User-Centric Factors Affecting the Adoption of Mobile Government

The Case of Oman

by

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"Each generation has a defining technology - the baby boomers were defined by the television. We will have a cohort of people around the world who have mobiles giving them togetherness. And we can expect this identification to have consequences for how we constitute and carry ourselves politically!!"

Howard Rheingold, 2005, a futurologist

"A typical smart phone has more computing power than Apollo 11 when it landed a man on the moon. In many parts of the world, more people have access to a mobile device than to a toilet or running water."

Nancy Gibbs, 2012, American Journalist

"The advance of technology is based on making it fit in so that you don't really even notice it, so it's part of everyday life."

Bill Gates, 2001, Founder of Microsoft

"Mobile is the enabling centerpiece of digital convergence. Mobile is the glue for all other digital industries to use when approaching convergence, but mobile is also the digital gateway for the real world to join in this global metamorphosis of human behavior."

Tomi Ahonen, 2013, IT Consultant

"...building a people-centred and inclusive information society, putting the potential of information and communication technologies at the service of development and addressing new challenges of the information society.."

United Nations World Summit, 2005

Abstract

The evolution of mobile-phone technologies such as Smartphones Applications and Services enabled the emergence of digital and smart economies, governments and nations. Many developed and developing countries, like Oman, have considerably invested in the area of Smart Technologies, and initiated countless number of projects such as Smart Governments, also known as Mobile or M-Government, to provide timely, secure, satisfactory and high quality of services for the citizens, businesses and other governmental agencies. Although many scholars have investigated this area of interest with huge amount of efforts, the adoption and actual use of M-Government applications and services, remain problematic and face many challenges.

In this area of interest, two major themes of research were reported in the literature: User-centred (i.e., Human-Computer Interaction perspective) and System-centred (i.e., Software Engineering perspective). The first theme remains a hot area of interest mainly due to the importance of the role of end-users in the adoption and success of the new technologies like M-Government. Therefore, this study attempted to develop and empirically validate a novel Mobile Government Adoption Model (titled: MGAM) within the culture of Oman. The MGAM model integrates a well-known theory in this domain, the Technology Acceptance Model (TAM), with other theories including Psychometric Paradigm Theory (PPT), Customer Culture Theory (CCT) and Personality Trait Theory (PTT) to identify key factors related to the end-users or citizens; those included their Perception of Risk, Culture and Personality Trait.

The study adopted quantitative research with Survey method as a research strategy for data collection and quantitative methodology for data analysis. A new data collection instrument was developed for the purpose of this study and distributed through online facilities to collect data about the variables of the MGAM Model from Users in Oman using the M-Government applications and services. Around 450 samples (302 males and 148 females) were collected and considered for the purpose of data analysis in this study. Several statistical tools and means have been used to analyse the data and valuate the MGAM model including Descriptive and Inferential Statistic, Structural Equation Modelling (SEM), Comparative Fit Index Analysis, Exploratory Factor Analysis (EFA) with Statistical Software Applications, SPSS and AMOS Applications.

The study revealed that most of the users in Oman using M-Government applications and services were very positive about the Perceived Ease of Use and the Perceived Usefulness of the technology with very positive Attitude and Behavioural Intention towards this technology. The findings also showed that the research participants have a slightly negative Perception of Risk when using the M-Government applications and services in Oman, and positive perception of Culture in this domain. With reference to the MGAM Model, the model was tested and validated, and the findings indicated that the Personality Trait moderator can strengthen the link between Behavioural Intention and Actual Use of the technology.

Based on the findings, the study provided key recommendations for the governmental personnel dealing with the development of M-Government applications and services in Oman, and for public users in Oman. Among those, the study recommends for considering this initiative in Oman as a real and strategic shift in public administration, and to make easy, flexible and dynamic M-Government applications and services through taking into account cultural issues and user-related preferences. The study also recommended offering more than a service in one visit by the users, providing information prior to services and training governmental employees on this technology.

The main contribution of this work is the development and validation of a new adoption model in the area of M-Government, the MGAM model. Theoretically, the MGAM Model extends the TAM Model through the integration process with with other theories including PPT, CCT and PTT to identify new key factors with impact on the adoption of M-Government infrastructure. This work also makes a novel contribution in terms of research methodology by developing and applying a new data collection tool, i.e., Mobile Government Adoption Questionnaire. This tool can be used by other researchers to collect data on the same research problem from contexts similar to the Omani one. Practically, this work attempted to identify the key prerequisites for the adoption and actual use of technology in the area of public services administration, and then making contribution towards the success of M-Government initiatives. The use of different tests and methods to statistically understand how the Omani end-users make decisions on the use of M-Government is also a novel practical contribution of this work.

Author's Declaration

I, the author of this thesis, Salim Qatoob Al Amri, confirm that the contents in this dissertation titled "**User-Centric Factors affecting the Adoption of Mobile Government – The Case of Oman**" has not previously been submitted for another degree at any other educational institution or university. I also wish to confirm and state that this thesis contains no contents previously published or written by other Authors except where due reference is cited. Brunel University is now authorized to make this thesis electronically available to the public.

