG1	I intend to use M-government applications to do my work.	Adopted from Bhattacherjee (2000), Junglas and Spitzmuller (2006) and Taylor and Todd (1995c).
BIMG2	I intend to use M-government applications frequently.	
BIMG3	Given the opportunity, I will use M-government applications.	

Table 10: Construct Measurement Items (Continued)

Construct	Items	Source
Actual Use of M- Government (AUMG)		
AUMG1	I often use M-government service frequently	Adopted from Almarashdeh, & Alsmadi, (2017).
AUMG2	I use the m-government whenever appropriate to obtain services and information	
AUMG3	I use the m-government services a lot to obtain services and information.	

3.9.2 Formatting the Questionnaire

According to Mondada (2017), formatting the questionnaire refers to how the questionnaire survey is laid out and how information is organized and presented. To solicit participation in the survey, a cover letter that introduced the researcher and described the topic under research, the research objectives and its potential value for both academics and the organization was distributed along with the questionnaire. The letter emphasized the voluntary nature of participation and that respondents had the right to withdraw at any time without being penalized. The letter also highlighted the fact that there are no right or wrong answers to any of the statements and that all answers would be treated as confidential. A one-page guide was also prepared to help participants to fill in the questionnaire. The guide described the structure of the questionnaire and explained how the respondent could tick the proper box to indicate a response for each statement. An example showing how the questionnaire box should be marked was included in the guide.

Participants started by filling in the demographic questions which are related to age, gender, nationality, etc. This demographic information does not require much efforts. A well-formatted survey helps the participants to complete the survey conveniently, which is considered as one of the critical goals leading to the generalization by maximizing the response rate (Fanning, 2005; Henry et al., 2008). The structural layout of the questionnaire consisted of a two-column table format. The left column indicated the selected variables and their relative scale measurement items, while the right column offered the respondent a choice of five pre-coded response with the neutral point being neither agree nor disagree. The use of five-point Likert- type scale questions allowed the participants to express how much they agreed or disagreed with the given statements. Figures 26-27 show an example of the questionnaire structure. A copy of the full questionnaire survey is detailed in the Appendix.

Factors that Affect Actual Use of M-government Services
العوامل التي تؤثر على الاستخدام الفعلي لخدمات التطبيقات الحكومية

Dear Sir/Madam

Alslamo Alykom

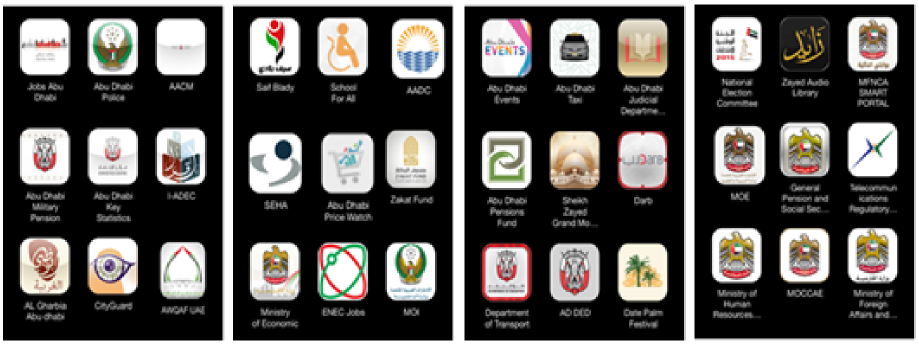
This questionnaire is designed to measure factors that affect user acceptance and usage of M-Government Services in Abu Dhabi. You have been selected for this study based on random sample of people. The study is purely academic and the data you provide will be used only for scientific research and will help in gaining a better understanding of users' acceptance of M-Government applications. Of course, you are not required to identify yourself and your response will be kept strictly confidential and there is no way of tracing your response. Only members of the research team will have access to the data you give and the completed questionnaire will not be made available to anyone other than the research team. The questionnaire should be filled in by anyone who have used any M-Government applications during the period of 2018 until today.

السلام عليكم،

تم تصميم هذا الاستبيان لقياس العوامل التي تؤثر على قبول المستخدم واستخدام خدمات الحكومة الإلكترونية في مدينة أبوظبي. لقد تم اختيارك لهذه الدراسة بناءً على عينة عشوائية من الناس. هذه الدراسة أكاديمية بحتة، وسيتم استخدام البيانات التي تقدمها فقط للبحث العلمي وستساعد في فهم أفضل لقبول المستخدمين لتطبيقات الحكومة الإلكترونية. بالطبع لا يلزمك تحديد هويتك وسيتم الاحتفاظ بإجابتك في سرية تامة ولا توجد وسيلة لتتبع ردك. سيتمكن أعضاء الفريق البحثي فقط من الوصول إلى البيانات التي تقدمها ولن يتم توفير الاستبيان المكتمل لأي شخص آخر غير فريق البحث. يجب ملء الاستبيان من قبل أي اي مستخدم لأي من تطبيقات الحكومة الإلكترونية خلال الفترة من 2018 الى اليوم.

Examples of Government Applications:

أمثلة على التطبيقات الحكومية



Thank you for your co-operation
If you would like a copy of the study results report, please complete the following details:

شكرا لتعاونكم

إذا كنت ترغب في الحصول على نسخة من تقرير نتائج الدراسة ، فيرجى إكمال التفاصيل التالية:

Figure 26: Questionnaire Cover Page

Using the scale provided below, please, indicate the level of agreement / disagreement with each of the following statements.

1	2	3	4	5
Extremely disagree لا أوافق بشدة	Disagree لا أوافق	Neutral محايد	Agree أوافق	Extremely agree أوافق بشدة

C.1	I would expect the information delivered to me through M-Government applications to be always accurate. أتوقع أن تكون المعلومات المقدمة لي من خلال الطلبات الحكومية دقيقة دائمًا.	1	2	3	4	5
C.2	I would find it unacceptable to get inaccurate information when using M-Government applications. أجد أنه من غير المقبول الحصول على معلومات غير دقيقة عند استخدام التطبيقات الحكومية.	1	2	3	4	5
C.3	Overall, M-Government applications are reliable to be used only when they are accurate. بشكل عام ، يمكن الاعتماد على التطبيقات الحكومية فقط عندما تكون دقيقة.	1	2	3	4	5

D.1	Using m-Government enables me to obtain services at a time that is convenient for me. يمكّنني استخدام التطبيقات الحكومية من الحصول على الخدمات في الوقت الذي يناسبني.	1	2	3	4	5
D.2	Using m-Government enables me to obtain services at anyplace that is convenient for me. يتيح لي استخدام التطبيقات الحكومية الحصول على الخدمات في أي مكان يناسبني.	1	2	3	4	5
D.3	M-Government is a pleasant experience. التطبيقات الحكومية تعد تجربة ممتعة.	1	2	3	4	5
D.4	M-Government saves time compared with going to a traditional customer service centers. التطبيقات الحكومية توفر الوقت مقارنة بالذهاب إلى مراكز خدمة العملاء التقليدية.	1	2	3	4	5
D.5	I find m-Government convenient for getting services. أجد التطبيقات الحكومية مريحة للحصول على الخدمات.	1	2	3	4	5

E.1	I trust the ability of M-Government applications to protect my privacy. أثق في قدرة التطبيقات الحكومية على حماية خصوصيتي.	1	2	3	4	5
E.2	Using M-Government applications is financially secured. استخدام التطبيقات الحكومية مؤمن / محمي مالياً.	1	2	3	4	5
E.3	I am not worried about the security of M-Government applications. أنا لست قلقًا بشأن أمان التطبيقات الحكومية.	1	2	3	4	5

Figure 27: The Questionnaire Format

3.9.3 Pre-Testing the Questionnaire

Prior to data collection, the questionnaire was evaluated by two academic experts and the researcher's main supervisor. Expert views were sought from scholars with an interest in similar fields of research. The academic experts reviewed the questionnaire's items to verify their suitability and to ensure that all items completely addressed every aspect of the research questions. They were also requested to give their feedback about any ambiguities, redundancies, or difficulties in comprehension that they encountered, and modifications were made accordingly. The feedback indicated that the survey instrument was clear and comprehensible and that the measurement scales addressed the constructs that they intended to measure. The questionnaire survey was translated into Arabic. According to the conventional back-translation protocol (Brislin, 1970). The researcher requested a qualified translator who was unaware of the research topic to translate the Arabic version back into English. The two English questionnaires were compared and corrected where necessary to ensure that the Arabic version and the original English questionnaire are identical.

Before the initiation of the main field research and the official distribution of the questionnaire, a pilot test was conducted to evaluate the design and methodology of the instrument. According to Zikmund et al. (2013), a pilot test is an experimental testing of a small sample group, with the results being used for testing a study design. Furthermore, Baumgartner et al. (2006) asserted that the purpose of pilot testing is to determine how well respondents understand the contexts of questions, and that pilot testing also provides an opportunity to eliminate ambiguous questions and reduce bias. Additionally, a pilot test can be used to determine whether the language of the questions is understandable and, moreover, to gauge the time necessary to complete the questionnaire. However, the most helpful aspect of a pilot test is the ability to test the face validity and reliability of the questionnaire. Hence, it is critical to conduct a pilot test prior to the actual research (Bradburn et al., 2004). This step entails an initial test of the data collection tools to determine and rectify any errors. Also, pilot testing can help to identify issues in the research methodology and data collection methods.

During the pretesting stage, a pilot test was performed on twenty volunteer participants from the study's target population. The volunteers were asked to comment on various aspects of a list of items corresponding to the constructs, including the wording of the scales, questionnaire format, and instrument length. Their valuable feedback was used to improve the wording of the questions, thereby reducing the possibility of respondents interpreting the questions in different ways. Based on participants' feedback, the wording of a small number of items was modified and amendments were made. Additional instructions on how to answer the questions were also included on the cover page, and brief definitions or clarifying phrases were inserted into each section. As a result of these efforts, the survey was considered to be appropriate for data collection.

After assessing the survey through the pilot study, the survey was generated as a hard copy. In addition to the field survey, the online survey was utilized due to the time consumed during the field survey.

3.10 Sampling Strategy

Sampling can be explained as a specific principle used to select members of population to be included in the study. It has been rightly noted that "because many populations of interest are too large to work with directly, techniques of statistical sampling have been devised to obtain samples taken from larger populations" (Proctor, 2005). In other words, due to the large size of a target population, researchers have no choice but to study a number of cases of elements within the population to represent the population and to reach conclusions about the population.

3.10.1 Sample Selection

The generalizability of the study is based on the representativeness of the respondents (Eid & El-Gohary, 2014). The participants of this study include UAE national and expatriate users of m-government in Abu Dhabi, UAE. Sampling methods can be classified into two categories: probability sampling and non-probability sampling (Cohen et al., 2002; Shively, 2011; Tyrer & Heyman, 2016). Probability sampling can further be separated into several types, such as stratified, simple random, and systematic sampling (Cohen et al., 2002), while non-probability sampling techniques include snowball, quota, purposive, accidental, and theoretical sampling (Cohen et al., 2002; Trobia & Lavrakas, 2008). The main difference between the two major categories is that, in probability sampling, the chances of individuals in the wider population being selected for the sample are known whereas, in a non-probability sample, those chances are unknown. In probability sampling, each element in the population has a known non-zero chance of being selected using a random selection procedure (Henry, 1990). The phenomenon in question can thus be described more precisely since every participant has an equal probability of being selected from the population (Visser et al., 2000). According to Tyrer and Heyman (2016), probability sampling is more accurate in determining a population's true characteristics as it allows all members of the population to have an equal chance of being selected. Probability sampling is thus appropriate when a researcher wishes to generalize the study's findings, as it seeks representativeness of the wider population, and allows two-tailed tests to be administered in the statistical analysis of quantitative data. Moreover, probability sampling has less risk of bias than non-probability sampling (Cohen et al., 2002). In light of this, probability sampling was the most reasonable choice for the present study.

Simple random sampling was used as the sample design of this research. In simple random sampling, each population member has an equal chance of being selected (Maxwell, 2012). Moreover, it minimizes sampling error ae well as enables the researcher to identify where sampling error exists (Palys, 2003).

3.10.2 Sample Size

The sample size is the number of volunteers participating in the study. The more the participants the better the study would be. Increasing the number of participants helps to reduce the risk of accidentally having extreme, or biased, groups (Chow et al., 2017). According to Liu Liu et al. (2018), the sample size plays a significant role in ensuring the quality of statistical analysis. Especially when researchers are interested in determining the correlation and defining that the empirical outcome of the hypothesis test is statistically significant.

There are multiple recommendations regarding the appropriate way to calculate the sample size (Pearson & Mundform, 2010). According to Aaker and Day (1986), the sample size can be determined based on the sample size equation which is broadly acknowledged by social science researchers. The following equation can determine the sample size:

$$S = Z\sqrt{\frac{P(1-P)}{n}}\sqrt{\frac{N-n}{N-1}}$$

Where;

Z = Degree of required confidence (95%)

S = Sample error (5%)

P = Ration of population characteristics available in the sample (50%)

N = Population size

n = Sample size

By applying the Aaker and Day (1986) equation, the initial sample size value will be 90 questionnaires, which is relatively small comparing to the population size of about 3 million people in Abu Dhabi as well as to run the data analysis software.

Based on the argument of Malhotra (2004), the researcher has to consider data analysis techniques used within the study when determining the study sample size. Within this respect, the most demanding proposed data analysis technique for this study is Structural Equation Modelling (SEM) which is sensitive to sample size and less stable when estimated from small samples (Garson, 2009; Ullman et al., 2001). By reviewing the literature, it was found that there are no generally accepted criteria for determining a specific sample size for using structural equation modelling (Chin, 1998; Garson, 2009; Hair, et al., 1996). However, there are some general guidelines that have been proposed by some researchers with regards to the suitable sample size to be used when using structural equation modelling in data analysis. Within this respect, Hair et al. (1998) suggest that a sample with a size of less than 100 is considered to be a small sample. They also suggest that a medium sample size is between 100 and 200, and a large sample size in more than 200. On the other hand, Garson (2009) suggest that a sample size has to be more than 100. Moreover, many researchers have used a sample size of around 100 to conduct research using structural equation modelling (El-Gohary, 2010). Based on that, it is generally regarded that a sample size of 100 is the practical acceptable size for using structural equation modelling. Moreover, as per the literature, the maximum required sample size is 200 responses as shown in Table 11.

However, the sample size of this study was 300 (only 279 questionnaires collected) to allow for any exclusion due to missing or aberrant data and to ensure the stability while using structural equation modelling in data analysis. In addition, to follow the recommendation of Chau (1996) and Thompson et al. (1994) to use a large sample number in order to get more reliable results.

Table 11: Calculated Sample Size as Per Previous Literature

No.	Research reference	Maximum Calculated Sample Size
1.	Aaker and Day (1986)	90
2.	Soper (2017)	106
3.	Nunnally (1978)	190
4.	Hair et al. (1998)	200

3.10.3 Data Collection

To undertake the present study, approval was sought for data collection from the United Arab Emirates University Social Sciences Research Ethics Committee. In accordance with the ethical codes of conduct for research various issues were addressed, including a participant information sheet that detailed the objectives of the research and a consent form that addressed issues related to confidentiality, privacy, and potential risks associated with participation in the research.

Prior to the distribution of the survey questionnaire, the study needed to be approved by the management of the collection areas where the survey took place. The distribution of the survey questionnaire to the m-government users was carried out between March 2020 and June 2020. A paper questionnaire and a covering letter were used to collect the data necessary to meet the purpose and objectives of the study. The covering letter was designed to encourage participation, and its first paragraph described the nature and the purpose of the study. The second paragraph included a request for participation in the study, followed by statements guaranteeing anonymity and the extent to which confidentiality of information provided would be maintained. An assurance that participation was voluntary and that any individual approached may withdraw from participation at any time was also included. The covering letter also included the following text in an explanatory statement "The participation is voluntary; accordingly, you may withdraw at any time from the study. There is minimal risk in participating in this study since all data collected will be anonymous". Participants were informed that a summary of results would be available at their request.

Respondents were informed about the purpose of the study and were encouraged to participate. The assurance regarding confidentiality was communicated verbally and in the survey's covering letter. To clarify any questions arising from respondents, a direct way of contacting the primary researcher was provided. The drop-off/pick-up approach was used to collect the completed questionnaires. In addition to the online survey was utilized.

The researcher considered to visit Tasheel centers to distribute the questionnaires. Tasheel gives a direct access to government services (registered at a Tasheel service centre), without the involvement of third parties. Tasheel centers are handled by highly experienced government service specialists.

Tasheel Abu Dhabi service centres can be found at Al Raha Mall, Marina Mall, Al Wahda Mall, and the Capital Mall. Besides this, there are service centres in Khalidiya, Al Jazeera Sports Club, Madinat Zayed, and the Ministerial Complex.

The researcher used the lottery method and gave numbers to the centers' locations and draw to distribute the locations equally between the researcher and the researcher assistance.

The researcher visited 4 locations that are, Ministerial Complex, Capital Mall, Al Raha Mall, and Madinat Zayed. While the researcher assistance visited Al Jazeera Sports Club, Marina Mall, Al Wahda Mall, and Khalidiya.

The researcher and the assistance have obtained approval from the centers managers before conducting the questionnaire distribution. Some of the questionnaires were filled and collected at the same time and some were picked up later from Tasheel reception. As part of the data collection carried out during the COVID-19 pandemic, the researcher went paperless to reduce the chance of transferring contaminants. Therefore, online survey was created and QR code was generated. All respondents were given the two options of the questionnaires to choose from. Moreover, they were informed about the purpose of the study and were encouraged to participate. The assurance regarding confidentiality was communicated verbally and in the survey's covering letter.

The precautionary measures allow for limited number of visitors to enter Tasheel centers at the same time. Also, the social distancing for obtaining queue number from Tasheel receptions gave sufficient time to approach each visitor and ask him/her to participate.

3.10.4 Data Analysis Strategy

After the data collection and before proceeding with model analysis, data screening was performed using multivariate and univariate outlier identification indicating data normality. Additionally, missing data were detected. Later, a preliminary factor analysis for the survey components was conducted to examine the Common Method Variance (CMV), reliability, and scale uni-dimensionality of each construct. This test is considered to be essential because the independent variables and dependency variables data used in this study are entirely self-reported, and so are prone to CMV. To satisfy this test, first, Harman's single-factor test was conducted to check if the scale items are unidimensional. Second, a Common Latent Factor (CLF) check was conducted using Analysis of Moment of Structure (AMOS 28), together with a Confirmatory Factor Analysis (CFA) to capture the path of common variance among all the observed variables in the model. This test is essential to determine that CMV does not affect the standardized path coefficients.

After ensuring that the normality and factorability assumptions have been tested, the analysis process was carried out by adopting Structural Equation Modeling with Maximum Likelihood Estimation (SEM-MLE) with AMOS 28 to examine the fit of the study's measurement and structural models. Following the two-step modelling method suggested by Anderson and Gerbing (1988), the validity of the measurement model was evaluated and then the structural model assessment was conducted by testing standardized path coefficients. The rationale for this two-step approach is to ensure that conclusions emanating from structural relationships were drawn from a set of measurement instruments with desirable psychometric properties.

The assessment of the measurement model for the study's sample was performed by estimating discriminant and convergent validities, as well as internal consistency. Convergent validities were evaluated through item loadings on their related factors; discriminant validities were examined through a comparison between the average variance that the constructs and their measures share to the variances the constructs themselves share (Fornell & Larcker, 1981a; Hair et al., 2006). After the measurement model had been checked by means of discriminate and convergent validity, it was appropriate to proceed with the structural model. However, to assess the structural model and hypotheses, the study adopted SEM using AMOS 28 with maximum likelihood estimation. The structural model standardized path coefficients (β values) were tested for their respective significance levels, as well as for the coefficients of determination (R^2 values). The significance of testing the structural model is to examine the hypothesized relationships included in the study's proposed conceptual model.

3.11 Ethical Considerations

Any researcher must adhere to ethical considerations and consider several ethical factors during conducting the study, particularly the aspects related to individual rights, convictions, values or social principles. In general, this study was governed by UAE University Guidelines for conducting social research. Therefore, ethics clearance from the Social Sciences Research Ethics Committee was secured before the commencement of the data collection.

3.11.1 Voluntary Participation

Voluntary participation refers to participant decision as to whether to take part in the research study or not. If the participant decides not to participate in the research, it will not result in any loss of benefits they are entitled to. A general explanation of the nature of the study was given to all respondents, especially the purpose and the benefits of this research. Completing a questionnaire may require participants to spend a considerable amount of their time and disrupt their regular activities. In addition, the questionnaire required participants to reveal some personal information, which may be unknown to their colleagues. To comply with this standard, a cover letter was distributed along with the questionnaire and included a statement to indicate participants' consent. In addition, participants were requested to return the completed questionnaire to the researcher only if they wished to take part.

3.11.2 No Harm to Participants

Ethical standards also require that the researcher should not put tourist who voluntarily participated in a situation where they might be at "risk of harm" as a result of their participation. Harm can cover both physical and psychological. A questionnaire is not expected to cause any harm (physical or psychological) to participants. The questionnaire did not require participants to perform any physical work or take untested drugs or endure stressful testing conditions. Furthermore, they completed the questionnaire individually at their own leisure without being subject to peer or group pressure.

3.11.3 Anonymity and Confidentiality

Making participants information "anonymous" means eliminating the contributor's name. However, the researcher needs to take more than this fundamental step to secure the participant's identity. According to Pezaro et al. (2018) other information can help to distinguish the individual, for instance: gender, age, nationality, qualification and monthly income. The more pieces of information that are introduced together, the easier it is to identify someone. Geographical information joined with the name of the organization, can give away individual identity relatively quickly (Novak, 2014). Researchers should consider as many precautions as they can to secure anonymity and guarantee the realistic level of anonymity (Wiles et al., 2008).

While "Confidentiality" is defined as the protection provided on the data collected (Butler & Middleman, 2018), the concept of the examination of the selected topic is mainly to get to private feeling, stories, and concerns. The researcher should be clear about how the confidentiality of the collected information will be respected (Gibson et al., 2013).

Several steps were followed to sustain firm confidentiality in all the stages starting by selecting the sample up to the findings, taking into consideration securing the permission for distributing the survey from the required authority. Participant's identity was not disclosed under any conditions, and their surveys will be kept anonymous to ensure an honest response. These steps include: the survey did not ask for any identifying source of information such as full names, home address, or phone numbers. In addition, the respondents returned the questionnaires in person or generated by the online survey software. Finally, all hardcopy of the collected responses was securely stored in a locked location while the electronic gathering sheet was located in a dedicated folder in the researcher's personal computer where both sources of data are accessible only by the researcher.

3.11.4 Avoiding Deception

According to Erat (2013) and Fogarty (2018), deception occurs as the consequence of researchers providing false or inadequate information to participants to mislead about the nature of the research. Therefore, a cover letter was delivered along with a questionnaire in order to introduce the m-government user who is willing to participate, to the current academic study under the supervision of UAE University. The letter contains the intention, the aim of conducting the study and the reasons for collecting data and its future use.

3.11.5 Providing the Right to Withdraw

The researcher informed the participant that "they have the privilege and the right to stop participating in this research at any point". At the point when the participant decided to pull back, they would not be pressurized or forced in anyway if they would like to withdraw from the research process.

3.11.6 Data Analysis and Reporting

The ultimate goals of any social research are to search for facts and address unbiased reporting. Researchers should report any changes made to the collected data, provide details and justification for such changes. Moreover, researchers have an ethical obligation towards finding true observation and not to enforce assumptions or special interests through data analysis. This study also highlighted the limitations, where an effort was made to explain the reasons behind the limitations to be as a reference for the future studies.

3.12 Chapter Summary

The study follows quantitative methodologies; a questionnaire was built and pre-tested to ensure its effectiveness as perceived by the respondents. Simple random sample method was implemented while distributing questionnaires. Subsequently, response collected were analyzed, and the findings compared with the hypotheses built in the literature review section.

This chapter provided an overview of the research paradigm, its associated dimensions, and the reasoning behind the specific choices made in the current research. The research paradigm chosen was positivistic, therefore this social enquiry was approached in a manner similar to the physical science. Social reality was considered as objective and generalizable and results could be obtained through a deductive process where certain hypotheses are proposed and verified by analyzing data. While collecting the empirical data the researcher attempted to detach herself from other social actors, or phenomena, to eliminate biased results.

The study used quantitative methodology via a structured questionnaire that operationalized various constructs in the form of statements to measure participants' attitudes, intention, and behavior that was later analyzed using statistical techniques. The steps in developing the survey were discussed and explicated. These included selecting measurement scales from the existing literature, formatting the survey instrument and pre-testing it to ensure that it measures the constructs that are intended to be studied.

The chapter also discussed data collection in terms of the subject under study, the sample size and the data collection mechanism designed to ensure a high response rate.

The chapter concluded with a review of steps taken to satisfy ethical considerations in social research. This included voluntary participation, assuring no harm to participants, maintaining confidentiality and avoiding deception. The following chapter presents details of the statistical analysis of the data and concomitant results.

Chapter 4: Data Analysis and Hypotheses Testing

4.1 Overview

This chapter analyses the data collected from the 279 participants to discover the findings and draw conclusions. First, the data were gathered and checked for impurities and irregularities. After data preparation, labelling and coding, the preliminary data analysis that involved analysis of missing values, aberrant values, normality, and Common Method Bias (CMB), has been conducted to prepare the data for further analysis in the next stage. Next, descriptive analyses were performed on the collected data. Then, the reliability and validity tests were conducted. The Cronbach's alpha test was utilized to assess the reliability of the survey constructs, and construct validity was examined using factor analysis. Furthermore, the testing of the model hypotheses was performed using Structural Equation Modelling (SEM). Finally, this chapter provides a summary of the analysis and concludes with the results of the hypothesis testing.

4.2 Data Screening

The process of raw data screening included checking for accuracy, missing data analysis, the existence of outliers, confirmation of the distribution assumptions and testing of the common method bias to guarantee that the data was accurate, complete and suitable for the next phase of multivariate statistical analysis.

4.2.1 Data Accuracy

To assess the accuracy of the data, descriptive statistics for every item in the survey were calculated using the SPSS software. A record of less than 1, or greater than 5, was classified as odd value since the survey instrument utilized a 5 point Likert scale (where “Strongly Agree = 5”, “Agree = 4”, “Neutral = 3”, “Disagree = 2” and “Strongly Disagree = 1”). Any odd values were identified and treated. A sample from the ‘Frequencies Summary’ is presented in Table 12. Data was verified as accurate as none of the study variables presented values outside of the predicted range.

Table 12: Partial Display of the Dataset Descriptive Statistics

		A.1	**B.1**	**C.1**	**D.1**	**E.1**	**F.1**	**G.1**	**H.1**	**I.1**	**J.1**	**K.1**
N	Valid	279	279	279	279	279	279	279	279	279	279	279
	Missing	0	0	0	0	0	0	0	0	0	0	0
Mean		4.22	4.36	4.37	4.30	4.10	4.23	1.98	4.05	4.14	4.23	4.23
Std. Deviation		.756	.642	.692	.760	.877	.707	.678	.906	.804	.746	.775
Minimum		1	1	1	1	1	1	1	1	1	1	1
Maximum		5	5	5	5	5	5	4	5	5	5	5

4.2.2 Missing Data

According to Enders (2010), missing values in the data sets used in the social sciences are quite common. Hair et al. (2006) believe that the quality of statistical analyses can be significantly influenced by the effect of a large number of missing values, and therefore, can destroy the result of analyses and make the results unreliable and biased. Moreover, some statistical analysis techniques cannot be conducted when values are missing. There are different solutions for addressing the missing data. First, to do nothing, and this option might be followed if the missing data are very few and non-random. Second, the missing data might be replaced by the mean of the used scale (5 point-Likert Scale). Third, to eliminate the replies or the affected variables. The latter solution is advised if the construct that has missing data is not important to the research (Tabachnick & Fidell, 2013). To evaluate the missing data, an overall summary of the missing values, shown in Table 13.

A careful analysis of missing values was carried out. No cases of missing data have been identified, as the completed responses were the only ones to be taken further, since these have given enough replies. In the present study, the data set comprised 279 respondents, who have given feedback for the following analyses.

Table 13: Partial Display of the Dataset Missing Values

		A.2	B.2	C.2	D.2	E.2	F.2	G.2	H.2	I.2
N	Valid	279	279	279	279	279	279	279	279	279
	Missing	0	0	0	0	0	0	0	0	0
Mean		4.16	4.38	4.36	4.37	4.06	4.26	1.94	4.06	4.00
Std. Deviation		.750	.666	.685	.707	.877	.703	.670	.850	.844
Minimum		1	1	1	1	1	1	1	1	1
Maximum		5	5	5	5	5	5	4	5	5

4.2.3 Aberrant Values

Aberrant values are defined as mistakes that might take place in entering the data (Hair et al., 2014). Calculating the highest and lowest values of each factor could identify the impermissible values. Since all of the elements in the recent study were examined using a Likert scale from 1 to 5, any value below 1 or greater than 5 (outside this range) was treated as aberrant value and given special treatment. Detailed examination produced no aberrant values in the data of the recent study.

4.2.4 Presence of Outliers

Obviously, outliers are questionnaire responses that have extraordinarily high or low values that make them significantly different from other responses for the same variable (Tabachnick & Fidell, 2013). There are two kinds of outlier, "univariate" and "multivariate". Univariate outliers reflect replies with an extreme value in one item, while multivariate outliers reflect responses with odd combinations of scores on two or more items (Tabachnick & Fidell, 2013). Outliers can destroy the results of a statistical analysis by increasing the variance of the error, lowering the power of statistical analysis and biasing expectations of substantive interest (Osborne & Overbay, 2004).

To assess the presence of multivariate outliers, Mahalanobis distance has been calculated using SPSS to determine any multivariate outliers within the data. Mahalanobis' distance is a tool for assessing how far each response is from the center of all the constructs' distributions (i.e. the centroid in multivariate space) (Mahalanobis, 1927). The Mahalanobis distances of all the cases/observations on all the items of the scales were computed, and the responses with a chi-square probability of Mahalanobis distance, $p < 0.001$ were treated as having multivariate outliers. The Mahalanobis distance test has identified 11 cases that have an outlier as shown in Table 14.

Table 14: Multivariate Outliers Test Results (Mahalanobis Distance Method)

No.	Case ID	Mahalanobis Distance	Probability
1	234	67.47687	.00000
2	38	65.51029	.00000
3	13	58.16823	.00000
4	17	55.50916	.00000
5	4	46.20964	.00001
6	273	44.13565	.00003
7	187	43.09784	.00004
8	95	41.29522	.00009
9	8	40.56651	.00011
10	24	39.68622	.00016
11	16	34.83794	.00090

The eleven questionnaires were cases 4, 8, 13, 16, 17, 24, 38, 95, 187, 234, and 273. In order to check whether it was suitable to remove these outliers from the data set or not, these cases were removed from the data set, the normality was re-examined through a Kolmogorov-Smirnov test, and the values of skewness and kurtosis were calculated. The Kolmogorov-Smirnov test showed that there was no improvement in the normality of the data after removing the outliers ($p < .05$). Similarly, an analysis of skewness and kurtosis values after removing the outliers was made and the values of skewness and kurtosis were found to be outside the range of +1.5 and -1.5. This proved that no significant improvement in the normality of the data was achieved by excluding the outliers. Thus, a decision was made not to remove these 11 cases from the data set but to conduct the remaining analysis with 279 cases.

4.2.5 Normality

Normality is a symmetric "bell-shape" curve determined by mean (average) and variance (variability). Previous studies claim that assessing normality is an important issue in most multivariate analysis (Tabachnick and Fidell, 2013). However, other researchers suggest that true normality is uncommon or unreal, since much authentic data is not normal (Blanca et al., 2013; Micceri, 1989). Furthermore, Reinartz et. al. (2009) suggest that the maximum likelihood estimators used in Structural Equation Modelling (SEM) are relatively robust to violations of normality assumptions (Reinartz et. al, 2009).

Table 15: Normality Test Results for all Constructs

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
A	279	4.2079	.63771	-1.458	.146	4.936	.291
B	279	4.3978	.59358	-1.411	.146	4.458	.291
C	279	4.3274	.62422	-1.278	.146	3.621	.291
D	279	4.3118	.64982	-1.407	.146	3.551	.291
E	279	4.0573	.84293	-.898	.146	.830	.291
F	279	4.2034	.63265	-.742	.146	1.496	.291
G	279	1.9976	.66846	.471	.146	.705	.291
H	279	4.0743	.51875	-.676	.146	1.321	.291
I	279	3.9875	.74448	-.793	.146	1.447	.291
J	279	4.2249	.68894	-.973	.146	1.729	.291
K	279	4.0337	.64964	-.878	.146	2.073	.291
L	279	4.3070	.73680	-1.188	.146	2.174	.291
M	279	4.2306	.73876	-.766	.146	.239	.291
N	279	4.0585	.80476	-.770	.146	.709	.291
Valid N (listwise)	279						

Using SPSS 27.0, the statistical values of skewness and kurtosis were tested and found they were within their respective levels. As reported in Table 15, all the values given support the normality of univariate distribution since all values of skewness were below their cut-off point of “3”, as well as all values of kurtosis were found to be not more than “8” (Kline, 2005; West et al., 1995).

Following Hair et al's. (2014) recommendation, a combined use of skewness and kurtosis coefficients in line with the Shapiro-Wilk Test has been utilized to give the highest powerful method to assess departures from univariate normality. The Shapiro-Wilk Test tests the null hypothesis that data distribution is normal, whereas distributions exhibiting skewness and kurtosis values greater than +1, or lower than -1, are considered as non-normal. The results are displayed in Table 16 below. The results of the Kolmogorov-Smirnov test showed that the data significantly differed from the normal distribution (low significance value of the test was below .05).

Table 16: Display of Normality Test Results for all Variables

	Kolmogorov-Smirnov[a]			**Shapiro-Wilk**		
	Statistic	Df	Sig.	Statistic	Df	Sig.
A	.204	279	.000	.851	279	.000
B	.176	279	.000	.815	279	.000
C	.207	279	.000	.824	279	.000
D	.158	279	.000	.865	279	.000
E	.190	279	.000	.881	279	.000
F	.196	279	.000	.877	279	.000
G	.255	279	.000	.863	279	.000
H	.088	279	.000	.967	279	.000
I	.155	279	.000	.916	279	.000
J	.178	279	.000	.871	279	.000
K	.160	279	.000	.925	279	.000
L	.228	279	.000	.811	279	.000
M	.217	279	.000	.835	279	.000
a. Lilliefors Significance Correction						

However, as reported in Table 15, all the values given support the normality of univariate distribution due to all values of skewness were recognized to be below their cut-off point of “3”as well as all values of kurtosis were found to be not more than “8” (Kline, 2005; West et al., 1995).

4.2.6 Common Method Bias (CMB)

Because of the cross-sectional design of the study, data for both the independent and dependent variables were simultaneously gathered using the same self-reported survey tool over a specific period. This may raise some concerns that the validity of survey replies could be influenced by Common Method Bias (CMB) and a non-response bias.

Common method bias is a variance that takes place as a result of the measurement method used, not because of the variable of interest. It is considered one source of the systematic measurement error which yields conclusions from empirical results that are misleading about the relationship between measures of different constructs (Campbell and Fiske, 1959; Podsakoff et al., 2003). Cote and Buckley (1987) suggest that the amount of common method variance varies according to the discipline of the research and the type of construct under investigation. Therefore, this issue in the present study had to be investigated before analysis began.

One of the commonly used techniques in investigating this issue is "Harman's single-factor test". The basic assumption of this test is that if a single variable emerges, or one general factor accounts for most of the covariance between the measures, then one can conclude that a substantial amount of common method variance is involved. It is suggested that the data have significant problems with common method bias if one factor accounts for more than 50% of the total variance (Eichhorn, 2014).

The results shown in Table 17 indicate that a single factor could only account for 30.675% of the variance, which is far less than the accepted threshold of 50% (Malhotra et al., 2006). This supports the idea that that the survey responses are free from significant common method bias and that it was acceptable to proceed with the model analysis.

Table 17: Results of Herman's Single-Factor Test for Common Method Bias

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	18.712	30.675	30.675	18.712	30.675	30.675
2	5.360	8.787	39.462			
3	3.259	5.343	44.805			
4	2.844	4.663	49.468			
5	2.699	4.425	53.894			
6	2.116	3.469	57.362			
7	2.000	3.279	60.642			
8	1.843	3.021	63.662			
9	1.490	2.442	66.104			
10	1.382	2.265	68.369			
11	1.360	2.229	70.599			
12	1.179	1.932	72.531			
Extraction Method: Principal Component Analysis.						

4.3 Descriptive Analysis

This part of the chapter provides general information about participants. The aim is to provide a clear image of the profile of the study sample. Frequency analysis is used to distribute the respondents according to the following characteristics:

- Gender
- Age of respondent
- Qualification

- Income
- Nationality

4.3.1 Gender

The first descriptive analysis begins with the gender of the respondents. Table 18 shows that just over half (155: 55.6%) were men, and just under half (124: 44.4%) were women. These results reflect good balance between men and women in the current study.

Table 18: Gender of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	155	55.6	55.6	55.6
	Female	124	44.4	44.4	100.0
	Total	279	100.0	100.0	

4.3.2 Age

The second descriptive analysis shows the age of the respondents. Table 19 includes demographic information about the ages of the survey participants. Almost half of the participants were between 35-44 years old. Eighty-two participants (29.4%) were 25 to 34 years old. This was followed by 39 participants (14.0%) were 45 to 54 years old. 25 participants (9.0%) were 18 to 24 years old. Only five participants (1.8%) were 54 to 65 years old. Finally, the least frequent age category was more than 65 years old, with 4 participants (1.4%).