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Dedication

This work is dedicated to my dearest father and dearest mother. I would like to tell both of you in this occasion that I am proud of loving you and being your son, I wish you accept this exceptional gift. With all my special respect and warm love, thanks for your extreme care and forgive me for troubling you at any given time.

For all of you, my wife and children, please, accept this gift, and thanks for all of my brothers and sisters for their help and support.

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- Al Amri, S. Q. and Sadka, A. H., (2018). An Empirical Investigation of User-Centric Factors affecting the Adoption of Mobile Government – a Mobile Government Adoption Model for the Case of Oman, *The Electronic Journal of e-Government (EJEG)*, Academic Conferences and Publishing International, UK [***In Preparation***].

Chapter 1
Introduction

This chapter provides an introduction towards this PhD research project for the development of novel Mobile Government Adoption Model (MGAM) with a focus on user-centric factors affecting the adoption of Mobile Government (M-Government or mGovernment, M-Government will be used in this work), particularly in Oman. The chapter first presents (in Section 1.1)a brief background on the research topic and the importance of M-Government initiatives for the public services administration and delivery within the context of the new era of Information and Communication Technologies (ICT). The chapter then discusses the issues related to the success of M-Government adoption as a new trend in the Digital Age (DA) or Information Age (IA), and then highlights the importance of user's Behavioural intention, perception of risks, and personality traits. The statement of problem (Section 1.2), research aim and objectives (Section 1.3), details of the proposed research theoretical framework (Section 1.4), research questions and hypotheses (Sections 1.5 and 1.6), as well as the anticipated research contributions to the existing knowledge and theories in the domain are provided in this chapter (Sections 1.7). Finally, the chapter discusses the research significance and implications (Section 1.8), and then provides outlines of the remaining parts of this dissertation (Section 1.9).

1.1 Research Background

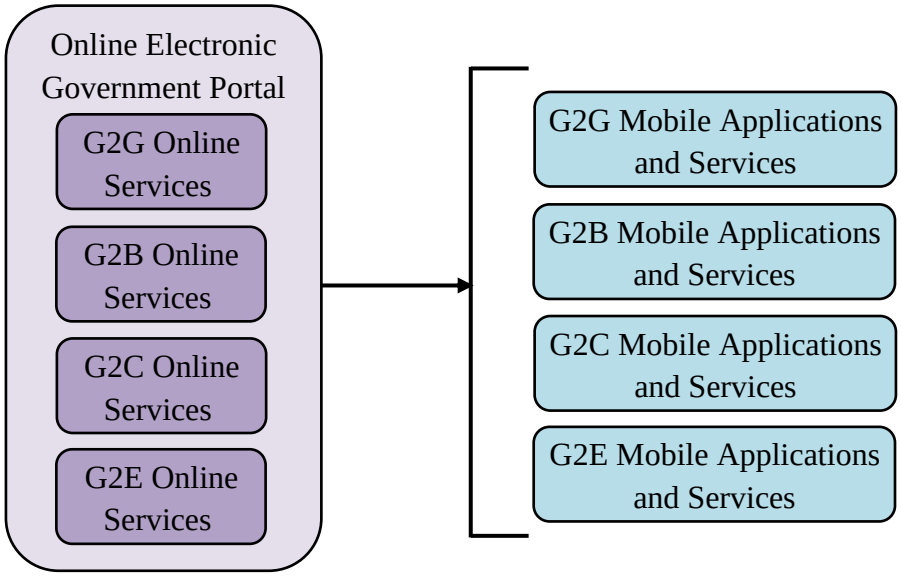
Information and Communication Technologies (ICT) with the high rate of Internet penetration in developed and developing countries have decisively become one of the crucial drivers that enable novel national developments and digital economies; opportunities will certainly continue moving forward to construct technologies-oriented generations and nations (Abdelghaffar and Magdy, 2012; ITU, 2015). The ICT

innovations have been reported to play a key and significant role in the near future in achieving sustainable development goals and infrastructures as the world moves faster and faster towards a digital society (ITU, 2015). The utilization of ICT means makes it possible to provide accountable and easy services with better access to data, information and transactions for citizens, businesses and governments; such services can be obtained at any time, using any digital device from anywhere (Danial, 2014, p. 163; Al-Hujran et al., 2015, p. 155). The advancements in ICT brought a wide range of communications, security and management digital inventions and means such as Personal Computers, Interconnected Networks (i.e., the Internet, Intranet and Extranet, LAN, CAN, MAN, WAN, etc.), Wireless Technologies (such as Internet of Things (IoT)), Smart Devices and Mobile Computing Technologies (such as tablets, mobile phones, personal digital assistants, mobile applications, online applications libraries, etc.), Cyber Security Systems, Multimedia and Web Technologies, Management Information Systems, and other technologies. These advancements swiftly revolutionise the core concepts and approaches of the way public services and their administration are offered and implemented by governments (Tavakoli, Ghasemi and Yaghoubi, 2016); those technologies yet remain to change and will continue to evolve. Therefore, research and scientific investigations and theorisation towards understanding how those technologies evolve; how they impact on societies; and how societies accept (or reject) and adopt them continues to be of interest.

Public Services Administration and Delivery is a central concern in all countries and for all nations and societies in terms of quality, security, accountability, credibility, innovation, transparency, equity, novelty, and many other critical aspects. Evidently, governments face a wide range of challenges in providing their nations and societies with the expected and affordable public goods and services related to the economic life, social security, urban planning, national defences, healthcare, education, and other daily societal and commercial engagements and activities (Zhou, 2011, p. 28). Therefore, public administrators and governments have had to consider the utilization and make true investment in acquiring advanced Information and Communication Technologies (ICT) tools to enhance and improve their performance, efficiency and effectiveness (Carrol, 2005, p. 77; Al-Khamayseh, 2009, p. 2). Worldwide, many countries have acquired new initiatives in the area of public services administration and delivery; such initiatives are known as Electronic Government (known also as eGovernment or as E-Government). The eGovernment initiatives have helped governments to succeed in

carrying out their responsibilities and fulfilling their commitments towards citizens, businesses, employees and other governmental agents using different models, respectively, Government to Citizen (G2C), Government to Business (G2B), Government to Employee (G2E) and Government to Government (G2G); any of those models or services offered via the Online Electronic Government Portal will be moving to be via Mobile phones using applications, Figure 1.1.

Figure 1.1: Transition Models of Electronic Government to Mobile Government



In fact, the acquisition and deployment of ICT means for the management of data, information and transactions related to or needed by public services and administration have enabled the easy, reachable, secure, affordable and timely flow of the necessary and essential contents between the government, businesses, citizens, and other governmental agents. This kind of key and mandatory partnership was already seen in the processes and activities involving gathering, organizing, storing, processing, securing, presenting and disseminating of data and information; such processing and activities deliver vital benefits for all parties with interest (Sareen et al., 2013:86). Clearly, the adoption and utilization of the ICT means in any domain and by any type of users remain a hot topic of research and interest from technical, social, cultural, psychological and other different perspectives, and due to many success and failure factors (Al-Qahtani, 2014; Alhujran, 2009; Tavakoli, Ghasemi and Yaghoubi, 2016; AI-khamayseh, Lawrence and Zmijewska, 2006).

Mobile Phones or Smartphones in particular are one of the most rapidly growing technology in history, and the most popular and widespread ICT technology in the world used at personal levels; Smartphones are now becoming part of our daily and business life. In 2015, the statistical figures found by the International Telecommunication Union (ITU) (the United Nations specialized agency for ICT) showed that access to mobile networks and phones is available to more than 90% of the world population with more than seven billion mobile phone subscriptions (up from less than one billion in 2000), and to around 80% of the population living in rural areas (ITU, 2015). The statistics by ITU also showed that mobile broadband is the most dynamic segment of the ICT market where the penetration reached around 47% globally in 2015, a value that increased 12 times since 2007. In fact, mobile phones, applications and technologies are the most intimately close component to the body involving not only the ear but also the mouth and voice (Fortunati, 2002). Given this extraordinary and highly exceptional advancements in the area of mobile communication and application technologies, governments are reaching a position to realise the value of mobile technologies for measurable improvements to public service delivery, social and economic development, operational efficiencies and active citizen engagement.

The interoperability of mobile devices and applications can support quick access to integrated data, information and location-based services (based on anytime, anyplace and anyhow); creating pioneering opportunities for innovative public services management and delivery (AI-khamayseh, 2009; Al-Busaidi, 2012). Further, mobile devices have a very high potential to become the ideal devices for accessing the web and Internet because they are easy to carry, small, light, personal, convenient, and many people carry them all the time everywhere. Therefore, many governments have recently made a brave and courageous transition to use wireless networks and mobile technologies and applications to provide their services and conduct their business transactions; this transition has created what is known as Mobile Government (will be called as M-Government in this dissertation).

Mobile Government (i.e., M-Government) was reported and considered as an extension of the Electronic Government (e-Government) initiatives, yet providing services using new mobile devices and applications (Al-Busaidi, 2012; Naqvi and Al-Shihi, 2009; Al-Hadidi, 2010). The eGovernment infrastructures have emerged and already reached a well-known stage in many developed and developing countries through the

development of ICT and Internet-enabled infrastructures and platforms to support citizen, businesses and other governmental agencies with the services they need; those initiatives have then evolved into M-Government i.e., M-Government is a subset of the eGovernment (Kushchu, 2007). Indeed, many developing countries, like Oman, have significantly invested over the last few years in the development of M-Government infrastructures. Through such M-Government infrastructure, governments are able to offer a wide range of services that can be acquired using different types of wireless devices, during unlimited time intervals, and from different locations. It has been reported that, while eGovernment initiatives were a crucial step taken by many governments, provision of services through mobile technologies is then now inevitable (Kuscu, Kushchu and Yu, 2007, p. 8). Yet, similar to any other new technology or digital innovation, M-Government infrastructures remain to face some critical technical, as well as non-technical challenges, particularly adoption and acceptance (Tavakoli, Ghasemi and Yaghoubi, 2016; AI-khamayseh, Lawrence and Zmijewska, 2006).