Table 19: Age of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-24	25	9.0	9.0	9.0
	25-34	82	29.4	29.4	38.4
	35-44	124	44.4	44.4	82.8
	45-54	39	14.0	14.0	96.8
	54-65	5	1.8	1.8	98.6
	more than 65	4	1.4	1.4	100.0
	Total	279	100.0	100.0	

4.3.3 Education

The third descriptive statistics deals with the educational level of the participants. Table 20 shows the education levels of the participants. Most participants (127: 45.5%) held a bachelor's degree, 61 (21.29%) had a master's degree. Approximately 18.0% of the survey participants (49 participants) received high school degrees. 26 participants (9.3%) of the survey received Diploma degrees. Only 9 (3.2%) of the survey participants had Below Secondary School education. Finally, very few participants received Doctorate Degree (2.5%).

Table 20: Distribution of Sample by Educational Qualifications

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below Secondary school	9	3.2	3.2	3.2
	Secondary school holder	49	17.6	17.6	20.8
	Diploma holder	26	9.3	9.3	30.1
	Bachelor's degree holder	127	45.5	45.5	75.6
	Master's degree holder	61	21.9	21.9	97.5
	Doctorate degree holder	7	2.5	2.5	100.0
	Total	279	100.0	100.0	

4.3.4 Distribution by Income Level

This study categorized the participants according to their monthly income as shown in Table 21. The largest group of participants, 30.5%, earn less than AED 10.000 per month. It shows that 14.3% earn between AED 10,000-19,000. Similarly, 17.9% earn between AED 20,000-29,000. 14.7% earn between AED 30,000-39,000. Finally, 22.6% earn more than AED 40,000.

Table 21: Distribution of Sample by Income Level

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	Less than AED 10,000	85	30.5	30.5	30.5
	AED 10,000-19,000	40	14.3	14.3	44.8
	AED 20,000-29,000	50	17.9	17.9	62.7
	AED 30,000 -39,000	41	14.7	14.7	77.4
	More than AED 40,000	63	22.6	22.6	100.0
	Total	279	100.0	100.0	

4.3.5 Respondents by Nationality

Finally, in terms of nationality, this research has respondents from 21 different countries which include; Bangladesh (0.4%), Cameroon (0.4%), Dominican (0.4%), Egypt (7.9%), France (0.4%), Greek (0.4%), India (16.1%), Jordan (1.4%), Lebanon (2.5%), Morocco (0.4%), Nepal (0.4%), Oman (0.7%), Pakistan (2.7%), Philippines (2.5%), Palestine (1.4%), Spain (0.4%), Sri Lanka (0.4%), Sudan (1.8%), Syria (2.5%), UAE (56.3%) and UK (0.7%). Table 22 shows the distribution of sample by nationality.

Table 22: Distribution of Sample by Nationality

		Frequency	Percent	Valid Percent	Cum. Percent
Valid	Bangladesh	1	.4	.4	.4
	Cameron	1	.4	.4	.7
	Dominican	1	.4	.4	1.1
	Egypt	22	7.9	7.9	9.0
	France	1	.4	.4	9.3
	Greek	1	.4	.4	9.7
	India	45	16.1	16.1	25.8
	Jordan	4	1.4	1.4	27.2
	Lebanon	7	2.5	2.5	29.7
	Morocco	1	.4	.4	30.1
	Nepali	1	.4	.4	30.5
	Oman	2	.7	.7	31.2
	Pakistan	8	2.9	2.9	34.1
	Palestine	4	1.4	1.4	35.5
	Philippines	7	2.5	2.5	38.0
	Spanish	1	.4	.4	38.4
	Sri Lanka	1	.4	.4	38.7
	Sudan	5	1.8	1.8	40.5
	Syria	7	2.5	2.5	43.0
	UAE	157	56.3	56.3	99.3
	UK	2	.7	.7	100.0
	Total	279	100.0	100.0	

4.4 Reliability Analysis

One of the important requirements in statistical analysis is the uniqueness and independence of the factors under study (Todorovic et al., 2015). Another important requirement is the uniqueness of the variables that are being tested. Drost (2011) reported that values of Cronbach's alpha of 0.7 or higher are sufficient. In line with that Nunnally (1978) and Cortina (1993) confirmed that a Cronbach's alpha of greater than 0.7 is acceptable. Values above 0.8 are considered highly creditable (Nunnally, 1978). Here, all of the alpha values for constructs were above 0.8, indicating a high degree of internal consistency in the responses.

The reliability of the survey instrument was assessed utilizing the values of Cronbach's Alpha to test the degree of consistency between the multiple measurements of a variable (Hair et al., 2017) . Variable reliability reflects the extent to which a group of measurement items are internally consistent in measuring the concept that they are supposed to measure (Hair et al., 2017). Cronbach's Alpha assumes that all utilized elements in a scale are reliable and load equally on their construct.

The following sections detail the results of the reliability tests for all constructs used in the current study; namely; perceived responsiveness, perceived currency, perceived accuracy, perceived convenience, perceived security, perceived trust, perceived risk, unauthorized access, unauthorized secondary use, collection, error, m-government ease of use, m-government usefulness, past experience, attitude towards m-government use, behavioral intention to use m-government and actual use of m-government. Computing the item-to-total correlation and examining with coefficient alpha establishes the process of analyzing reliability. Item-to-total correlation and the

Cronbach Alpha coefficient are observed to be very common in the field of social science research (Fershtman & Muller, 1986).

All the items were found to have a high item-to-total correlation, above the acceptable level of 0.30. As shown in the last column of Table 23, below, the reliability coefficients ranged from 0.815 to 0.952 which were significantly higher than the acceptable level of 0.70 (Nunnally, 1978). These results confirm that reliable scales were used. This study calculates the reliability for every single variable.

Table 23 shows the reliability coefficient and item-to-total correlations for all the study constructs.

Table 23: Reliability Analysis for the Research Variables

Item Code	**Item**	**Item-to-total correlation**	**Cronbach's Alpha**
A	**Perceived Responsiveness (PR)**		**0.815**
A.1	I would expect m-government applications to be timely when being used for getting any governmental service.	.717	
A.2	If I used m-government applications, I would always expect a prompt response.	.623	
A.3	Overall, m-government applications should offer information in a timely manner.	.659	
B	**Perceived Currency (PC)**		**0.889**
B.1	M-government applications should provide up-to-the-minute information about the provided services.	.788	
B.2	I would be concerned if the information provided to me by m-government applications was not up-to-date.	.781	
B.3	I think m-government applications should always have the latest information in order to be reliable.	.780	

Table 23: Reliability Analysis for the Research Variables (Continued)

Item Code	Item	Item-to-total correlation	Cronbach's Alpha
C	**Perceived Accuracy (PA)**		**0.874**
C.1	I would expect the information delivered to me through m-government applications to be always accurate.	.793	
C.2	I would find it unacceptable to get inaccurate information when using m-government applications.	.803	
C.3	Overall, M-government applications are reliable to be used only when they are accurate.	.677	
D	**Perceived Convenience (PCV)**		**0.895**
D.1	Using m-government enables me to obtain services at a time that is convenient for me.	.715	
D.2	Using m-government enables me to obtain services at any place that is convenient for me.	.747	
D.3	M-government is a pleasant experience	.711	
D.4	M-government saves time compared with going to a traditional customer service centers.	.782	
D.5	I find m-government convenient for getting services.	.748	
E	**Perceived Security (PS)**		**0.906**
E.1	I trust the ability of m-government applications to protect my privacy.	.788	
E.2	Using m-government applications is financially secured.	.838	
E.3	I am not worried about the security of m-government applications.	.814	
F	**Perceived Trust (PT)**		**0.897**
F.1	I believe the information offered by the m-government applications is genuine.	.827	

Table 23: Reliability Analysis for the Research Variables (Continued)

Item Code	Item	Item-to-total correlation	Cronbach's Alpha
F.2	I think m-government applications are trusted applications.	.755	
F.3	I can rely on m-government applications for the information about different services.	.813	
F.4	M-government applications serves the best interests of its users.	.694	
G	**Perceived Risk (PRK)**		**0.929**
G.1	There is a considerable risk involved in using m-government applications.	.873	
G.2	My decision to use m-government applications would be risky.	.859	
G.3	There is too much uncertainty associated with using m-government applications.	.825	
H	**Perceived Privacy (PP)**		**0.886**
	Unauthorized Access		**0.839**
H.1	M-government should devote more time and effort to preventing unauthorized access to personal information.	.681	
H.2	M-government should take more steps to make sure that the personal information in their files is accurate.	.769	
H.3	M-government should take more steps to make sure that unauthorized people cannot access personal information.	.661	
	Unauthorized Secondary Use		**0.878**
H.4	M-government should not use personal information for any purposes unless it has been authorized by the individuals who provided the information.	.707	

Table 23: Reliability Analysis for the Research Variables (Continued)

Item Code	Item	Item-to-total correlation	Cronbach's Alpha
H.5	When people give personal information to m-government for some reason, m-government should never use the information for any other purpose.	.685	
H.6	M-government should never sell the personal information in their computer databases to other companies.	.762	
H.7	M-government should never share personal information with other companies unless it has been authorized by the individuals who provided the information.	.786	
	Collection		**0.843**
H.8	It usually bothers me when m-government ask me for personal information.	.723	
H.9	When m-government ask me for personal information, I sometimes think twice before providing it.	.775	
H.10	It bothers me to give personal information to so many people	.537	
H.11	I am concerned that m-government are collecting too much personal information about me.	.707	
	Error		**0.851**
H.12	All the personal information in computer databases should be double-checked for accuracy no matter how much this cost.	.602	
H.13	M-government should take more steps to make sure that the personal information in their files is accurate.	.720	
H.14	M-government should have better procedures to correct errors in personal information.	.689	

Table 23: Reliability Analysis for the Research Variables (Continued)

Item Code	Item	Item-to-total correlation	Cronbach's Alpha
H.15	M-government should devote more time and effort to verifying the accuracy of the personal information in their databases.	.756	
	M-Government Ease of Use		**0.899**
I.1	Learning how to use m-government applications would be easy for me.	.652	
I.2	I found m-government services easy to use.	.830	
I.3	M-government applications are clear and understandable.	.834	
I.4	I find it easy to get m-government applications to do what I want them to do.	.796	
	M-Government Usefulness		**0.938**
J.1	Using m-government applications helps me to accomplish things more quickly.	.830	
J.2	Using m-government applications makes my life easier.	.882	
J.3	I find m-government applications useful to my life.	.879	
J.4	Using the m-government applications would increase my productivity.	.816	
	Past Experience		**0.870**
K.1	If I have access to the m-government, I will use it always.	.708	
K.2	I want to see the benefits of m-government before I apply it.	.536	
K.3	The m-government provides me a more efficient and organized tool for getting services.	.789	
K.4	I often tell my friends about my m-government experiences.	.690	

Table 23: Reliability Analysis for the Research Variables (Continued)

Item Code	Item	Item-to-total correlation	Cronbach's Alpha
K.5	M-government are valuable to my overall online experiences	.757	
	Attitude Toward M-Government Use		**0.952**
L.1	I like the idea of using m-government applications instead of visiting the government entity	.880	
L.2	I consider using m-government applications for getting the governmental services is good idea	.929	
L.3	In general, the idea of using m-government applications might be beneficial to my family and me	.887	
	Behavioural Intention to use M-Government		**0.949**
M.1	I intend to use m-government applications to do my work	.886	
M2	I intend to use m-government applications frequently	.908	
M.3	Given the opportunity, I will use m-government applications	.884	
	Actual Use of m- Government		**0.924**
N.1	I often use m-government service frequently	.848	
N.2	I use the m-government whenever appropriate to obtain services and information	.834	
N.3	I use the m-government services a lot obtain services and information	.851	

4.5 Validity Analysis

Validity is one of the most important issues to be investigated in any social science research. Validity concerns the suitability of a measurement item and how well it fits for purposes of data interpretation (Hammond & Wellington, 2012). This part covers the test of measure validity and scale development for variables included in this research. It is concerned with testing the extent to which a tool is measuring what it is intended to measure; in other words, it ensures the significance of a research component (Bell, 2010). Furthermore, validity denotes how close a concept being measured is to what is intended to be measured (Roberts et al., 2006). An order of steps has been implemented through the scale development process. It includes the use of exploratory factor analysis. This type of procedure was utilized to sustain the reliability and validity of the data.

4.5.1 Antecedents of M-Government Use

Based on the literature review, eight factors have been identified as factors that are external factors that affect M-Government Use. These factors are Perceived Responsiveness, Perceived Currency, Perceived Accuracy, Perceived Convenience, Perceived Security, Perceived Trust, Perceived Risk and Perceived Privacy. To validate the constructs, the different items included have been submitted to the factor analysis. The results of the factor analysis are presented below.

Before using the exploratory factor analysis, specific requirements should be met before factor analysis can be successfully used. First, variables should be assessed using interval scales. Using a 5-point Likert scale in the survey fulfilled this requirement. Second, the sample size should be more than 100 since the researcher generally cannot use factor analysis with fewer than 50 observations (Hair et al., 2006). This requirement has been also fulfilled because there were 279 customers in this research. The results of the factor analysis tests are briefly discussed below:

4.5.1.1 Bartlett's Test of Sphericity

The 39 items representing the eight variables have been submitted to the factor analysis. The results of Exploratory Factor Analysis (EFA) yielded a ten-factor solution that accounted for 75.373% of the variance extracted. The result for Bartlett's Test of Sphericity (BTS) was large at 7604.143, and the associated significance value was very small (p=0.00). This shows that the data were appropriate for factor analysis (Snedecor & Cochran, 1989).

4.5.1.2 Kaiser-Meyer-Olkin Measure of Sampling Adequacy

The Kaiser-Meyer-Olkin (KMO) for measurement of sample adequacy (MSA) gives the computed KMO as 0.881, which is adequate, and above acceptable level (Snedecor & Cochran, 1989) as shown in Table 24.

Table 24: KMO and Bartlett's Test of M-Government Use

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.881**
Bartlett's Test of Sphericity	Approx. Chi-Square	7604.143
	Df	741
	Sig.	.000

Since the above requirements were met, it was possible to infer that Factor Analysis was appropriate for this data set and that the procedures for factor analysis could be performed. The factor extraction results using Principal Component Analysis (PCA) are given in Table 25.

4.5.1.3 Results of Principal Component Analysis Extraction Process

Factor extraction results using Principal Component Analysis (PCA) are given in Table 25. It should be noted that an eigenvalue of 1.0 is used as the benchmark in deciding the number of factors (Hair et al., 2014).

Table 25: Principal Component Analysis Extraction Results of M-Government Use

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.209	28.741	28.741	11.209	28.741	28.741	4.226	10.836	10.836
2	4.673	11.982	40.722	4.673	11.982	40.722	3.893	9.983	20.819
3	2.572	6.596	47.318	2.572	6.596	47.318	3.122	8.005	28.824
4	2.376	6.091	53.409	2.376	6.091	53.409	2.874	7.369	36.193
5	2.011	5.155	58.565	2.011	5.155	58.565	2.802	7.185	43.378
6	1.943	4.981	63.546	1.943	4.981	63.546	2.762	7.083	50.462
7	1.300	3.334	66.880	1.300	3.334	66.880	2.542	6.519	56.981
8	1.230	3.153	70.033	1.230	3.153	70.033	2.529	6.485	63.465
9	1.070	2.743	72.775	1.070	2.743	72.775	2.412	6.185	69.650
10	1.013	2.598	75.373	1.013	2.598	75.373	2.232	5.723	75.373
Extraction Method: Principal Component Analysis.									

4.5.1.4 Extraction Method: Principal Component Analysis

An initial (un-rotated) solution identified 39 items and ten factors with eigenvalues of more than one, accounting for 75.373% of the variance as Table 25 shows. As Table 26 shows, all 39 items score communalities that range from 0.561 to 0.890. Therefore, it could be concluded that a degree of confidence in the factor solution has been achieved.

Table 26: Communalities of M-Government Use

	Initial	**Extraction**
A.1	1.000	.779
A.2	1.000	.720
A.3	1.000	.753
B.1	1.000	.825
B.2	1.000	.800
B.3	1.000	.814
C.1	1.000	.813
C.2	1.000	.832
C.3	1.000	.745
D.1	1.000	.717
D.2	1.000	.740
D.3	1.000	.735
D.4	1.000	.777
D.5	1.000	.727
E.1	1.000	.800
E.2	1.000	.862
E.3	1.000	.826
F.1	1.000	.792
F.2	1.000	.772
F.3	1.000	.767
F.4	1.000	.669
G.1	1.000	.889
G.2	1.000	.890
G.3	1.000	.864

Table 26: Communalities of M-Government Use (Continued)

	Initial	Extraction
H.1	1.000	.590
H.2	1.000	.704
H.3	1.000	.718
H.4	1.000	.701
H.5	1.000	.657
H.6	1.000	.741
H.7	1.000	.760
H.8	1.000	.753
H.9	1.000	.797
H.10	1.000	.561
H.11	1.000	.724
H.12	1.000	.628
H.13	1.000	.740
H.14	1.000	.671
H.15	1.000	.741
Extraction Method: Principal Component Analysis.		

4.5.1.5 Factor Rotation and Factor Loading

On being satisfied with the ten chosen variables, a loading of all the items within the ten factors was examined. The Varimax technique for rotated component analysis was used with a cut-off point for interpretation of the factors at 0.50 or greater (Snedecor & Cochran, 1989). The results are summarized in Table 27.

Table 27: Rotated Component Matrix[a] of M-Government Use

	Component									
	1	2	3	4	5	6	7	8	9	10
A.1										.783
A.2										.788
A.3										.737
B.1								.808		
B.2								.813		
B.3								.794		
C.1									.781	
C.2									.788	
C.3									.784	
D.1		.720								
D.2		.766								
D.3		.738								
D.4		.797								
D.5		.750								
E.1					.812					
E.2					.836					
E.3					.841					
F.1							.702			
F.2							.663			
F.3							.709			
F.4							.606			

Table 27: Rotated Component Matrix[a] of M-Government Use (Continued)

	Component									
	1	2	3	4	5	6	7	8	9	10
G.1						.913				
G.2						.897				
G.3						.905				
H.1	.562									
H.2	.626									
H.3	.737									
H.4	.782									
H.5	.758									
H.6	.756									
H.7	.798									
H.8				.844						
H.9				.875						
H.10				.677						
H.11				.807						
H.12			.711							
H.13			.812							
H.14			.706							
H.15			.775							
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]										
a. Rotation converged in 8 iterations.										

Most of the items were loaded onto the designed factors for which they were allocated. Factor loadings were all higher than 0.50 so that each item loaded higher on its associated construct than on any other construct. As suggested by Hair et al. (1998), a factor loading higher than 0.35 is considered statistically significant at an alpha level of 0.05. This is supported by the discriminant validity of the measurement.