Adoption and Acceptance of Technologies where societies experience and express digital readiness to deploy, accept and adopt the evolutionary innovations is crucial and has become a fundamental criterion by which to measure the degree of progress and success (or failure) of nations and societies in the twentieth and twenty first centuries (Al-Shafi and Weerakkody, 2009). Therefore, the investigation of factors affecting the deployment of ICT means and tools in the area of public or governmental services administration, and researching the adoption of such developments and initiatives, remain of importance and interest (e.g., Al-Busaidi, 2012; Alotaibi and Dmitri, 2015; Al-khamayseh, 2009).

1.2 Statement of Problem

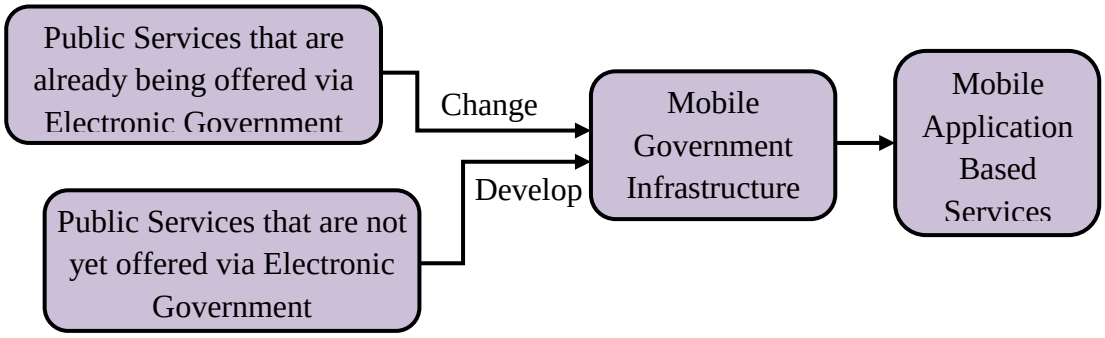
Scientific research towards understanding the adoption, acceptance and success, or failure, of ICT, and efforts to identify the Behaviours, intentions and decisions of the end users in relation to the novel ICT innovations produced a wide range of theories, or scientific models and frameworks. Examples of the theories or models conceptualising the adoption and acceptance of ICT innovations involve the Technology Acceptance Model (TAM) (Davis, 1989), The Task Technology Fit (TTF) Model (Dishaw and Strong, 1998), Theory of Innovation Diffusion (Roger, 1995), Perceived Attributes of Innovation (PAI) Theory (Moore and Benbasat, 1991), the Unified Theory of

Acceptance and Usage of Technology (UTAUT) (Venkatesh et al., 2003), and the Theory of Prospective Gratification (TPG) (LaRose et al., 2001). Other theories such as the Theory of Planned Behaviour (TPB) (Sheppard et al., 1988; Ajzen, 1991), Theory of Reasoned Action (TRA) (Fishein and Ajzen, 1975), the Big Five Personality Traits Theory (also known as Five Factor Model (FFM)) (McCrae and John, 1992), Psychometric Paradigm Theory (Tversky and Kahneman, 1974) and Customer Culture Theory (CCT) (Arnould and Thompson, 2005) were developed to identify and provide further insight into understanding the Behaviours, personality, decisions and intentions of the end users towards such ICT innovations. A massive amount of research was conducted in this area with a focus on many appearing technologies such as the Internet, Information Systems, Online Banking, Electronic Commerce, Electronic Government, and Health Informatics, to name a few. However, conducting research in such area remains a hot research topic of interest due to many changing factors related to the nature of the evolving technologies and the environments where implemented. The unavailability of a standard model that fits all technologies, cultures, societies, domains and other circumstances or dynamics is also making research activities in this domain vital, mainly in developing countries (e.g., (Eid, 2011; Al-Ghaith et al., 2010; Al-Somali, 2015; Al-Qahtani, 2014; AI-khamayseh, Lawrence and Zmijewska, 2006; Alhujran, 2009; AlSoufi and Ali, 2014)).

Mobile Government is one of those recent technologies that came to enhance the performance of public services administration and management as one of the key domains for societies and nations. This innovative and modern trend enables providing governmental services for citizens, businesses, employees and other governmental agents (AI-khamayseh, Lawrence and Zmijewska, 2006; Abdelghaffar and Magdy, 2012; Alotaibi and Dmitri, 2015). Sultanate of Oman is one of the developing countries attempting to succeed and make a remarkable progress in this direction, despite costs and efforts. The eGovernment infrastructure in the Sultanate of Oman was acquired and implemented partially at earlier stage; however, with the advent of Smartphones and Mobile Computing, Applications and technologies, the Omani government started shifting into the implementation of M-Government, regardless of making services transition from eGovernment to M-Government or introducing services directly via M-Government (Al-Busaidi, 2012; Naqvi and Al-Shihi, 2009; Al-Hadidi, 2010), Figure 1.2. However, the uptake in the area of M-Government as general remains below the potential target and the services have not reached the expected adoption levels (Kuscu,

Kushchu and Yu, 2007). To succeed, M-Government developments and initiatives need to be carefully planned as it differs from the eGovernment infrastructure; i.e., what may fit, enable or disable the eGovernment infrastructure may not do so in case of the M-Government infrastructure (Antovski and Gusev, 2005). Therefore, M-Government need to be investigated within its own context, despite of other similar or close technologies.

Figure 1.2: the Transition of Public Services to Mobile Government



Recent literature related to the adoption and acceptance of new innovations revealed that the perceived risk is an important factor affecting the user's intention to use mobile devices, such as in banking, (e.g., (Chen, 2013; Martins, Oliveira and Popovic, 2014)). It has also been reported that around 83% of mobile Internet users have concerns about sharing their personal information when using mobile applications and online services; such concerns are due to risks and how they perceive risks (GSMA, 2015). The cultural factors in this regard have an effect and may play a critical game against changing and then impact on the ability to succeed, otherwise mobile-enabled services may fail (Eid, 2011; Al-Ghaith et al. 2010). As the deployment of technologies is not only for providing services and products, the development of end-user satisfaction and retention with improving quality of services also remain to be an important matter. Indeed, it has been reported that more research is needed within the cultural and social contexts of developing countries like Oman (Al-Busaidi, 2012; Naqvi and Al-Shihi, 2009; Al-Hadidi, 2010), or Saudi Arabia as a similar example (Al-maghrabi, Dennis and Halliday, 2009), rather than Western cultures. Further, Oman has been ranked culturally as quite low on individualism and high on uncertainty avoidance, and classified as a culturally distant nation, i.e., power of distance where cultural and social power remains to appear between male and female, old and young. Therefore, the findings of studies conducted in western nations may not be applicable directly to the social and cultural environment in Oman (e.g., (Peikari, 2010)). Therefore, research and investigation

focusing on technology adoption will not only need to explore the reasons for technology acceptance that eventually lead to satisfaction, but also to develop and validate a model that considers cultural and user-related issues; such factors can be used as a reference point in future research and practice to make standard procedures to assess user's intention and adoption (Eid, 2011; Al-Ghaith et al. 2010).

Earlier research efforts toward the investigation of the scientific model for the development, adoption, acceptance or implementation of M-Government initiatives mostly concentrated on the developed countries, rather than developing ones. The classification of the Omani culture is very unique in many terms, and therefore, the cultural and personality traits related concepts will also be unique such as trust, risk, power, individuality, feminine, etc.; technology users decision making process is a multidimensional process which takes into account several cultural terms such as Perception of Risk (PoR) and the characteristics of the technology (Farzianpour et al., 2014). However, the impact of culture on the technology adoption, like M-Government, remains unknown. In addition, some studies considered only the administrative part in regard to the technology adoption and success, i.e., electronic services frameworks, information security, risk perception, electronic markets, and so forth (e.g., (Wu et al., 2007)). Therefore, it has been recommended by many scholars to consider cultural, personality, security and risk related issues when conducting further research in the area of ICT adoption and success, to further understand the role of risk, personality and culture in understanding the decision making dynamics (Eid, 2011, Al-Ghaith et al., 2010; McCrae and John, 1992; Tversky and Kahneman, 1974).

Furthermore, some studies within the context of Middle East or developing countries have revealed few models and frameworks to understand and conceptualise the different issues related to the adoption and acceptance of such initiatives including: The intention of citizens to use and utilize M-Government services, general factors affecting the success of M-Government implementation, critical factors affecting the development or diffusion of mGovemment, dynamics affecting the transition of e-government into M-Government, the intention of governmental end-users and providers to adopt M-Government services, and other factors from the perspective of businesses and organizations (Alotaibi and Dmitri, 2015; Abdelghaffar and Magdy, 2012; Al-khamayseh, 2009; Al-Hadidi, 2010). However, the literature on this topic of interest revealed that there is a lack of research into the construction and validation of a

scientific model handling the challenges associated with the adoption of M-Government in developing countries, like Oman. Several studies have reported that there is no particular or comprehensive model that has been developed to investigate the factors affecting the adoption of M-Government with a specific focus on the end-user (i.e., citizens), mainly in Oman (Al-Busaidi, 2012; Al-Hadidi, 2010).