4.5.1.6 Factor Naming and Interpretation Process

The interpretation of the ten-factor solution was accomplished by relating them to the theoretical concepts of Management information System (MIS) and Information Technology (IT) literature. The ten variables can be explained as follows:

Factor 1 consists of seven items and fits very well with 'Unauthorized Access and USE'. This factor comprises the following items (1) M-government should devote more time and effort to preventing unauthorized access to personal information, (2) M-government should take more steps to make sure that the personal information in their files is accurate, (3) M-government should take more steps to make sure that unauthorized people cannot access personal information, (4) M-government should not use personal information for any purposes unless it has been authorized by the individuals who provided the information, (5) When people give personal information to m-government for some reason, m-government should never use the information for any other purpose, (6) M-government should never sell the personal information in their computer databases to other companies and (7) M-government should never share personal information with other companies unless it has been authorized by the individuals who provided the information. The values are closely grouped with the highest loading being 'M-government should never share personal information with other companies unless it has been authorized by the individuals who provided the information' (.798) and the lowest loading "M-government should devote more time and effort to preventing unauthorized access to personal information" (0.562).

Factor 2 consists of five items. This factor represents the customers' opinions regarding 'Perceived Convenience (PCV)'. It covers the following items (1) Using m-government enables me to obtain services at a time that is convenient for me, (2) Using m-government enables me to obtain services at any place that is convenient for me, (3) M-government is a pleasant experience, (4) M-government saves time compared with going to a traditional customer service centers and (5) I find m-government convenient for getting services. The values are closely grouped with the highest loading being "M-government saves time compared with going to traditional customer service centers" (0.797) and the lowest loading "Using m-government enables me to obtain services at a time that is convenient for me" (0.720).

Factor 3 consists of four items and fits very well with 'Error'. This factor comprises the following items (1) All the personal information in computer databases should be double-checked for accuracy no matter how much this cost, (2) M-government should take more steps to make sure that the personal information in their files is accurate, (3) M-government should have better procedures to correct errors in personal information and (4) M-government should devote more time and effort to verifying the accuracy of the personal information in their databases. The values are closely grouped with the highest loading being 'm-government should take more steps to make sure that the personal information in their files is accurate' (.812) and the lowest loading "M-government should have better procedures to correct errors in personal information" (0.706).

Factor 4 consists of four items and fits very well with 'Collection'. This factor comprises the following items (1) It usually bothers me when m-government ask me for personal information, (2) When m-government ask me for personal information, I sometimes think twice before providing it, (3) It bothers me to give personal information to so many people and (4) I am concerned that m-government are collecting too much personal information about me. The values are closely grouped with the highest loading being ‘When m-government ask me for personal information, I sometimes think twice before providing it’ (.875) and the lowest loading “It bothers me to give personal information to so many people” (0.677).

Factor 5 consists of three items and fits very well with ‘Perceived Security (PS)’. This factor comprises the following items (1) I trust the ability of M-government applications to protect my privacy, (2) Using m-government applications is financially secured, and (3) I am not worried about the security of m-government applications. The values are closely grouped with the highest loading being ‘I am not worried about the security of m-government applications’ (.841) and the lowest loading “I trust the ability of m-government applications to protect my privacy” (0.812).

Factor 6 consists of three items and fits very well with ‘Perceived Risk (PRK)’. This factor comprises the following items (1) There is a considerable risk involved in using m-government applications, (2) My decision to use m-government applications would be risky, and (3) There is too much uncertainty associated with using m-government applications. The values are closely grouped with the highest loading being ‘There is a considerable risk involved in using m-government applications’ (.913) and the lowest loading “My decision to use m-government applications would be risky” (0.897).

Factor 7 consists of four items and fits very well with ‘Perceived Trust (PT)’. This factor comprises the following items (1) I believe the information offered by the m-government applications is genuine, (2) I think m-government applications are trusted applications; (3) I can rely on m-government applications for the information about different services and (4) m-government applications serve the best interests of its users. The values are closely grouped with the highest loading being ‘I can rely on m-government applications for the information about different services’ (.709) and the lowest loading “m-government applications serve the best interests of its users” (0.606).

Factor 8 consists of three items and fits very well with ‘Perceived Currency (PC)’. This factor comprises the following items (1) M-government applications should provide up-to-the-minute information about the provided services, (2) I would be concerned if the information provided to me by m-government applications was not up-to-date, and (3) I think m-government applications should always have the latest information in order to be reliable. The values are closely grouped with the highest loading being ‘I would be concerned if the information provided to me by m-government applications was not up-to-date’ (.813) and the lowest loading “I think m-government applications should always have the latest information in order to be reliable” (0.794).

Factor 9 consists of three items and fits very well with ‘Perceived Accuracy (PA)’. This factor comprises the following items (1) I would expect the information delivered to me through m-government applications to be always accurate, (2) I would find it unacceptable to get inaccurate information when using m-government applications, and (3) Overall, m-government applications are reliable to be used only when they are accurate. The values are closely grouped with the highest loading being ‘I would find it unacceptable to get inaccurate information when using m-government applications’ (.788) and the lowest loading “I would expect the information delivered to me through m-government applications to be always accurate” (0.781).

Factor 10 consists of three items and fits very well with ‘Perceived Responsiveness (PR)’. This factor comprises the following items (1) I would expect m-government applications to be timely when being used for getting any governmental service, (2) If I used m-government applications, I would always expect a prompt response, and (3) Overall, m-government applications should offer information in a timely manner. The values are closely grouped with the highest loading being ‘If I used M-Government applications, I would always expect a prompt response’ (.788) and the lowest loading “Overall, m-government applications should offer information in a timely manner” (0.737).

4.5.2 M-Government Attitudes and Behaviour

Based on the literature review, six factors have been identified as factors that are related to the M-Government Attitudes and Behaviors. These factors are M-Government Ease of Use, M-Government Usefulness, Past User Experience, Attitude towards M-Government Use, Behavioral Intention to use M-Government and Actual Use of m- Government. To validate the constructs, the different items included have been submitted to the factor analysis. The results of the factor analysis are presented below.

Specific requirements should be met before factor analysis can be successfully used. First, variables should be measured using interval scales. Using a 5-point Likert scale in the survey fulfilled this requirement. A number of reasons account for this use of Likert scales. Second, the sample size should be more than 100 since the researcher generally cannot use factor analysis with fewer than 50 observations (Hair et al., 2006). This requirement has been also fulfilled because there were 279 customers in this research. The results of the factor analysis tests are briefly discussed below:

4.5.2.1 Bartlett's Test of Sphericity

The 22 items representing the six variables have been submitted to the factor analysis. The results of Exploratory Factor Analysis (EFA) yielded a six-factor solution that accounted for 82.00% of the variance extracted. The result for Bartlett’s

Test of Sphericity (BTS) was large at 5758.356, and the associated significance value was very small (p=0.00). This shows that the data were appropriate for factor analysis (Snedecor & Cochran, 1989).

4.5.2.2 Kaiser-Meyer-Olkin Measure of Sampling Adequacy

The Kaiser-Meyer-Olkin (KMO) for measurement of sample adequacy (MSA) gives the computed KMO as 0.915, which is adequate, and above acceptable level (Snedecor & Cochran, 1989) as shown in Table 28.

Table 28: KMO and Bartlett's Test of M-Government Attitudes and Behaviors

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.915**
Bartlett's Test of Sphericity	Approx. Chi-Square	5758.356
	Df	231
	Sig.	.000

Since the above requirements were met, it was possible to infer that Factor Analysis was appropriate for this data set and that the procedures for factor analysis could be performed. The factor extraction results using Principal Component Analysis (PCA) are given in Table 29.

4.5.2.3 Results of Principal Component Analysis Extraction Process

Factor extraction results using Principal Component Analysis (PCA) are given in Table 29. It should be noted that an eigenvalue of 1.0 is used as the benchmark in deciding the number of factors (Hair et al., 2014).

Table 29: Principal Component Analysis Extraction Results of M-Government Attitudes and Behaviors

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.914	49.610	49.610	10.914	49.610	49.610	3.340	15.183	15.183
2	2.125	9.660	59.270	2.125	9.660	59.270	3.242	14.738	29.921
3	1.625	7.388	66.657	1.625	7.388	66.657	3.189	14.496	44.417
4	1.240	5.639	72.296	1.240	5.639	72.296	2.842	12.920	57.336
5	1.129	5.132	77.428	1.129	5.132	77.428	2.822	12.827	70.163
6	1.006	4.573	82.000	1.006	4.573	82.000	2.604	11.837	82.000
Extraction Method: Principal Component Analysis.									

4.5.2.4 Extraction Method: Principal Component Analysis

An initial (un-rotated) solution identified 22 items and six factors with eigenvalues of more than one, accounting for 82.00% of the variance as Table 29 shows. As Table 30 shows, all 22 items score communalities that range from 0.616 to 0.939. Therefore, it could be concluded that a degree of confidence in the factor solution has been achieved.

Table 30: Communalities of M-Government Attitudes and Behaviors

	Initial	Extraction
I.1	1.000	.659
I.2	1.000	.855
I.3	1.000	.841
I.4	1.000	.793
J.1	1.000	.816
J.2	1.000	.893
J.3	1.000	.868
J.4	1.000	.803
K.1	1.000	.696
K.2	1.000	.616
K.3	1.000	.773
K.4	1.000	.651
K.5	1.000	.733
L.1	1.000	.890
L.2	1.000	.939
L.3	1.000	.902
M.1	1.000	.892
M.2	1.000	.923
M.3	1.000	.894
N.1	1.000	.872
N.2	1.000	.849
N.3	1.000	.881
Extraction Method: Principal Component Analysis.		

4.5.2.5 Factor Rotation and Factor Loading

On being satisfied with the six chosen variables, a loading of all the items within the six factors was examined. The Varimax technique for rotated component analysis was used with a cut-off point for interpretation of the factors at 0.50 or greater (Snedecor & Cochran, 1989). The results are summarized in Table 31 below:

Table 31: Rotated Component Matrix[a] of M-Government Attitudes and Behaviors

	Component					
	1	2	3	4	5	6
I.1		.696				
I.2		.872				
I.3		.825				
I.4		.764				
J.1	.741					
J.2	.850					
J.3	.799					
J.4	.739					
K.1			.612			
K.2			.771			
K.3			.750			
K.4			.686			
K.5			.738			
L.1				.833		
L.2				.881		
L.3				.852		

Table 31: Rotated Component Matrix[a] of M-Government Attitudes and Behaviors (Continued)

	Component					
	1	2	3	4	5	6
M.1					.838	
M.2					.863	
M.3					.842	
N.1						.817
N.2						.807
N.3						.814

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 7 iterations.

All items were loaded onto the designed factors for which they were allocated. Factor loadings were all higher than 0.60 so that each item loaded higher on its associated construct than on any other construct. As suggested by Hair et al. (1998), a factor loading higher than 0.35 is considered statistically significant at an alpha level of 0.05. This is supported by the discriminant validity of the measurement.

4.5.2.6 Factor Naming and Interpretation Process

The interpretation of the six-factor solution was accomplished by relating them to the theoretical concepts of Management information System (MIS) and Information Technology (IT) literature. The six variables can be explained as follows:

Factor 1 consists of four items and fits very well with 'M-government Usefulness'. This factor comprises the following items (1) Using m-government applications helps me to accomplish things more quickly, (2) Using m-government applications makes my life easier, (3) I find m-government applications useful to my life and (4) Using the m-government applications would increase my productivity. The values are closely grouped with the highest loading being ‘Using m-government applications makes my life easier’ (.850) and the lowest loading “Using the m-government applications would increase my productivity” (0.739).

Factor 2 consists of four items. This factor represents the customers’ opinions regarding ‘M-Government Ease of Use’. It covers the following items (1) Learning how to use m-government applications would be easy for me, (2) I found m-government services easy to use, (3) M-government applications are clear and understandable and (4) I find it easy to get m-government applications to do what I want them to do. The values are closely grouped with the highest loading being “I found m-government services easy to use” (0.872) and the lowest loading “Learning how to use m-government applications would be easy for me” (0.696).

Factor 3 consists of five items and fits very well with ‘Past User Experience’. This factor comprises the following items (1) If I have access to the m-government, I will use it always, (2) I want to see the benefits of m-government before I apply it, (3) The m-government provides me a more efficient and organized tool for getting services, (4) I often tell my friends about my m-Government experiences and (5) m-government are valuable to my overall online experiences. The values are closely grouped with the highest loading being ‘I want to see the benefits of m-government before I apply it’ (.771) and the lowest loading “If I have access to the m-government, I will use it always” (0.612).

Factor 4 consists of three items and fits very well with ‘Attitude Towards M-Government Use’. This factor comprises the following items (1) I like the idea of using m-government applications instead of visiting the government entity, (2) I consider using m-government applications for getting the governmental services is good idea and (3) In general, the idea of using m-government applications might be beneficial to my family and me. The values are closely grouped with the highest loading being ‘I consider using m-government applications for getting the governmental services is good idea’ (.881) and the lowest loading “I like the idea of using m-government applications instead of visiting the government entity” (0.833).

Factor 5 consists of three items and fits very well with ‘Behavioral Intention to use M-Government’. This factor comprises the following items (1) I intend to use m-government applications to do my work, (2) I intend to use m-government applications frequently and (3) Given the opportunity, I will use m-government applications. The values are closely grouped with the highest loading being ‘I intend to use m-government applications frequently’ (.863) and the lowest loading “I intend to use m-government applications to do my work” (0.838).

Factor 6 consists of three items and fits very well with ‘Actual Use of M-Government’. This factor comprises the following items (1) I often use m-government service frequently, (2) I use the m-government whenever appropriate to obtain services and information, and (3) I use the mobile services a lot obtain services and information. The values are closely grouped with the highest loading being ‘I often use m-government service frequently’ (.817) and the lowest loading “I use the m-government whenever appropriate to do my work” (0.807).

4.6 Model and Hypotheses Testing

As discussed in the introduction chapter, the aims of the current research are to identify service characteristics factors that affect the formulation of m-government usefulness for Abu Dhabi citizens and residents, identify technology characteristics factors that affect the formulation of m-government usefulness for Abu Dhabi citizens and residents, link m-government ease of use construct with m-government usefulness, attitude towards m-government use, and behavioral intention to use m-government, link m-government usefulness construct with attitude towards m-government use and behavioral intention to use m-government and develop and test a model that integrates and examines the service characteristics factors, technology characteristics, m-government ease of use, m-government usefulness, past user experience, attitude towards m-government use, behavioral intention to use m-government and actual use of m-government. Therefore, this research attempts to address the main question: what are the factors that affect the actual use of m-government services from the user's perspectives? The next part of this chapter contributes to the full answer of the research question.

4.6.1 Measurement Models

It is worth mentioning that, as suggested by Anderson and Gerbing (1982), before examining the full latent model, an Exploratory Factor Analysis (EFA) was conducted using principal components analysis with Varimax rotation (Section 4.4.1). For the Antecedents of M-Government Use, the results of Exploratory Factor Analysis (EFA) yielded a ten-factor solution that accounted for 75.373% of the variance extracted (Section 4.4.1.1). For the M-Government Attitudes and Behavior, the results of Exploratory Factor Analysis (EFA) yielded a six-factor solution that accounted for 82.00% of the variance extracted (chapter 4). All items loaded highly on their intended constructs (Section 4.4.2.1).

4.6.1.1 Confirmatory Factor Analysis (CFA)

Testing the measurement model intended to discover reflective indicator loadings, internal consistency reliability, convergent validity, and discriminant validity of latent variables (Hair et al., 2014). It is worth mentioning that before testing the study model, which involves all the variables together, it is important to highlight, from a methodological point of view, that the two-step approach recommended by Hair et al. (2014) has been used in this research. The two-step technique gives distinctive advantages by separating the two stages into a measurement model and a structural model. The first step includes factor analysis with bootstrapping methodology for validation of the measurement model. Assessment of the structural model, the second part of the two-step approach, specifies the causal relationships among the hypothesized variables.

4.6.1.1.1 CFA for the Antecedents of M-Government Use

Testing the measurement model intended to assess reflective indicator loadings, internal consistency reliability, convergent validity, and discriminant validity of latent variables (Hair et al., 2014). The results, shown in Table 32, support the proposed ten-factor solution, comprising Perceived Responsiveness, Perceived Currency, Perceived Accuracy, Perceived Convenience, Perceived Security, Perceived Trust, Perceived Risk and Perceived Privacy.

In conceptualizing the Privacy construct, it has been treated as a second-order construct that consists of three first-order components– Unauthorized Access and Use, Error, and Collection – measured by seven, four and four items respectively. The other seven variables have been treated as a first order construct. Figure 28 shows the results of the CFA of the ten factors.

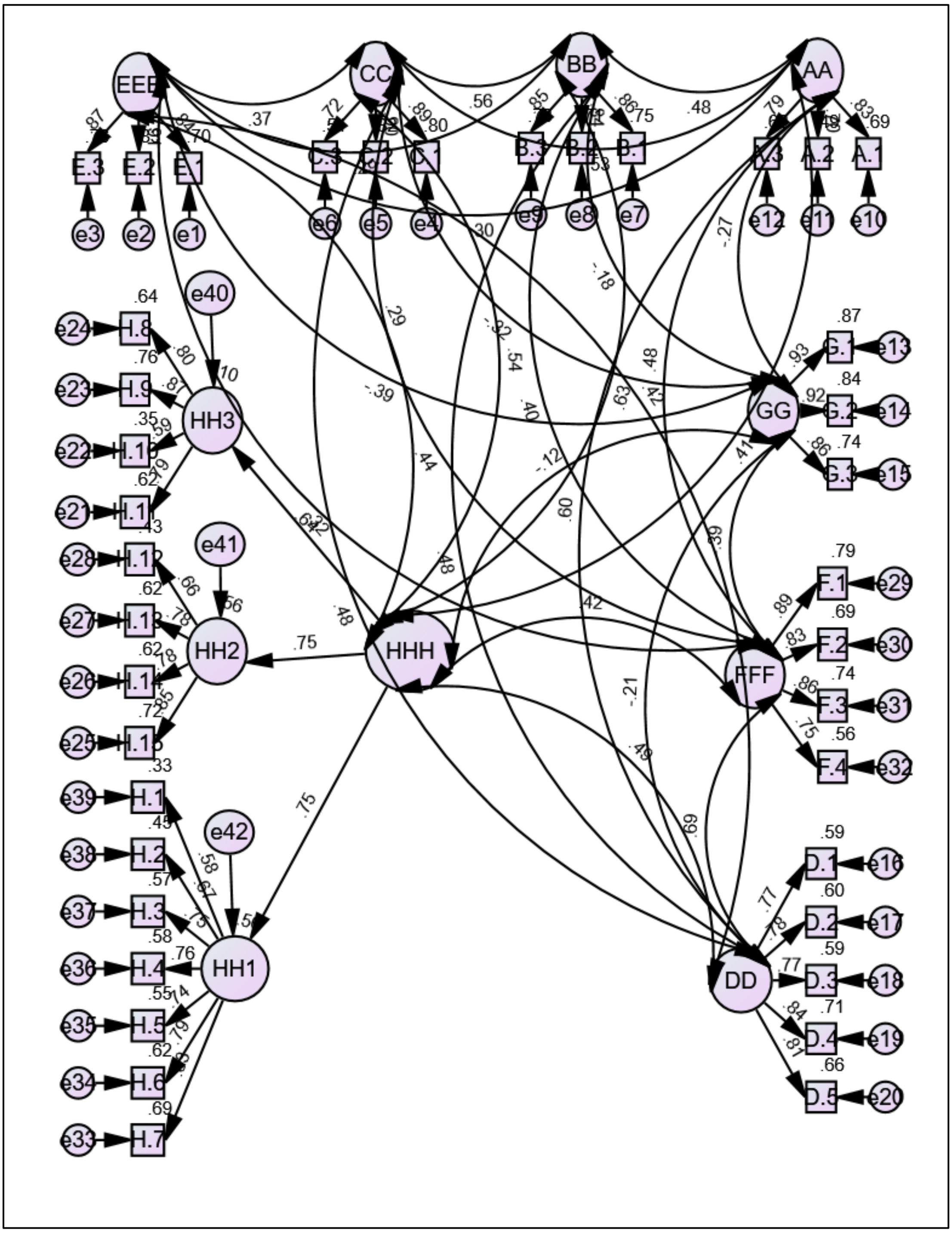


Figure 28: The Antecedents of M-Government Use

Table 32 summarize descriptive statistics for the goodness of fit of the measurement model.