In the light of the above narrative, there are special requirements and complexities associated with the M-Government services and infrastructures such as the different types of risks, traits of the end-users, and the cultural context, mainly in countries like Oman. Obviously, more efforts using robust scientific theories then remain to be crucial and on demand to tackle and investigate the issue of M-Government adoption and success. Therefore, the current study and investigation of such gaps through the development and validation of a Mobile Government Adoption Model (MGAM) will be the focus of this research using the Technology Acceptance Model (TAM) extended to involve perception of risk, culture and personality trait of the end-users, i.e., citizens. The TAM model is much and well known in this domain and has been used and validated by many studies in other domains with success in identifying factors related to the adoption of new technologies similar to M-Government, e.g., Internet Banking, Electronic Commerce, Information Systems and others. The perception of risk factor has been identified by Behavioural theories with the support of many studies as a critical factor with a strong and deterministic impact on human Behaviours, and such concept should not be taken simplistically, rather than to be seen as a variable with a broad definition covering different types of risks and interactive to different societal levels.

The above outlook also showed that the culture factor has been reported to be important when investigating Behavioural and intentional problems within different cultural contexts, such as adoption and acceptance. Several of the above studies and as in the literature as well have reported that scientific findings of research and studies conducted in western nations may not be applicable directly into the eastern societies like the social or cultural environment in Oman. The personality trait as a moderating factor is critical when investigating the adoption and acceptance of, or resistance against, new technologies due to the fact that such factor has been reported to affect the emotions, thoughts and Behaviours of individuals, i.e., end-users. This concept also identifies the set of variations seen in an individual as Behavioural way of acting, expressing

emotions and thinking toward issues, such as new technologies or M-Government initiatives. However, there is no study, as far as this research has surveyed and examined, that has combined these variables into a single model for M-Government adoption through or with the extension of the TAM model.

In summary, and based on the above highlights, the research problem in this project can be described in terms of the following highlights:

- The ignorance of cultural variables in most of the studies conducted on the adoption and acceptance of M-Government, particularly in Oman.
- Factors and dynamics that may fit, enable or disable the eGovernment infrastructure may not do so in case of the M-Government infrastructure.
- The importance of end-user's Perception of Risk (PoR) in the area of M-Government; despite the fact that trust and security issues were taken into account earlier. The PoR is different from the issue of trust and privacy, and the PoR is different from one individual to another and from context to another.
- The classification of Omani culture as unique with reference to many terms: Trust, risk, power, individuality, feminine, etc., and; thus, the cultural related concepts as a decision making process will also be unique and should take into account risks and how an end-user perceives such risks.
- Trust, Security and Privacy remain characteristics of the technology, and this is based on the efforts and technical spending made by an organization to achieve the needed levels; while the PoR deals with the level of the end-user's belief in regard to technology-related safety because an incident may take place regardless of whether or not the tools for that case exist. Therefore, although the M-Government may use all security tools and a risk-free zone can be obtained up to some extent, end-users are still not eliminating the level of risks.
- Further research into the acceptance and adoption of M-Government in developing countries is importantly needed, and should be conducted separately from research done in developed countries. Therefore, cultural and personality issues should be considered when conducting research towards the end-user's adoption and satisfaction with the M-Government services.

1.3 Research Aim and Objectives

The aim of this study is to develop and empirically test and validate a Mobile Government Adoption Model (MGAM), a model based on the extension of Technology Acceptance Model (TAM) to integrate key factors related to the end-users or citizens defined by other theories: their perception of risk, their cultural context and their personality trait. Using the MGAM model, the user-centric factors affecting or influencing the adoption and acceptance of M-Government in Oman will be identified, tested and validated. Therefore, this study attempts to achieve the following specific research objectives:

- Conduct a comprehensive review of literature on M-Government research to highlight the complexities and crucial challenges facing the adoption and acceptance of M-Government with a focus on the success factors that may influence this initiative within the context of Oman.
- Construct a MGAM conceptual model, as the extension of TAM model that can be empirically applied to identify the user-centric factors affecting the adoption of M-Government in Oman.
- Evaluate the impact of the Omani culture on the perception of risk by the end-user; and on their attitude toward using M-Government.
- To identify the role of the perception of risk by the end-user of M-Government in influencing the perception ease of use of M-Government.
- Evaluate the impact of the end-users' perceived ease of use on their attitude toward using M-Government.
- Evaluate the impact of the perception usefulness of the end-users on their Behavioural intention and on their attitude toward using M-Government.
- Evaluate the impact of the perception usefulness of the end-users on their Behavioural intention and their attitude toward using M-Government.
- Evaluate the impact of the Behavioural intention of the end-users on their actual use of the M-Government in Oman.
- Examine the influence of personality trait of the end-users in their intention to and actual use of m-Government in Oman.
- Examine the influence of demographic variables (gender, age and education) of users in their intention to and actual use of M-Government in Oman.

1.4 Proposed Research Model

Most of the implementation efforts toward building M-Government infrastructure are done using some frameworks, inheritably from eGovernment domain; however, it is important to revise the existing frameworks and models used in the industry because most of the available frameworks or models as discussed above were developed when many of the user-centric factors to adoption were unknown yet, or not considered (i.e., culture, perception of risk and personality traits); this explains that most of the available frameworks and models do not provide clear, direct and comprehensive view of the adoption challenge and dynamics. In addition, most of the available frameworks and models as reported by the earlier literature focus on technical aspects; this indicates that these frameworks and models ignore what is known as the soft factors (again, e.g., culture, user's perception and personality traits), and ignore their impact the user's intention. Furthermore, many of the available frameworks and models have been mainly developed for the developed nations and most likely are not suitable for the developing nations such as Oman, where the social and cultural dimensions are different and unique from the developed nations. Finally, many of the reported frameworks and models did not consider the nature of the Mobile device which has a strong attachment to the personality, intention, Behaviour and identity of the end-user; this may impact on the adoption rates within the context of personality.

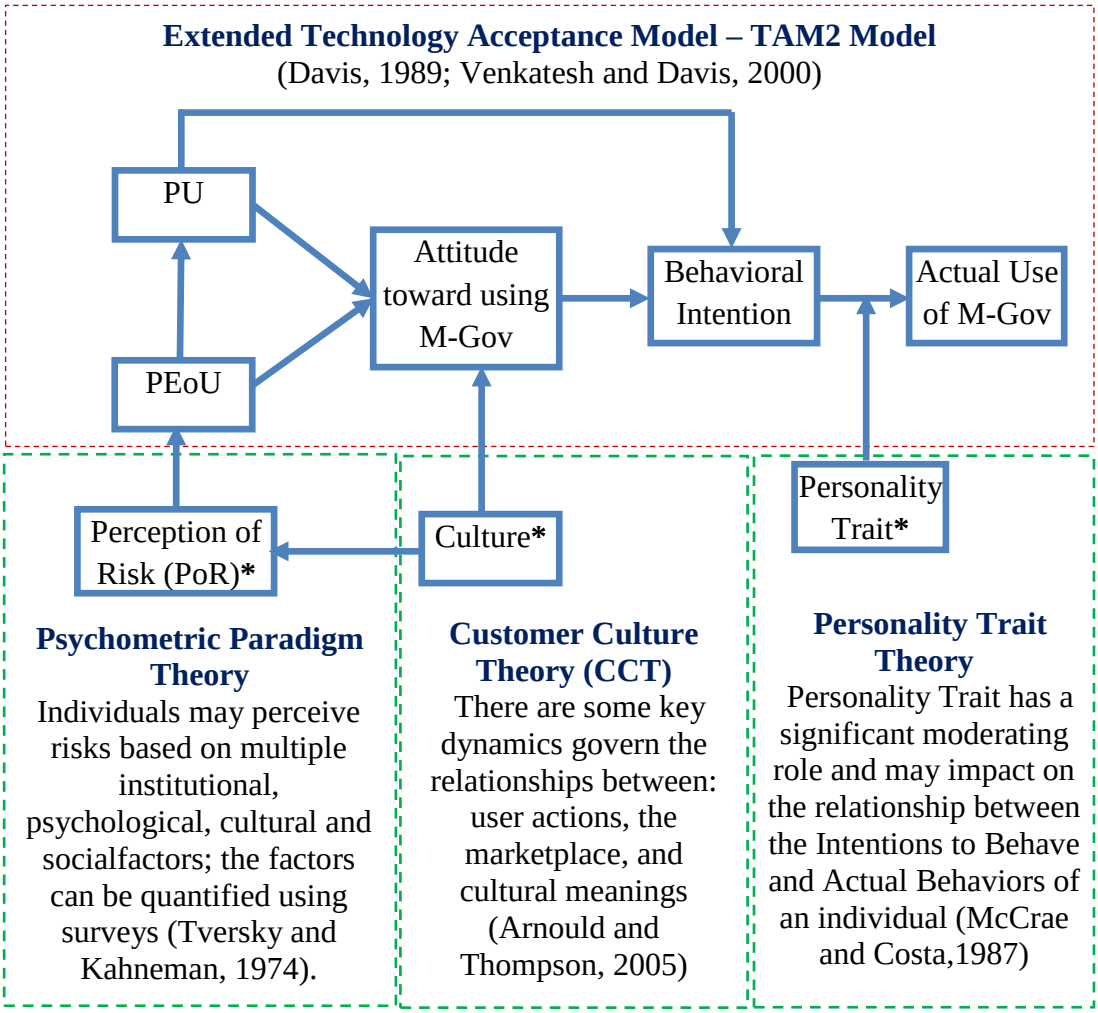
Based on the above, this research will take one step further into the user related factors affecting adoption of M-Government and will aim to investigate deeply the factors that may affect the adoption of M-Government in practice. Therefore, a theoretical framework will be developed based on the above literature. This framework engages aspects of approved scientific theories including: Technology Acceptance Model (TAM) (Davis, 1989), Customer Culture Theory (CCT) (Arnould and Thompson, 2005), Personality Traits Theory or the Five Factor Model (FFM) (McCrae and Costa, 1992), and the Psychometric Paradigm Theory (Tversky and Kahneman, 1974). The model integrates the different variables defined by those theories to understand the influences and inhibitors related to the adoption of M-Government in Oman. As explained earlier, the TAM model is very well known in this domain and has been used and validated by many studies in other similar domains with success in identifying factors related to the adoption of new technologies.