Table 32: The Fitness Indices for the Antecedents of M-Government Use

Statistic	**Index value Obtained**	**Suggested Acceptable Level**
Chi-square significance	0.00	> 0.01
CMIN/DF	1.707	<3
GFI	0.830	>0.90
AGFI	0.801	> 0.80
TLI	0.928	>0.95
CFI	0.935	>0.90
RMSEA	0.050	<0.10

The fitness indices are listed in Table 32. Although Chi-square significance =0.000 the other indices show that the model has a good fit and aligned with the suggested statistic proposed by Bentler (1990), Hu and Bentler (1995), and Jöreskog and Sörbom (1982). Furthermore, although the GFI is lower that the cut- off point of 0.90, the other indices show also that the model has a good fit and aligned with the suggested statistic proposed by experts (Bentler, 1990; Hu & Bentler, 1995; Jöreskog & Sörbom, 1982) such as Adjusted goodness-of-fit index AGFI=0.801 (≥0.80), the Comparative fit index (CFI) =0.935 (≥0.90), the CMIN/DF=1.707 (<3), RMSEA =0.050 (<0.10) and TLI=0.928 (>0.90).

Both Cronbach's Alpha and the Composite Reliability Index can take any value between 0 and 1, with values between 0.7 and 0.9 considered as satisfactory (Hair et al., 2014). Table 33 gives a summary of values for Cronbach's Alpha, the Composite Reliability Index and Average Variance extracted for all the model constructs.

First, reflective indicator loadings ranged from 0.323 to 0.865, which were all statistically significant. Second, to test the internal consistency of items, a reliability test using Cronbach's α coefficients produced values for the constructs ranging from 0.815 to 0.929, indicating an acceptable level of reliability (α = 0.70) as advised by Nunnally (1978). Composite reliabilities (CR) within the 0.649 to 0.929 range exceeded the recommended 0.70 threshold (Nunnally, 1978). Third, the average variance extracted (AVE) estimates within the range of 0.407 to 0.815 were all above the minimum acceptable value of 0.50 (Fornell & Lacker, 1981) except Privacy (0.407). However, according to Fornell and Larcker (1981b) if AVE is less than 0.5, but composite reliability is higher than 0.6, the convergent validity of the construct remains acceptable, allowing Privacy (0.407) to remain due to its significance.

Table 33: Antecedents of M-Government Use CFA

Construct	Scale	Factor Loading	Cronbach's Alpha	CR	AVE
Responsiveness	A.1	.697	0.815	0.817	0.600
	A.2	.483			
	A.3	.619			
Currency	B.1	.746	0.889	0.889	0.728
	B.2	.711			
	B.3	.726			
Accuracy	C.1	.796	0.874	0.878	0.709
	C.2	.819			
	C.3	.511			

Table 33: Antecedents of M-Government Use CFA (Continued)

Construct	Scale	Factor Loading	Cronbach's Alpha	CR	AVE
Convenience	D.1	.464	0.895	0.895	0.631
	D.2	.484			
	D.3	.623			
	D.4	.752			
	D.5	.716			
Security	E.1	.702	0.906	0.907	0.764
	E.2	.834			
	E.3	.759			
Trust	F.1	.792	0.897	0.900	0.694
	F.2	.687			
	F.3	.738			
	F.4	.560			
Risk	G.1	.865	0.929	0.929	0.815
	G.2	.839			
	G.3	.738			
Privacy	H.7	.627	0.886	0.649	0.407
	H.6	.533			
	H.5	.566			
	H.4	.573			
	H.3	.602			
	H.2	.453			
	H.1	.323			
	H.11	.623			
	H.10	.347			

Table 33: Antecedents of M-Government Use CFA (Continued)

Construct	Scale	Factor Loading	Cronbach's Alpha	CR	AVE
	H.9	.757			
	H.8	.637			
	H.15	.721			
	H.14	.618			
	H.13	.613			
	H.12	.433			

4.6.1.1.2 Convergent and Discriminant Validity Analysis

Convergent validity describes the extent to which a measure correlates positively with alternative measures of the same construct. High correlations between test scores are clear evidence of convergent validity. (Hair et al., 2017). Convergent validity can be assessed by three criteria (Fornell and Larcker 1981; Liang and Wang 2004; Hair et al., 2014; Hooper et al., 2008; Čater and Čater 2010). Firstly, factor loading for an item is at least 0.6 and significant. Secondly, construct reliability is a minimum of 0.60 as shown in Table 33. Finally, average variance extracted (AVE) for a construct is larger than 0.5.

On the other hand, discriminant validity is the extent to which a reflectively measured construct is truly distinct from other constructs in the structural model. Thus, establishing discriminant validity implies that a construct is unique and captures phenomena not represented by other constructs in the model. Discriminant validity is present when the variances extracted by the constructs (AVE) from each construct are greater than the correlations. As seen in Table 34, all latent constructs had the squared root of AVE higher than their inter-correlation estimates with other corresponding constructs (the factor scores as single item indicators were used to calculate the between-constructs correlations); this implied that the constructs were empirically distinct (Fornell & Larcker, 1981). For example, Currency's squared root of AVE is 0.853 and is greater than any squared correlation among the other constructs, i.e. 0.480, -0.176, 0.483 and 0.631 which means that Currency as a construct is empirically distinct.

Table 34: Discriminant Validity Results

	Trust	**Security**	**Accuracy**	**Currency**	**Respons**	**Risk**	**Conven**	**Privacy**
Trust	0.833							
Security	0.640	0.874						
Accuracy	0.438	0.367	0.842					
Currency	0.395	0.290	0.555	0.853				
Respons	0.485	0.300	0.531	0.480	0.774			
Risk	-0.385	-0.393	-0.319	-0.176	-0.266	0.903		
Conven	0.686	0.418	0.480	0.483	0.598	-0.205	0.794	
Privacy	0.420	0.290	0.536	0.631	0.407	-0.117	0.494	0.638

Consequently, the measures for the proposed 8 variables attained both convergent and discriminant validity as well as high reliability.

4.6.1.1.3 CFA for Results of M-Government Attitudes and Behavior

Similarly, Confirmatory Factor Analysis (CFA) was conducted to verify the theorized construct of the observed variables of M-Government Attitudes and Behavior. The results, shown in Table 35, support the proposed six-factor solution, comprising m-government ease of use, m-government usefulness, past experience, attitude toward m-government use, behavioral intention to use m-government and actual use of m-government.

Tables 35-36 summarize descriptive statistics for the goodness of fit of the measurement model. First, reflective indicator loadings ranged from 0.318 to 0.937, which were all statistically significant. Second, to test the internal consistency of items, a reliability test using Cronbach's α coefficients produced values for the constructs ranging from 0.870 to 0.952, indicating an acceptable level of reliability ($\alpha = 0.70$) as advised by Nunnally (1978). Composite Reliabilities (CR) within the 0.867 to 0.953 range exceeded the recommended 0.70 threshold (Nunnally, 1978). Third, the Average Variance Extracted (AVE) estimates within the range of 0.570 to 0.872 were all above the minimum acceptable value of 0.50 (Fornell & Larcker, 1981b).

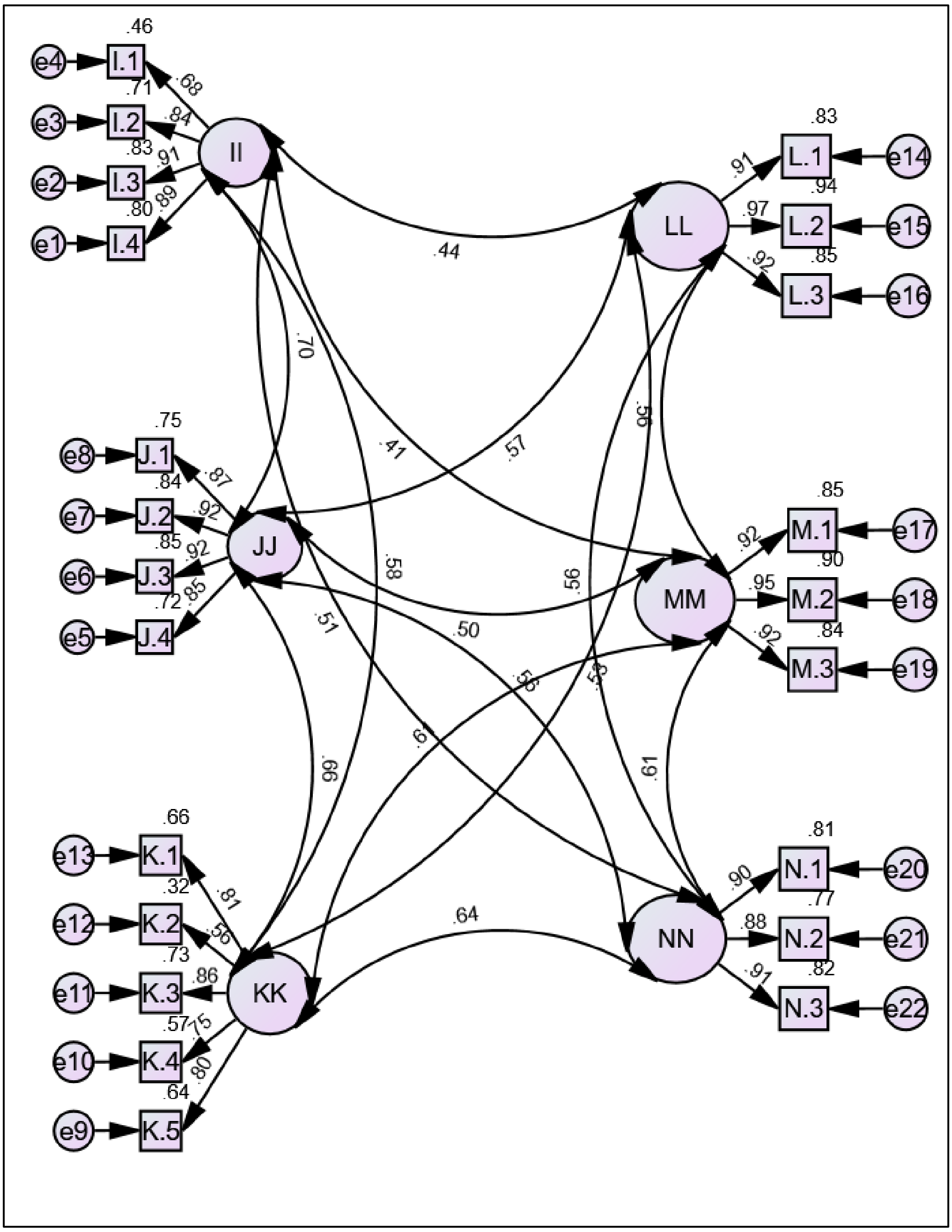


Figure 29: M-Government Attitudes and Behavior

As was the case with the components of the antecedents of the M-Government Use, all the factor loadings on the main and sub-constructs are high. All the factor loadings and R^2 are reasonably high. The results of the measurement model which are the indicators of the latent variable (Bian, 2011) of Figure 29 are shown in Table 35 and Table 36. All the factor loadings are sufficiently high and the high values of

Cronbach's Alpha, Composite Reliability (CR) and Average Variance Extracted (AVE) also reflect high internal consistency and reliability of the main construct and all the sub-constructs.

Table 35: The Fitness Indices for M-Government Attitudes and Behavior

Statistic	**Index value Obtained**	**Suggested Acceptable Level**
Chi-square significance	0.000	> 0.05
CMIN/DF	2.101	<3
GFI	0.888	> 0.90
AGFI	0.852	> 0.80
TLI	0.955	>0.95
CFI	0.963	>0.90
RMSEA	0.063	<0.10

The fitness indices are listed in Table 35. Although Chi-square significance =0.000 the other indices show that the model has a good fit and aligned with the suggested statistic proposed by Bentler (1990), Hu and Bentler (1995), and Jöreskog and Sörbom (1982). Furthermore, although the GFI is lower that the cut- off point of 0.90, the other indices show also that the model has a good fit and aligned with the suggested statistics proposed by experts (Bentler, 1990; Hu & Bentler, 1995; Jöreskog & Sörbom, 1982) such as Adjusted goodness-of-fit indices AGFI=0.852 (≥0.80), the Comparative fit index (CFI) =0.963 (≥0.90), the CMIN/DF=2.101 (<3), RMSEA =0.063 (<0.10) and TLI=0.955 (>0.90).

Table 36: M-Government Attitudes and Behavior

Construct	Scale	Factor Loading	Cronbach's Alpha	CR	AVE
M-Government Ease of Use	I.4	.821	0.899	0.895	0.685
	I.3	.845			
	I.2	.672			
	I.1	.401			
M-Government Usefulness	J.4	.722	0.938	0.939	0.793
	J.3	.854			
	J.2	.843			
	J.1	.753			
Past User Experience	K.5	.587	0.870	0.867	0.570
	K.4	.508			
	K.3	.755			
	K.2	.318			
	K.1	.682			
Attitude Towards M-Government Use	L.1	.830	0.952	0.953	0.872
	L.2	.937			
	L.3	.850			
Behavioral Intention to use M-Government	M.1	.845	0.949	0.949	0.862
	M.2	.897			
	M.3	.845			
Actual Use of m- Government	N.1	.808	0.924	0.924	0.802
	N.2	.774			
	N.3	.823			

Both Cronbach's Alpha and the Composite Reliability Index can take any value between 0 and 1, with values between 0.7 and 0.9 considered as satisfactory (Hair et al., 2014). Table gives a summary of values for Cronbach's Alpha, the Composite Reliability Index and Average Variance extracted for all the model constructs. The values suggest that all the measurement constructs are both valid and reliable and therefore can be used for path analysis.

4.6.1.1.4 Convergent and Discriminant Validity Analysis

Convergent validity describes the extent to which a measure correlates positively with alternative measures of the same construct. High correlations between test scores are clear evidence of convergent validity (Hair Jr et al., 2016). Convergent validity can be assessed by three criteria (Čater & Čater, 2010; Fornell & Larcker, 1981b; Hair Jr et al., 2016; Hooper et al., 2008; Liang & Wang, 2004). Firstly, factor loading for an item is at least 0.6 and significant. Secondly, construct reliability is a minimum of 0.60 as shown in Table 36. Finally, Average Variance Extracted (AVE) for a construct is larger than 0.5.

On the other hand, discriminant validity is the extent to which a reflectively measured construct is truly distinct from other constructs in the structural model. Thus, establishing discriminant validity implies that a construct is unique and captures phenomena not represented by other constructs in the model. Discriminant validity is present when the variances extracted by the constructs (AVE) from each construct are greater than the correlations. As seen in Table 37, all latent constructs had the squared root of AVE higher than their inter-correlation estimates with other corresponding constructs (the factor scores as single item indicators were used to calculate the between-constructs correlations); this implied that the constructs were empirically distinct (Fornell & Larcker, 1981b). For example, M-Government Usefulness's squared root of AVE is 0.891 is greater than any squared correlation among the other constructs, i.e. 0.668, 0.565 and 0.556 which means that M-Government Usefulness as a construct is empirically distinct.

Table 37: Discriminant Validity Results

	BITUMG	MGEU	MGU	PE	ATMGU	AUMG
BITUMG	0.928					
MGEU	0.394	0.827				
MGU	0.501	0.693	0.891			
PE	0.609	0.575	0.668	0.755		
ATMGU	0.557	0.426	0.565	0.543	0.934	
AUMG	0.612	0.502	0.556	0.638	0.557	0.895

Consequently, the measures for the proposed six variables attained both convergent and discriminant validity as well as high reliability.

4.6.2 Structural Model

Finally, as the main aim of this study was to test the hypothesized causal relationships among the constructs of the model, the structural equation modelling package, AMOS 26 has been utilized as shown in Figure 30. In accordance with Anderson and Gerbing (1988) suggestions, a two-step approach was used to assess the measurement model and examine the structural model. In the first step, the reliability of each measurement was assessed on the basis of composite reliability and Cronbach's alpha, and the validity of each measurement were evaluated on the basis of standard factor loadings, Average Variance Extracted (AVE), square root of the estimates of AVE and the correlation coefficients between any pair of latent constructs. In the second step, structural equation modelling was applied to examine the relationships among variables in the structural model.

The factor means were employed as single item indicators to perform path analysis, applying the Maximum Likelihood Estimates (MLE) method, following the guidelines suggested by Jöreskog and Sörbom (1982). A more detailed analysis of the results and measures for model fit is reported in Table 38.

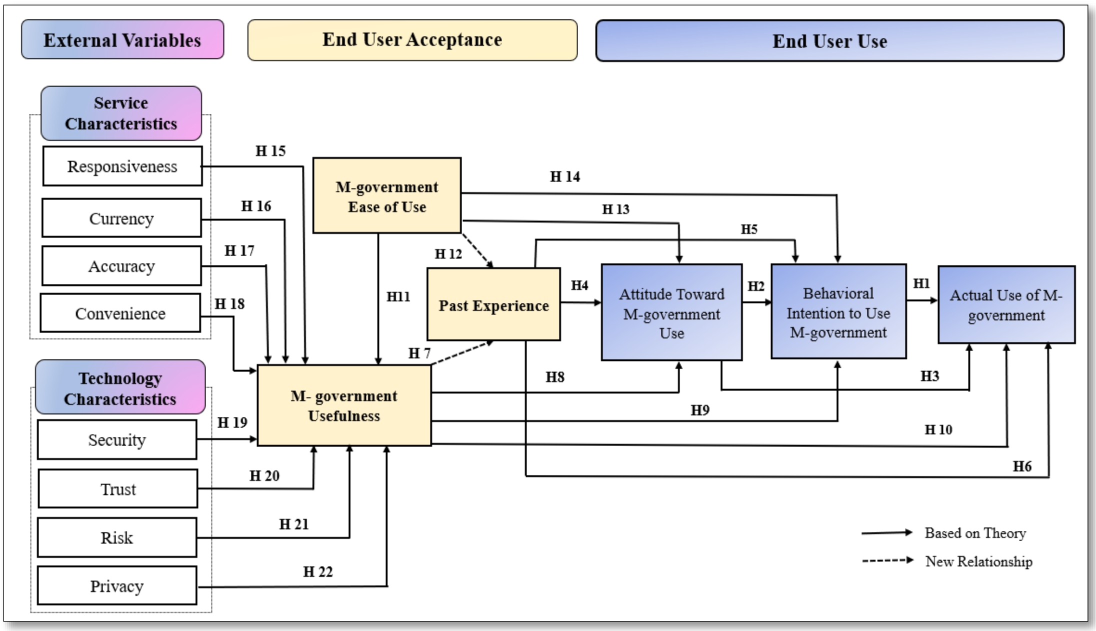


Figure 30: Research Model

To apply the MLE method for estimating the model, the constructs must satisfy the criterion of multivariate normality (Bagozzi & Yi, 1988). Therefore, for all the constructs, tests of normality, i.e. skewness and kurtosis, (Bagozzi & Yi, 1988), were conducted. Table16 indicated no departure from normality as most of the results are close to one (i.e. +/- 1) (Bagozzi & Yi, 1988). Thus, once normality was confirmed for all the constructs, it was decided to proceed with the use of the Maximum Likelihood Estimation (MLE) method to estimate the model. The reliability of the constructs was assessed by item-to-total correlations and Cronbach's alpha reliability coefficient (Nunnally, 1994).

Furthermore, as discussed earlier, to evaluate the presence of multivariate outliers, the analysis of Mahalanobis distance has been carried out using AMOS to identify any multivariate outliers within the data. Mahalanobis' distance is a metric for estimating how far each case is from the center of all the variables' distributions (i.e. the centroid in multivariate space) (Mahalanobis, 1927). The Mahalanobis distance test has identified 11 cases that have an outlier.

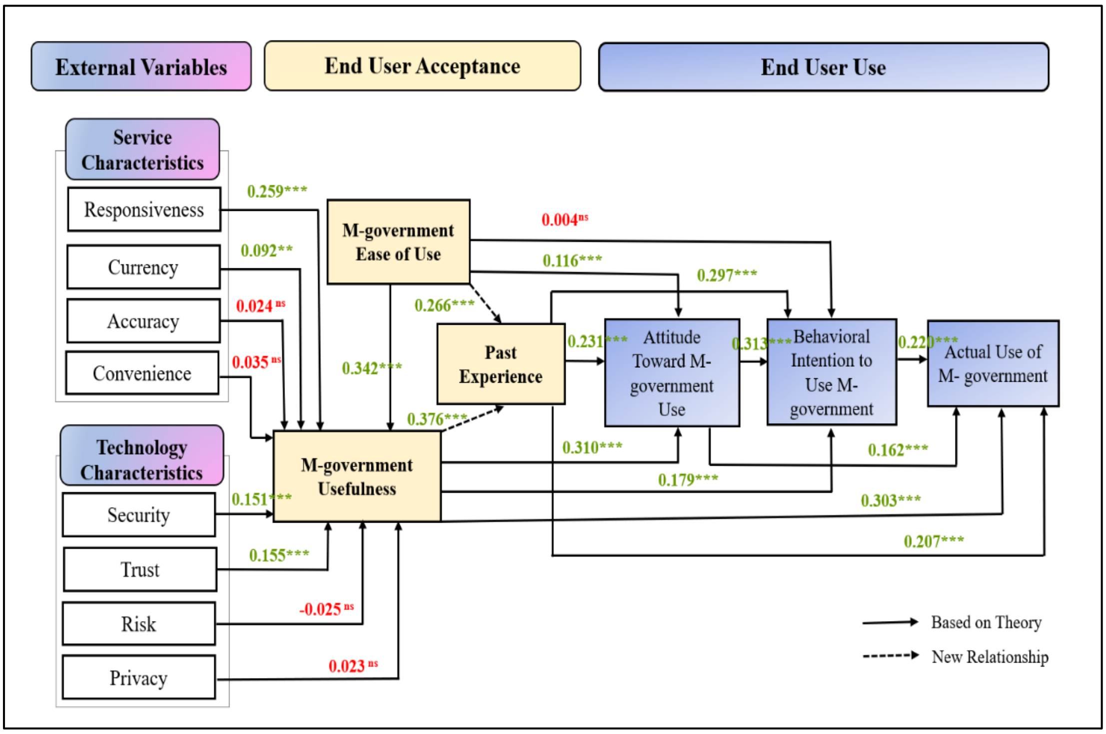


Figure 31: Tested Model

The current study model explains 51.6% for the actual use of m-government, which indicates that it has a strong prediction capacity. The results of testing hypotheses from H1 to H22 using MLE-SEM approach were discussed in Figure 31.

The structural model was checked by conducting structural equation modelling. The results reflected an acceptable fit: X^2/df = 2.597, GFI = 0.962, AGFI= 0.875, CFI = 0.969, RMR = 0.027 and RMSEA = 0.076 (Hu and Bentler, 1999). Since these indicators confirm that the overall fit of the model to the data was good, it was concluded that the structural model was a suitable basis for hypothesis testing.

Table 38: Hypotheses Testing

Predictor variables	**Criterion Variables**	**Hypothesized relationship**	**Standardized coefficient**	**R^{2a}**
Responsiveness	M-GOV Usefulness	H15	0.259***	0.606
Currency	M-GOV Usefulness	H16	0.092**	
Accuracy	M-GOV Usefulness	H17	0.024 ^{ns}	
Convenience	M-GOV Usefulness	H18	0.035 ^{ns}	
Security	M-GOV Usefulness	H19	0.151***	
Trust	M-GOV Usefulness	H20	0.155***	
Risk	M-GOV Usefulness	H21	-0.025 ^{ns}	
Privacy	M-GOV Usefulness	H22	0.023 ^{ns}	
M-GOV Ease of use	M-GOV Usefulness	H11	0.342***	
M-GOV Ease of use	Past User Experience	H12	0.266***	0.344
M-GOV Usefulness	Past User Experience	H7	0.376***	
M-GOV Ease of use	Attitude towards m-GOV Use	H13	0.116***	0.318
Past User Experience	Attitude towards m-GOV Use	H4	0.231***	
M-GOV Usefulness	Attitude towards m-GOV Use	H8	0.310***	
M-GOV Ease of use	BEH INT to use M-GOV	H14	0.004^{ns}	0.423
Past User Experience	BEH INT to use M-GOV	H5	0.297***	
M-GOV Usefulness	BEH INT to use M-GOV	H9	0.179***	
Attitude towards m-GOV Use	BEH INT to use M-GOV	H2	0.313***	
Past User Experience	ACT use of M-GOV	H6	0.207***	0.515
M-GOV Usefulness	ACT use of M-GOV	H10	0.303***	
Attitude towards m-GOV Use	ACT use of M-GOV	H3	0.162***	
BEH INT to use M-GOV	ACT use of M-GOV	H1	0.220***	
Statistic			Suggested	Obtained
Chi-Square Significance			≥0.01	0.013
Goodness-of-fit index (GFI)			≥0.90	0.962
Adjusted Goodness-of-fit index (AGFI)			≥0.80	0.875
Comparative fit index (CFI)			≥0.90	0.969
Normed Fit Index (NFI)			≥0.90	0.952
Root Mean Square Residual (RMR)			≤0.05	0.027
Root mean square residual (RMSEA)			≤0.10	0.076

***P<0.01, **P<0.05, ns is not significant

To test the 22 hypotheses, a structural model was utilized. The results give support to most of the hypotheses. Table shows the estimated standardized parameters for the causal paths.

First, the hypotheses of Accuracy (H17) (Standardized Estimate=0.024, $P > 0.10$), convenience (H18) (Standardized Estimate=0.035, $P > 0.10$), Risk (H21) (Standardized Estimate=-0.025, $P > 0.10$) and Privacy (H22) (Standardized Estimate=0.023, $P > 0.10$) have an insignificant impact and therefore have been rejected; Hypotheses 11, 15, 16, 19 and 20 were supported. Therefore, the suggested factors that positively affect the M- government Usefulness, are the M- government Ease of Use (H11) (Standardized Estimate=0.342, $P< 0.01$), Responsiveness (H15) (Standardized Estimate=0.259, $P< 0.01$), Currency (H16) (Standardized Estimate=0.092, $P< 0.05$), the Security (H19) (Standardized Estimate=0.151, $P< 0.01$), and Trust (H20) (Standardized Estimate=0.155, $P< 0.01$). As can be seen from the results, M- Government PEOU has the greatest impact on the M- Government PU followed by the Responsiveness then trust, security, and finally, currency. Therefore, Hypotheses H11, H15, H16, H19 and H20 were accepted while H17, H18, H21 and H22 were rejected.

Second, all suggested factors positively affect the Past User Experience, namely the M-government PEOU (H12) (Standardized Estimate=0.266, $P< 0.01$) and M-government PU (H7) (Standardized Estimate=0.376, $P< 0.01$). As can be seen from the results, M-government PU has the greatest impact on the Past User Experience followed by the M- government PEOU. Therefore, Hypotheses H12 and H7 were accepted.

Third, all suggested factors positively affect the Attitude Toward M-government Use, namely the M-government PEOU (H13) (Standardized

Estimate=0.116, P< 0.01), the Past User Experience (H4) (Standardized Estimate=0.231, P< 0.01) and M-government PU (H8) (Standardized Estimate=0.310, P< 0.01). As can be seen from the results, M-government PU has the greatest impact on the Attitude Toward M-government Use, followed by the Past User Experience, then the M- government PEOU. Therefore, Hypotheses H4, H8 and H13 were accepted.

Fourth, the hypothesis of the M- government Ease of Use (H14) (Standardized Estimate=0.004, P > 0.10) have insignificant positive impact on the Behavioral Intention to Use M-government and therefore has been rejected; Hypotheses 5, 19 and 2 were supported. Therefore, all other suggested factors positively affect the Behavioral Intention to Use M-government, namely the Past User Experience (H5) (Standardized Estimate=0.297, P< 0.01), the M- government Usefulness (H9) (Standardized Estimate=0.179, P< 0.01) and the Attitude Toward M-government Use (H2) (Standardized Estimate=0.313, P< 0.01). As can be seen from the results, Attitude Toward M-government Use has the greatest impact on the Behavioral Intention to Use M-government followed by the Past User Experience and then the M- government Usefulness. Therefore, Hypotheses H5, H9 and H2 were accepted.

Finally, all the suggested factors positively affect the Actual Use of M-government, namely the Past User Experience (H6) (Standardized Estimate=0.207, P< 0.01), the M- government Usefulness (H10) (Standardized Estimate=0.303, P< 0.01), the Attitude Toward M-government Use (H3) (Standardized Estimate=0.162, P< 0.01) and the Behavioral Intention to Use M-government (H1) (Standardized Estimate=0.220, P< 0.01). As can be seen from the results, M- government Usefulness has the greatest impact on the Actual Use of M-government followed by the Behavioral Intention to Use M-government, then the Past User Experience and finally

Attitude Toward M-government Use. Therefore, Hypotheses H1, H3, H6 and H10 were accepted.

4.7 Chapter Summary

This chapter covers the primary statistical analysis of the collected data. This involved first, encoding, editing and entering the data into SPSS. This was followed by checking the reliability and validity of the used constructs to assess the extent to which the measurements were reliable and valid. Item-to-total correlation was computed for each construct. As shown in Table 32, all constructs had acceptable reliability values ranging from 0.815 to 0.952, which was significantly higher than the acceptable level of 0.60 (Nunnally, 1978) and therefore, acceptable for more tests.

Table 39 presented a summary of the reliability analysis of the main variables in this research. Then, construct validity was explained. The reliability and validity analyses show that the measures are both reliable and valid. Lastly, the study examined the general descriptive analysis of the respondents' profile and their response distribution. In addition, some initial interpretations were also put forward as a start to the data analysis process.

Table 39: Cronbach Alpha Coefficients of Main Constructs

Basic Constructs	**Total Number of Items**	**Cronbach Alpha**
Perceived Responsiveness (PR)	3	0.815
Perceived Currency (PC)	3	0.889
Perceived Accuracy (PA)	3	0.874
Perceived Convenience (PCV)	5	0.895
Perceived Security (PS)	3	0.906
Perceived Trust (PT)	4	0.897
Perceived Risk (PRK)	3	0.929
Unauthorized Access	3	0.839
Unauthorized Secondary Use	4	0.878
Collection	4	0.843
Error	4	0.851
M-government Ease of Use	4	0.899
M-government Usefulness	4	0.938
Past User Experience	5	0.870
Attitude Toward M-government Use	3	0.952
Behavioral Intention to Use M-government	3	0.949
Actual Use of M- government	3	0.924

This chapter provides the statistical analysis results that enabled the researcher to come to conclusions that extend beyond the simple data. This chapter discussed the processes and findings of the confirmatory factor analysis, path analysis, and hypotheses testing, which were used for analytic objectives.

The results of the first confirmatory factor analysis supported the proposed eight-factor solution, comprising perceived responsiveness, perceived currency, perceived accuracy, perceived convenience, perceived security, perceived trust, perceived risk, and perceived privacy. Furthermore, the results of the second confirmatory factor analysis supported the proposed six-factor solution, comprising m-government ease of use, m-government usefulness, past user experience, attitude towards m-government use, behavioral intention to use m-government, and actual use of m-government.

After the results of confirmatory factor analysis, the suggested hypotheses were tested. The results summary of hypotheses testing is presented in Table 40 below:

Table 40: Results of Hypotheses Testing

Hypotheses	**Result**
H1. The End User Behavioral Intention to use M-government will positively affect the Actual Use of M-government.	Accepted
H2. The End User Attitude Toward M-government Use will positively impact the End User Behavioral Intention to use M-government.	Accepted
H3. The End User Attitude Toward M-government Use will positively affect the Actual Use of M-government.	Accepted
H4. Past User Experience will positively affect the End User Attitude Toward M-government Use.	Accepted
H5. Past User Experience will positively impact the End User Behavioral Intention to use M-government.	Accepted
H6. Past User Experience will positively affect the Actual Use of M-government.	Accepted

Table 40: Results of Hypotheses Testing (Continued)

Hypotheses	Result
H7. Perceived Usefulness of M-government will positively impact Past User Experience.	Accepted
H8. Perceived M-government Usefulness will positively impact the End User Attitude Toward M-government Use.	Accepted
H9. Perceived M-government Usefulness will positively impact the End User Behavioral Intention to Use M-government.	Accepted
H10. Perceived M-government Usefulness will positively affect the Actual Use of M-government.	Accepted
H11. Perceived M-government Ease of Use will positively impact its Perceived Usefulness.	Accepted
H12. Perceived M-government Ease of Use will positively impact Past User Experience.	Accepted
H13. Perceived M-government Ease of Use will positively impact the End User Attitude Toward M-government Use.	Accepted
H14. Perceived M-government Ease of Use will positively impact the End User Behavioral Intention to Use M-government.	Rejected
H15. Perceived Responsiveness of M-government services will positively impact its Perceived Usefulness.	Accepted
H16. Perceived Currency of M-government services will positively impact its Perceived Usefulness.	Accepted
H17. Perceived Accuracy of M-government services will positively impact its Perceived Usefulness.	Rejected
H18. Perceived Convenience of M-government services will positively impact its Perceived Usefulness.	Rejected

Table 40: Results of Hypotheses Testing (Continued)

Hypotheses	**Result**
H19. Perceived Security of M-government based technology will positively impact its Perceived Usefulness.	Accepted
H20. Perceived Trust on M-government based technology will positively impact its Perceived Usefulness.	Accepted
H21. Perceived Risk of M-government based technology will negatively impact its Perceived Usefulness.	Rejected
H22. Perceived Privacy of M-government based technology will positively impact its Perceived Usefulness.	Rejected

Source: Analysis of Survey Data

The following chapter presents details of the research discussion based on the data analysis presented in this chapter. It also deals with the theoretical implications, practical implications, research limitations, recommendation for the future research, and conclusion.

Chapter 5: Discussion and Conclusion

5.1 Overview

The current chapter presents the discussion and conclusion of this study's research. It also covers the discussion around the research literature. This chapter also deals with the theoretical and practical implications, research limitations, and recommendations for future research covered in the conclusion.

5.2 Discussion

The present research is an empirical attempt to explore and examine the relationships between m-government service characteristics, technology characteristics, perceived ease of use, perceived usefulness, user past experience, attitude toward use, behavioral intention to use, and actual use of m-government (in the context of the Abu Dhabi society). The relationships were developed through 22 hypotheses and tested using a sample of 279 users of m-government services in Abu Dhabi. This chapter discusses and analyzes the results, with reference to the theoretical framework and literature surrounding m-government adoption and actual use. This chapter tries to answer the study questions through the validated and tested research hypotheses. Moreover, it addresses the main findings and their implications for decision makers in the Abu Dhabi m-government.

Overall, the research findings of the current study support the proposed model of users' actual use of m-government applications. As expected, users' behavioral intention to use m-government, attitude toward use, past user experience, ease of use, and usefulness were found to be determinants of m-government adoption in Abu Dhabi.

The study findings confirm that a user's BI has a significant influence on the actual use of m-government services, as it is often reported to generally have a strong role in determining the actual usage and adoption of a new system (Ajzen, 1985, 1991; Almrashdah et al., 2010; Venkatesh et al., 2003; Venkatesh et al., 2012; Yu, 2012), particularly with regard to m-government services (Almrashdah et al., 2010; Yu, 2012).

Baker et al. (2007) highlighted that there is ample evidence confirming that attitude can significantly impact an individual’s intention to use either non-technological or technological information systems. Wong (2013) also reached this conclusion, stating that an increasing number of studies suggested that attitude toward computer use has a strong impact on behavioral intention. Within the mobile library application field, Yoon (2016) found that attitude is a significant antecedent of a user’s intention to use or adopt the application. Consistent with the previous findings, this study finds that end user attitude toward m-government use has a significant positive effect on the user’s BI to use m-government services.

Similarly, an increasing number of studies suggested that attitude toward computer use has a strong impact on the actual behavior of using computers (Wong, 2013). Likewise, Hsu et al. (2009) mentioned that a number of empirical researchers found a significant relationship between attitude and actual usage. In line with what Hsu et al. (2009) and Wong (2013) have mentioned, this study finds a significant positive effect of a user's attitude on their actual use of m-government services.

TAM has been extended to include and investigate the influence of the past experience construct in different ways (Bailey et al., 2017; Groß, 2018; Li et al., 2012; Severi & Ling, 2013; Sun & Chi, 2018; Wang et al., 2012). For example, Eagly and Chaiken (1993), Fazio and Zanna (1978), and Regan and Fazio (1977) found a strong correlation between attitude and individuals who had a direct experience. Similarly, Taylor and Todd (1995a) suggested a stronger impact of perceived usefulness and attitude on behavioral intention and subsequent actual behavior for experienced users. User attitudes, perceptions, and intentions changed significantly as a user's direct-use experience increased (Fazio & Zanna, 1978; Lymperopoulos & Chaniotakis, 2005; Nelson, 1990; Poon, 2008; Rivard & Huff, 1988; Schmitz & Fulk, 1991; Venkatesh & Davis, 2000; Xia & Lee, 2000). Dabholkar (1996) found that past experience with similar technologies is a main factor that influences an individual's attitude during the adoption decisions. This study outcome supports the conclusion drawn from the previous researchers: that past user experience has a positive impact on end user attitude toward m-government services or applications.

It is suggested that knowledge obtained from past behavior practices helps to form intention (Eagly & Chaiken, 1993; Fishbein & Ajzen, 1975) because past experience makes knowledge more reachable and accessible in memory (Fazio & Zanna, 1978; Regan & Fazio, 1977). This indicates that IT intention usage may be more efficiently modeled for users with prior experience. In the field of IB, Karjaluoto et al. (2002) and Lassar et al. (2005) concluded that past experience can strongly impact and shape a user's intention to use IB. In the field of m-government, this study concludes that past user experience has a significant positive impact on the end user's BI to use m-government.

On one hand, many researchers found that previous experience is a significant factor of a behavior (Bagozzi, 1981; Bentler & Speckart, 1979; Fishbein & Ajzen, 1975; Fishbein & Ajzen, 1980; Triandis, 1979). Similarly, the adoption and continued usage of e-commerce (Kwak et al., 2002), computer systems (O'cass & Fenech, 2003; Smith & Brynjolfsson, 2001), online purchasing (Bigné & Ruiz, 2003; Burton &

Pulendran, 2000; Castaneda et al., 2007; Citrin et al., 2000; Dholakia & Uusitalo, 2002; Hsu et al., 2007; Liao & Cheung, 2001; Miyazaki & Fernandez, 2001; Muñoz Leiva, 2008; White, 1996), e-government (Alomari et al., 2010; Pons, 2004), and mobile services (Ristola, 2010) are impacted by the previous experiences of individuals with similar information technology systems. Previous studies proved that past experience of a technology is a main factor determining its future use (McFarland & Hamilton, 2006).

On the other hand, Abaza and Saif (2015) concluded that a user’s past experience with the Internet has a non-significant effect on their intention to adopt Egyptian m-government. This study's finding is aligned with the former group of researchers who found a positive significant effect of user past experience on actual use of m-government.

This research hypothesizes the positive influence of PU of m-government on a user's past experience, and the hypothesis is supported by the results of this research analysis.

The significant and positive influences of PU on attitude were investigated and examined through a great deal of e-government adoption research (Hung et al., 2013; Hung et al., 2006; Hung et al., 2009; Lin et al., 2011; Lu et al., 2010). Suki and Suki (2011) found that PU has a positive impact on both the attitude and the behavioral intention of the service subscribers for 3G mobile services, while Wang (2014) confirms the positive effect of PU on a user's attitude toward m-government adoption. This study finds a similar conclusion, as PU of m-government has a significant positive effect on end user attitude toward m-government use.

This study also finds PU to have a similar effect on end user's BI to use m-government, which is in line with the findings of Abdelghaffar and Magdy (2012), who reached the same conclusion when they studied m-government adoption within an Egyptian context. Consistent with the Abdelghaffar and Magdy (2012) finding, several studies established the fact that PU is the main predictor of BI toward using or accepting new technology in general (Alalwan et al., 2017; Alalwan et al., 2015; Hanafizadeh et al., 2014; Luo et al., 2010; Tsai et al., 2017; Venkatesh et al., 2003; Venkatesh et al., 2012; Zhou, 2012) and m-government in particular (Abdelghaffar & Magdy, 2012; Abu-Shanab & Haider, 2015; Almarashdeh & Alsmadi, 2017; Althunibat & Sahari, 2011; Liu et al., 2014). This study as well as the previous studies found a significant direct impact of PU on BI, while (Kirmizi, 2014; Teo & Milutinovic, 2015) did not.

Numerous research studies demonstrated the significant impact of PU on user acceptance and adoption of new technology (Davis, 1989; Davis et al., 1992; Davis & Venkatesh, 1996; Green & Pearson, 2011; Sago, 2013; Wang et al., 2003). The impact is recognized as a significant factor affecting m-government service adoption, and it is a key determining construct for the acceptance of technology across a range of studies (Althunibat & Sahari, 2011). Consistent with the previous findings, this study finds that PU of m-government has a positive impact on the actual use of m-government.

Perceived ease of use is widely regarded as a main factor of a technology's perceived usefulness (Davis et al., 1989; Venkatesh, 2000; Venkatesh & Bala, 2008). The relationship between PEOU and PU has been proven across empirical studies (King & He, 2006; Ma & Liu, 2004; Mun et al., 2006; Paré et al., 2006; Schepers & Wetzels, 2007; Yarbrough & Smith, 2007). Contrary to previous results, several researchers failed to find an effect of PEOU on PU (Chau & Hu, 2002; Chismar & Wiley-Patton, 2003; Hu et al., 1999). This study's findings are in line with the findings of the former group.

This research hypothesizes the positive influence of PEOU of m-government on user's past experience, and is supported by the results of the research analysis.

In the technology adoption research, PEOU is found to be a main predictor of attitude (Almarashdeh, 2016; Davis et al., 1989; Moore & Benbasat, 1991; Park et al., 2007; Plouffe et al., 2001; Pynoo et al., 2011; Taylor & Todd, 1995b; Thompson et al., 1991; Venkatesh, 2000). Similar findings in the field of e-government systems adoption are noted (Hung et al., 2013; Hung et al., 2006; Hung et al., 2009; Lin et al., 2011; Lu et al., 2010). Consistent with the previous findings, this study finds a positive impact of PEOU on the end user attitude toward m-government use.

Previous research on technology adoption found that PEOU plays a significant role in shaping BI toward using new technology (Adams et al., 1992; Agarwal & Prasad, 1999; Al-Busaidi, 2012; Alalwan et al., 2017; Alalwan et al., 2015; Almarashdeh & Alsmadi, 2017; Davis, 1989; Gefen, 2003; Gefen & Straub, 1997, 2000; Hanafizadeh et al., 2014; Jackson et al., 1997; Lallmahomed et al., 2017; Lu & Gustafson, 1994; Moore & Benbasat, 1991; Pan & Jordan-Marsh, 2010; Venkatesh, 1999, 2000; Venkatesh & Davis, 2000; Venkatesh et al., 2012; Zhou, 2012). PEOU was also identified as a key determinant for BI to use e-government (Abu-Shanab, 2014; Carter & Belanger, 2004; Dahi & Ezziane, 2015; Hung et al., 2009; Hussein et al., 2011; Rehman et al., 2012; Sang et al., 2010; Suki & Ramayah, 2010; Teoh & Cyril, 2008) and m-government services (Abu-Shanab & Haider, 2015; Alotaibi & Roussinov, 2017; Althunibat & Sahari, 2011; Liu et al., 2014; Shareef et al., 2012). However, Abaza and Saif (2015) found no significant impact of PEOU on BI to use Egypt's m-government. Similarly, Tsai et al. (2017) found that PEOU did not have any significant impact on BI. In line with the latter group's findings, this study finds no significant impact of PEOU on a user's BI to use m-government services.

Ezzi (2014) found a significant relationship between IB system responsiveness and PU of the system. Similarly, Aloudat et al. (2014) showed that user perception of the m-government services' responsiveness would highly influence its PU. However, Eid et al. (2020) found no significant impact of perceived m-government services' responsiveness on its PU. This study finds that perceived responsiveness of an m-government service has a positive impact on its PU.

The second service characteristic of this research is perceived currency, which is found to have a significant impact on the user's PU of m-government services. This result is in line with the findings of Aloudat et al. (2014) and Eid et al. (2020) within the m-government adoption context.

According to Aloudat et al. (2014), the m-government end user perception of how useful an application is will be highly influenced by the degree to which the user perceives the services to be accurate. Eid et al. (2020) drew a similar conclusion. In contradiction to past results, this study finds no significant impact of perceived services accuracy on m-government PU.

Similarly, this study finds no significant impact of perceived service convenience on m-government PU, which contradicts the results obtained by Liao and Cheung (2002), who found that perceived convenience is a significant quality characteristic that positively impacted the PU of e-banking. Likewise, this study contradicts the conclusion of Tsai et al. (2017), who defined convenience as a significant determinant of both PU and PEOU. Also, this study contradict the results obtained by Yoon and Kim (2007), who found that perceived convenience positively affected PU. Similarly, it contradicts Chang et al. (2012) and Cho and Sagynov (2015) findings that perceived convenience has a significant impact on PU.

Sohn (2017) showed an impact of security on the PU toward searching and purchasing from mobile online stores. Moreover, Eid et al. (2020) showed security of m-government services as an antecedent of PU. This research also finds that the perceived security of m-government services has a significant positive impact on its PU.

The trust construct is essential to the delivery of e-government services (Hung et al., 2013) and the delivery of m-government services (Teo et al., 2008). Trust in new technologies (Dahlberg et al., 2003; Ha & Stoel, 2009; Pavlou, 2003; Reid & Levy, 2008; Wu & Chen, 2005), m-technology (Alalwan et al., 2017; Aloudat et al., 2014; Cho et al., 2007; Gefen et al., 2003; Hollingsworth & Dembla, 2013; Zarmpou et al., 2012; Zhang et al., 2010), and m-government services (Aloudat et al., 2014; Eid et al., 2020) positively impacts user PU. Similar to previous findings, this research finds that perceived trust of m-government technology has a significant positive impact on a user's PU.

Hampshire (2017) found risk to be a significant determinant of PU toward m-payment systems. Similarly, Aloudat et al. (2014) and Eid et al. (2020) concluded that risk has a significant but negative relationship with PU. However, this study finds no significant impact of risk on PU of m-government services.

As m-government transactions involve acquiring and transmitting data, users are often exposed to privacy risks (Radomir & Nistor, 2013). Aloudat et al. (2014) found that privacy has a positive impact on PU of m-government services. In contradiction to the results of Aloudat et al. (2014), this study finds no significant impact of perceived privacy of m-government on its PU. Although, Smith et al. (1996) have identified and defined four privacy concerns: collection, unauthorized secondary use, errors in storage, and unauthorized access of collected data. However, this research found that privacy as a multidimension construct has only three dimensions, as the items of unauthorized secondary use, and unauthorized access of collected data grouped under one construct named as "unauthorized access and use" in this research.

Finally, this study tries to answer the following questions:

- What are the factors affecting the actual use of m-government services from the user's perspective?

As per the study analysis and results, the factors that have a direct significant impact on the user's actual use of m-government are: past user experience with e-government or similar technology to m-government, PU of using m-government, attitude toward m-government, and BI to use m-government services. These factors are collectively successful in explaining more than 51% of the actual use of m-government services from the users' perspectives in Abu Dhabi City.

- What are the factors that can identify m-government usefulness to the users?

This study proposes external variables that affect PU as m-government service characteristics (responsiveness, currency, accuracy, and convenience), m-government technology characteristics (security, trust, risk, and privacy), and PEOU of m-government services that have a direct impact on PU. The factors of accuracy, convenience, risk, and privacy are found to have no significant impact on PU. However, the remaining factors are successful in collectively explaining more than 60% of the PU.

- To what extent can m-government ease of use affect m-government usefulness?

PEOU of m-government is found to have a significant impact on PU by a standardized coefficient of 0.266.

- What are the roles of m-government ease of use and usefulness in impacting user attitude toward m-government use, and behavioral intention to use m-government?

On one hand, PEOU and PU of m-government have a significant impact on user attitude toward m-government use and, along with past user experience, could explain more than 31% of user attitudes toward m-government in Abu Dhabi. On the other hand, PEOU of m-government has no significant impact on an individual's BI to use m-government. However, PU of m-government, past user experience, and user attitude toward m-government were all found to have a significant impact on one's BI to use m-government, which could explain more than 42% of citizens' BI to use m-government in Abu Dhabi.

- To what extent can past user experience affect the actual use of m-government?

Past user experience is found to have significant impact on the actual use of Abu Dhabi's m-government by a standardized coefficient of 0.207.

- What practical lessons can this study provide to support and enhance the UAE's m-government application?

Please refer to section 5.3.2 in the Conclusion: Practical Implications.

5.3 Theoretical Implications

The main contribution of this study is that it proposes an extensive model of the antecedents and consequences of m-government implementation in Abu Dhabi. This conclusion is based on the grounds that 17 out of the 22 hypotheses presented in the research's model were supported. Overall, the study findings indicate that: (a) Actual use of m-government applications has four determinants: behavioral intention to use m-government, attitude toward m-government use, m-government ease of use and m-government usefulness, and past user experience; (b) Perceived m-government usefulness has the greatest impact on the actual use of m-government, followed by the behavioral intention to use m-government, then past experience, and finally, attitude toward m-government use; and (c) Perceived ease of use of m-government services, responsiveness of the service, currency of the provided information and services, security concerns associated with m-government services utilization, and trust in the technology of m-government services are antecedents of users' perceptions of the m-government services' usefulness. The research's accepted hypotheses are illustrated in Figure 32.

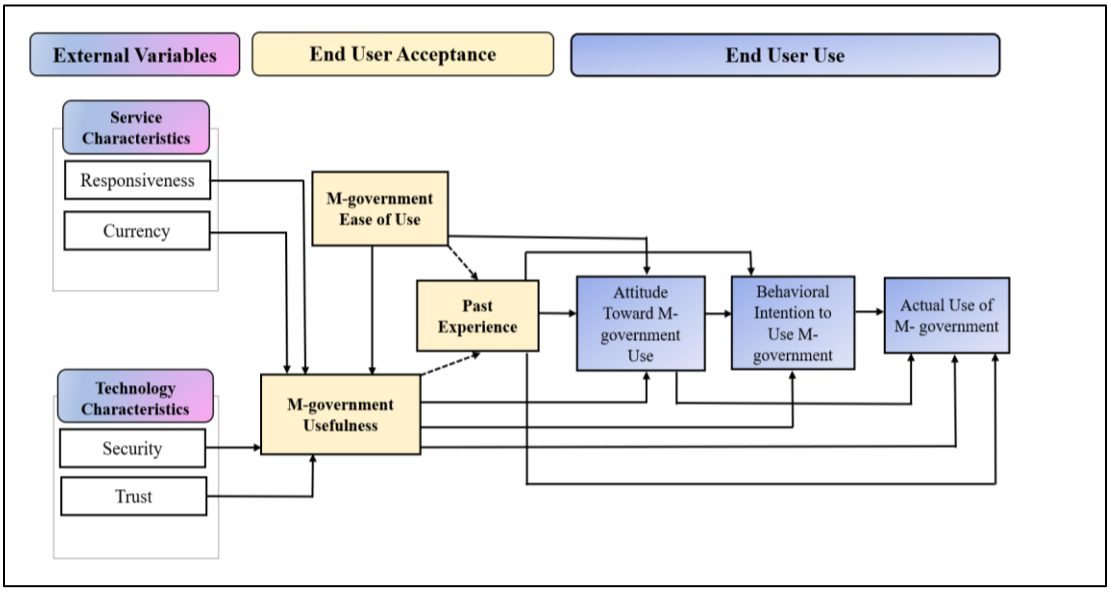


Figure 32: Accepted Relationships Based on the Study Results

5.4 Practical Implications

The study's findings have implications for both IS researchers and practitioners. For practitioners, the analysis results highlight factors for m-government adoption, as the main factor impacting m-government's actual use is PU of the m-government applications and services. Therefore, decision makers can focus on promoting the usefulness aspect of the application.

Moreover, this study suggests practical and valuable guidelines that can empower the development of m-government services to reach out to more users, as the research investigated different service and technology characteristic attributes that impact PU of m-government applications and services.

This study finds that out of the factors positively affecting the m-government PU that are responsiveness, currency, security, trust, and m-government PEOU, PEOU has the greatest impact on the m-government PU followed by responsiveness, trust, security, and finally currency. Therefore, developers of m-government services can focus on the mentioned design factors and try to advertise and market those features along with PU and PEOU of the m-government services and applications. Since accuracy, convenience, risk, and privacy features have an insignificant impact on PU for Abu Dhabi users, those factors can be overlooked during the promotion of the m-government application features, but they could possibly be included in the application design.

In general, MIS researchers have provided practitioners with four key areas, including: choice of system characteristics (Lucas Jr & Nielsen, 1980); choice of development process (Alavi, 1984); choice of implementation strategies (Alavi & Henderson, 1981), and nature of support services provided (Rockart & Flannery, 1983).

5.5 Research Limitations and Recommendations for Future Research

As with any research, there are some limitations that should be mentioned and addressed. First, this research was carried out in Abu Dhabi. Therefore, the generalizability of the research findings should be limited only to the Abu Dhabi context. Thus, an important future research direction is to study the suggested m-government adoption model and measure the actual usage within other populations or contexts in the UAE.

Second, the research model was extended to assess two dimensions: service characteristics and technology characteristics. The service characteristics were introduced using four factors: responsiveness, accuracy, currency, and convenience. More constructs of the service characteristics can be studied to assess their impact, such as personal control (Chen et al., 2016) or cost of service (Almarashdeh & Alsmadi, 2017). Similarly, different constructs of the technology characteristics can be explored, such as visibility (Aloudat et al., 2014) or compatibility (Agag & El-Masry, 2016), rather than the attributes used in this research (security, trust, risk, and privacy).

Third, the dependent variable of actual use of m-government that is used in this study was measured by self-reporting. In general, there are two common ways to measure actual use: subjective measurement—which is self-reported use—and objective measurement—which is actual use recorded by computerized systems (Straub et al., 1995). Subjective measures are usually gathered through self-reported values about intensity or frequency of use of a system (Turner et al., 2010). Of course, this measure of actual usage is subject to response bias and it is generally not possible in pre-adoption stages. On the other hand, objective measures are generally usage data extracted from system logs, including number of logins or total number of interactions with the system, as well as time spent in the system, which may provide more accurate usage information. Although both subjective and objective measures tend to be correlated, the relation between these measures of use is not clear (Straub et al., 1995). Moreover, this type of measure has been adopted across myriad studies. Due to this extensive research and the tight time frame of this study, the subjective measure was chosen. Therefore, it is suggested that future research could employ both measures to examine the actual use of a system (Thompson et al., 1994).

Fourth, is the relatively small sample size. While the sample sizes are considered large enough for this research, from a statistical perspective, a larger sample number could provide more reliable results (Chau, 1996; Thompson et al., 1994).

Fifth, Bhattacherjee (2001), Zhao et al. (2013), and Zhou et al. (2012) identified the first-time use of an information system as an important contribution to IS success. However, they emphasized that the long-term acceptance of IS and its ultimate success depends on the system's continued use rather than initial use. Thus, many organizations are currently considered very successful based on today’s use of IS, but from the point of view of long-term use, they could encounter failures (Lyytinen & Hirschheim, 1988). Therefore, future research can investigate the continued usage of m-government, as the time constraint of this study was a barrier to conducting a longitudinal study, requiring a cross-sectional study instead.

Sixth, the relationships between m-government PEOU and user past experience, and between m-government PU and user past experience need further investigations. Therefore, future research can investigate the mentioned relationships in depth.

Finally, residents’ adoption behavior, requirements, and preferences may be impacted by cross-cultural characteristics. The m-government adoption behavior should be studied and analyzed by focusing on cultural differences (Shareef et al., 2016).

5.6 Conclusion

Amidst the global outbreak of the COVID-19 pandemic, everyday life is changing in incredible ways. With social distancing, precautionary, and quarantine measures underway to stop the spread of the corona virus, digital solutions have become crucial to address isolation and keep citizens updated and engaged. Governments are exploring new approaches to providing clear, up-to-date information to the public and to frontline healthcare workers, while working together with stakeholders to reduce the spike in disinformation and misinformation. Assertive and rapid efforts are being taken to digitally manage the effects of the pandemic in different sections of the community. This has immediately put to the test the e-government's national visions, tools, and applications that countries have invested in over the past years. The COVID-19 pandemic has advanced the global level of e-government and m-government services, as governments are reminded more than ever about the relevance and importance of digital services. Digital transformation is now a critical part of the national sustainable development of many countries.

Many new technologies have been introduced to different businesses (Hasibuan & Syahrial, 2019; Shirowzhan et al., 2020). During the current pandemic climate, most businesses have been affected (Yue et al., 2020; Liu, et al., 2020); employees and citizens are encouraged and sometimes forced to do business remotely from home. Therefore, the demand for using appropriate technologies is increasing. This pandemic experience is a transformative global incident that may raise the need for fully online work, while the need for smart systems—including smart cities (Sepasgozar et al., 2019), smart real estate (Ullah et al., 2017), e-government (Bailey et al., 2017; Kurfalı et al., 2017; Twizeyimana & Andersson, 2019), e-commerce (Gregory et al., 2019; Vakulenko et al., 2019), e-banking (Ramesh et al., 2020;

Shankar & Jebarajakirthy, 2019), and other digital systems (Sepasgozaar et al., 2017)—is increasingly reported, which increases the significance of the automation and/or the creation of online systems. However, there is a critical need to investigate IS behavior across different contexts, more specifically investigating technology acceptance behavior in different contexts (Hasibuan & Syahrial, 2019; Rakhmawati & Rusydi, 2020; Rifat, Nisha, & Iqbal, 2019; Soeng et al., 2019). One context is m-government, particularly after the COVID-19 pandemic that might impact the user acceptance in different ways.

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Appendix

- Survey Instrument (Questionnaire):

Factors that Affect Actual Use of M-government Services

العوامل التي تؤثر على الاستخدام الفعلي لخدمات التطبيقات الحكومية

Dear Sir/Madam

Alslamo Alykom

This questionnaire is designed to measure factors that affect user acceptance and usage of M-Government Services in **Abu Dhabi**. You have been selected for this study based on random sample of people. The study is purely academic and the data you provide will be used only for scientific research and will help in gaining a better understanding of users' acceptance of M-Government applications. Of course you are not required to identify yourself and your response will be kept strictly confidential and there is no way of tracing your response. Only members of the research team will have access to the data you give and the completed questionnaire will not be made available to anyone other than the research team.

السلام عليكم،

تم تصميم هذا الاستبيان لقياس العوامل التي تؤثر على قبول المستخدم واستخدام خدمات الحكومة الإلكترونية في مدينة أبوظبي. لقد تم اختيارك لهذه الدراسة بناءً على عينة عشوائية من الناس. هذه الدراسة أكاديمية بحتة، وسيتم استخدام البيانات التي تقدمها فقط للبحث العلمي وستساعد في فهم أفضل لقبول المستخدمين لتطبيقات الحكومة الإلكترونية. بالطبع لا يلزمك تحديد هويتك وسيتم الاحتفاظ بإجابتك في سرية تامة ولا توجد وسيلة لتتبع ردك. سيتمكن أعضاء الفريق البحثي فقط من الوصول إلى البيانات التي تقدمها ولن يتم توفير الاستبيان المكتمل لأي شخص آخر غير فريق البحث.

- **Who should complete this questionnaire?**

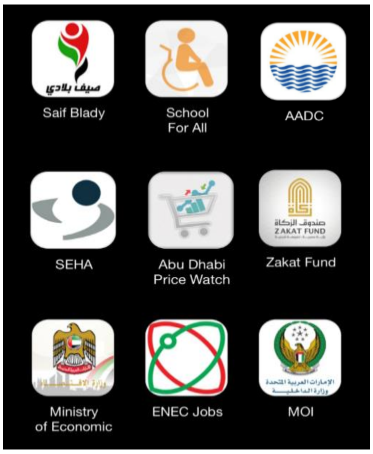
The questionnaire should be filled in by any UAE local or resident who have used any M-Government applications during the period of 2018 until today.

- **من الذي يجب عليه إكمال هذا الاستبيان؟**

يجب ملء الاستبيان من قبل أي مواطن أو مقيم في الإمارات العربية المتحدة استخدم أي من تطبيقات الحكومة الإلكترونية الفترة من 2018 الى اليوم.

- **Examples of Government Applications:**

- **أمثلة على التطبيقات الحكومية**



1- BACKGROUND INFORMATION

Please tick in the appropriate box

Q1. Age Category

الفئة العمرية .Q1

□ Less 25 yrs □ أقل من 25 سنة	□ 25 - 34 yrs □ 25 - 34 سنة	□ 35 - 44 yrs □ 35 - 44 سنة	□ 45 - 55 yrs □ 45 - 55 سنة	□ More than 55 yrs □ أكثر من 55 سنة

Q2. Gender

الجنس .Q2

□ Male ذكر	□ Female أنثى

Q3. Qualifications

المؤهلات العلمية .Q3

□Below Secondary □ متوسط	□ Secondary □ ثانوي	□ Diploma □ شهادة دبلوم	□ Bachelor □ بكالوريس	□ Master □ ماجستير	□ Doctorate □ دكتوراه

Q4. Monthly Income (in AED)

الدخل الشهري (بالدرهم الاماراتي) .Q4

□ Less than 10000 □ اقل من 10000	□ 10000 – 19000 □ بين 10000 – 19000	□ 20000 – 29000 □ بين 20000 – 29000	□ 30000 – 39000 □ بين 30000 – 39000	□ More than 40000 □ أكثر من 40000

Q5. Nationality الجنسية : ……………….

2- M-Government Applications' Characteristics

1	2	3	4	5
Strongly Disagree غير موافق بشده	**Disagree** غير موافق	**Neutral** محايد	**Agree** موافق	**Strongly Agree** موافق بشده

A. Perceived Responsiveness:					
A1. I would expect m-government applications to be timely when being used for getting any governmental service. أتوقع أن تكون التطبيقات الحكومية تستجيب لحظيا عند استخدامها للحصول على أي خدمة حكومية.	1	2	3	4	5
A2. If I used m-government applications, I would always expect a prompt response. إذا كنت تستخدم التطبيقات الحكومية ، أتوقع دائمًا استجابة سريعة.	1	2	3	4	5
A3. Overall, m-government applications should offer information in a timely manner. بشكل عام، يجب أن تقدم الطلبات الحكومية المعلومات في الوقت المناسب.	1	2	3	4	5
B. Perceived Currency:					
B1. M-government applications should provide up-to-the-minute information about the provided services. يجب أن توفر التطبيقات الحكومية معلومات محدثة عن الخدمات المقدمة.	1	2	3	4	5
B2. I would be concerned if the information provided to me by m-government applications was not up-to-date. سأكون قلقًا إذا كانت المعلومات التي قدمتها لي الطلبات الحكومية غير محدثة.	1	2	3	4	5

B3. I think m-government applications should always have the latest information in order to be reliable أعتقد أن التطبيقات الحكومية يجب أن تحتوي دائمًا على أحدث المعلومات حتى تكون موثوقة.	1	2	3	4	5
C. Perceived Accuracy:					
C1. I would expect the information delivered to me through m-government applications to be always accurate. أتوقع أن تكون المعلومات المقدمة لي من خلال الطلبات الحكومية دقيقة دائمًا.	1	2	3	4	5
C2. I would find it unacceptable to get inaccurate information when using m-government applications. أجد أنه من غير المقبول الحصول على معلومات غير دقيقة عند استخدام التطبيقات الحكومية.	1	2	3	4	5
C3. Overall, m-government applications are reliable to be used only when they are accurate. بشكل عام ، يمكن الاعتماد على التطبيقات الحكومية فقط عندما تكون دقيقة.	1	2	3	4	5
D. Perceived Convenience:					
D1. Using m-government enables me to obtain services at a time that is convenient for me. يمكّنني استخدام التطبيقات الحكومية من الحصول على الخدمات في الوقت الذي يناسبني.	1	2	3	4	5
D2. Using m-government enables me to obtain services at anyplace that is convenient for me. يتيح لي استخدام التطبيقات الحكومية الحصول على الخدمات في أي مكان يناسبني.	1	2	3	4	5
D3. M-government is a pleasant experience. التطبيقات الحكومية تعد تجربة ممتعة.	1	2	3	4	5

D4. M-government saves time compared with going to a traditional customer service centers. التطبيقات الحكومية توفر الوقت مقارنة بالذهاب إلى مراكز خدمة العملاء التقليدية.	1	2	3	4	5
D5. I find m-government convenient for getting services. أجد التطبيقات الحكومية مريحة للحصول على الخدمات.	1	2	3	4	5
E. Perceived Security:					
E1. I trust the ability of m-government applications to protect my privacy. أثق في قدرة التطبيقات الحكومية على حماية خصوصيتي.	1	2	3	4	5
E2. Using m-government applications is financially secured. استخدام التطبيقات الحكومية مؤمن / محمي مالياً.	1	2	3	4	5
E3. I am not worried about the security of m-government applications. أنا لست قلقًا بشأن أمان التطبيقات الحكومية.	1	2	3	4	5
F. Perceived Trust:					
F1. I believe the information offered by the M-government applications is genuine. أعتقد أن المعلومات التي تقدمها التطبيقات الحكومية حقيقة/صادقة.	1	2	3	4	5
F2. I think M-government applications are trusted applications. أعتقد أن التطبيقات الحكومية تطبيقات موثوق بها.	1	2	3	4	5
F3. I can rely on M-government applications for the information about different services. يمكنني الاعتماد على التطبيقات الحكومية للحصول على معلومات حول الخدمات المختلفة.	1	2	3	4	5
F4. M-government applications serves the best interests of its users تخدم التطبيقات الحكومية أفضل اهتمامات مستخدميها	1	2	3	4	5

G. Perceived Risk:					
G1. There is a considerable risk involved in using m-government applications. يوجد خطر كبير في استخدام التطبيقات الحكومية.	1	2	3	4	5
G2. My decision to use m-government applications would be risky. سيكون قراري في استخدام التطبيقات الحكومية محفوفًا بالمخاطر.	1	2	3	4	5
G3. There is too much uncertainty associated with using M-government applications. يوجد الكثير من عدم اليقين المرتبط باستخدام التطبيقات الحكومية.	1	2	3	4	5
H. Perceived Privacy:					
H1. M-government should devote more time and effort to preventing unauthorized access to personal information. يجب على التطبيقات الحكومية تخصيص مزيد من الوقت والجهد لمنع الوصول غير المصرح به إلى المعلومات الشخصية.	1	2	3	4	5
H2. M-government should take more steps to make sure that the personal information in their files is accurate. يجب على التطبيقات الحكومية اتخاذ المزيد من الخطوات للتأكد من دقة المعلومات الشخصية في ملفاتها.	1	2	3	4	5
H3. M-government should take more steps to make sure that unauthorized people cannot access personal information. يجب على التطبيقات الحكومية اتخاذ المزيد من الخطوات للتأكد من أن الأشخاص غير المصرح لهم لا يمكنهم الوصول إلى المعلومات الشخصية	1	2	3	4	5
H4. M-government should not use personal information for any purposes unless it has been authorized by the individuals who provided the information. يجب على التطبيقات الحكومية عدم استخدام المعلومات الشخصية لأي غرض من الأغراض ما لم يكن مصرحًا بذلك من قبل الأفراد الذين قدموا المعلومات.	1	2	3	4	5

H5. When people give personal information to a m-government for some reason, m-government should never use the information for any other purpose. عندما يقدم الأشخاص معلومات شخصية في التطبيقات الحكومية لسبب ما ، يجب ألا تستخدم الحكومة هذه المعلومات لأي غرض آخر.	1	2	3	4	5
H6. M-government should never sell the personal information in their computer databases to other companies. يجب على التطبيقات الحكومية عدم بيع المعلومات الشخصية في قواعد بيانات الكمبيوتر لشركات أخرى.	1	2	3	4	5
H7. M-government should never share personal information with other companies unless it has been authorized by the individuals who provided the information. يجب على التطبيقات الحكومية عدم مشاركة المعلومات الشخصية مع شركات أخرى ما لم تكن معتمدة من قبل الأفراد الذين قدموا المعلومات.	1	2	3	4	5
H8. It usually bothers me when m-government ask me for personal information. عادة ما يزعجني عندما تطلب مني التطبيقات الحكومية معلومات شخصية.	1	2	3	4	5
H9. When m-government ask me for personal information, I sometimes think twice before providing it. عندما تطلب مني التطبيقات الحكومية معلومات شخصية ، أفكر أحيانًا مرتين قبل تقديمها.	1	2	3	4	5
H10. It bothers me to give personal information to so many people. يزعجني أن أقدم معلومات شخصية لكثير من الناس.	1	2	3	4	5
H11. I am concerned that m-government are collecting too much personal information about me. إنني قلق من قيام التطبيقات الحكومية بجمع الكثير من المعلومات الشخصية عني.	1	2	3	4	5

H12. All the personal information in computer databases should be double-checked for accuracy no matter how much this cost. يجب التحقق من دقة جميع المعلومات الشخصية الموجودة في قواعد بيانات التطبيقات الحكومية للتأكد من دقتها مهما كانت هذه التكلفة.	1	2	3	4	5
H13. M-government should take more steps to make sure that the personal information in their files is accurate. يجب على التطبيقات الحكومية اتخاذ المزيد من الخطوات للتأكد من أن المعلومات الشخصية في ملفاتهم دقيقة.	1	2	3	4	5
H14. M-government should have better procedures to correct errors in personal information. يجب أن يكون لدى التطبيقات الحكومية إجراءات أفضل لتصحيح الأخطاء في المعلومات الشخصية.	1	2	3	4	5
H15. M-government should devote more time and effort to verifying the accuracy of the personal information in their databases. يجب على التطبيقات الحكومية تكريس المزيد من الوقت والجهد للتحقق من دقة المعلومات الشخصية في قواعد البيانات الخاصة بهم	1	2	3	4	5

3- End User Factors

I. M-Government Ease of Use:					
I1. Learning how to use m-government applications would be easy for me. سيكون تعلم كيفية استخدام التطبيقات الحكومية أمرًا سهلاً بالنسبة لي.	1	2	3	4	5
I2. I found m-government services easy to use. لقد وجدت الخدمات الحكومية سهلة الاستخدام.	1	2	3	4	5

I3. M-government applications are clear and understandable. التطبيقات الحكومية واضحة ومفهومة.	1	2	3	4	5
I4. I find it easy to get m-government applications to do what I want them to do. أجد أنه من السهل على التطبيقات الحكومية القيام بما أريد منهم القيام به.	1	2	3	4	5
J. M-Government Ease of Usefulness:					
J1. Using M-government applications helps me to accomplish things more quickly. يساعدني استخدام التطبيقات الحكومية على إنجاز الأمور بسرعة أكبر.	1	2	3	4	5
J2. Using m-government applications makes my life easier. استخدام التطبيقات الحكومية يجعل حياتي أسهل.	1	2	3	4	5
J3. I find m-government applications useful to my life. أجد التطبيقات الحكومية مفيدة لحياتي.	1	2	3	4	5
J4. Using the m-government applications would increase my productivity. استخدام التطبيقات الحكومية سيزيد من إنتاجيتي.	1	2	3	4	5
K. Past User Experience (CE):					
K1. If I have access to the m-government, I will use it always إذا كان بإمكاني الوصول إلى التطبيقات الحكومية، فسأستخدمها دائمًا	1	2	3	4	5
K2. I want to see the benefits of m-government before I apply it أريد أن أرى فوائد التطبيقات الحكومية قبل تطبيقها	1	2	3	4	5
K3. The m-government provides me a more efficient and organized tool for getting services. توفر لي التطبيقات الحكومية أداة أكثر كفاءة وتنظيمًا للحصول على الخدمات.	1	2	3	4	5

K4. I often tell my friends about my m-government experiences. غالبًا ما أخبر أصدقائي بتجاربي مع التطبيقات الحكومية	1	2	3	4	5
K5. M-government are valuable to my overall online experiences. التطبيقات الحكومية هي قيّمة لتجاربي عبر الإنترنت بشكل عام.	1	2	3	4	5

4- End User Acceptance

L. Attitude Towards M-Government Use:					
L1. I like the idea of using m-government applications instead of visiting the government entity. تعجبني فكرة استخدام التطبيقات الحكومية بدلاً من زيارة الجهة الحكومية.	1	2	3	4	5
L2. I consider using m-government applications for getting the governmental services is good idea. استخدام التطبيقات الحكومية للحصول على الخدمات الحكومية تعد فكرة جيدة.	1	2	3	4	5
L3. In general, the idea of using m-government applications might be beneficial to my family and me. بشكل عام ، قد تكون فكرة استخدام التطبيقات الحكومية مفيدة لي و لعائلتي.	1	2	3	4	5
M. Behavioural Intention to use M-Government:					
M1. I intend to use m-government applications to do my work. أنوي استخدام التطبيقات الحكومية للقيام بعملي	1	2	3	4	5
M2. I intend to use m-government applications frequently. أنوي استخدام التطبيقات الحكومية بشكل متكرر	1	2	3	4	5
M3. Given the opportunity, I will use m-government applications. إذا أتيحت لي الفرصة، سأستخدم التطبيقات الحكومية	1	2	3	4	5
N. Actual Use of M-Government:					

N1. I often use m-government service frequently أستخدم خدمات التطبيقات الحكومية بشكل متكرر	1	2	3	4	5
N2. I use the m-government applications whenever appropriate to obtain services and information أستخدم التطبيقات الحكومية كلما كان ذلك مناسبًا للحصول على الخدمات	1	2	3	4	5
N3. I use the m-government applications a lot to obtain services and information أستخدم التطبيقات الحكومية كثيرًا في إنجاز أعمالي	1	2	3	4	5

Any additional comments: أي تعليقات إضافية:

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Thank you for your co-operation

If you would like a copy of the study results report, please complete the following details:

شكرا لتعاونكم

إذا كنت ترغب في الحصول على نسخة من تقرير نتائج الدراسة ، فيرجى إكمال التفاصيل التالية:

Name: ……………………………………………………………………………:الاسم

Address: ……………………………………………………………………………:العنوان

E-mail: ……………………………………………………………………………:البريد الإلكتروني