The Personality Trait Theory or the Five Factor Model implies that an individual has a trait that can be defined as habitual patterns of Behaviour, thought and emotions; such

traits are relatively stable over time, differ across individuals where some people are outgoing toward a certain issue with influenced Behaviour whereas other individuals are not. The FFM model identifies five major traits of personality: Neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. The Perception of Risk is the evaluation made by an individual with reference to the characteristics, type and severity of a risk. The judgement can be based on using one of the three approaches: the Psychometric Paradigm (based on psychometric affects, emotions, and stigma that influence the perception of risk), Anthropology or Sociology Approach (this is driven by organizational, social and cultural theories), or the Interdisciplinary Approach (known as Social Amplification of Risk Framework (SARF)) (based on using a combination of Psychology, Sociology, Anthropology, and Communications Theories). In this work, the Psychometric Paradigm Theory will be used as it is more related to the psychometric affects, emotions, and factors that make influences on the Behaviours made by an individual. To demonstrate the research model and components for this work, Figure 1.3 illustrates a model the titled: Mobile Government Adoption Model (MGAM).

The MGAM Model is different from the standard TAM Model by introducing and incorporating new variables to understand the factors affecting the adoption and acceptance of M-Government and to understand the dynamics among those variables. although many studies have reported the importance of those variables (i.e., Culture, Risk, Personality Traits), the other earlier models build based on the standard TAM Model remain lack the integration provided in this proposed MGAM Model. Chapter 2 will provide more details on the literature in this domain.

Figure 1.3: Proposed Research Model – Mobile Government Adoption Model (MGAM)



*: *New to this Project, the Conceptual Model used in this research, Author Development*

1.5 Research Questions

The earlier scanning of the literature on M-Government poses several key questions in regard to the development of a roadmap towards m-Government planning and implementation. This has prompted the following key and main research question that underpins the current study: What are the user-centric factors affecting the adoption of M-Government in Oman? To answer this main question, this research will seek the answers to the following questions:

1. What are the factors that make up the construction of a Mobile Government Adoption Model for successful implementation and adoption of M-Government in Oman?
2. To what extent can the Omani culture impact on the perception of risk acquired by the end-user of M-Government and influence their attitude toward using this technology?
3. To what extent can the perception of risk by the end-user of M-Government influence their perceived ease of use of M-Government in Oman?
4. To what extent can the end users' perceived ease of use of M-Government impact on their perceived usefulness? and on their attitude toward using M-Government in Oman?
5. To what extent can the perception usefulness of the end-users of M-Government impact on Behavioural intention and on their attitude toward using M-Government in Oman?
6. To what extent can the Behavioural intention of the end-users of M-Government impact on their actual use of the M-Government in Oman?
7. To what extent can the personality trait be a moderating factor with impact on the relationship between the Behavioural intention of the end-users of M-Government and their actual use of the M-Government in Oman?
8. To what extent can the demographic variables of the end-users of M-Government in Oman (including, gender, age and education) impact on the factors that are the constituents of a Mobile Government Adoption Model in Oman?

1.6 Research Hypothesis

The hypotheses in this project are developed based on the argument presented within the Mobile Government Adoption Model as illustrated earlier, i.e., the proposed research theoretical framework. The key issue here is that several factors related to the end-user may influence or affect the adoption of M-Government in Oman. Therefore, this work will try to investigate the validity of the following hypotheses:

- ***H1***: Perceived ease of use of M-Government among the Omani users will have a positive association with the perceived usefulness of M-Government, and will positively influence their attitude toward M-Government in Oman.
- ***H2***: Perceived usefulness of M-Government among the Omani end-users will have a positive association with their Behavioural intention, and will positively influence their attitude toward using M-Government in Oman.
- ***H3***: The perception of risk acquired by the end-user will have a positive association with their perceived ease of use of M-Government in Oman.
- ***H4***:The Omani culture and its impact on the end-user of M-Government will have a positive association with the perception of risk acquisition; and will positively influence users' attitude toward using M-Government in Oman.
- ***H5***: The Behavioural intention of the end-users of M-Government will positively influence their actual use of M-Government in Oman.
- ***H6***: The personality trait of the end-users of M-Government will be a moderating factor with a positive impact on the relationship between the Behavioural intention and their actual use of M-Government in Oman.
- ***H7***: Some of the demographic variables of the end-users of M-Government in Oman (including, gender, age and education) will positively impact on the factors that constitute a Mobile Government Adoption Model in Oman.

1.7 Research Contributions

The building blocks and components of any given theoretical development should identify four key components: The factors logically describing the topic under investigation (i.e., **what**), the causalities describing the relationships among those factors (i.e., **how**), and the dynamics justifying a selection of factors and their proposed casual relationships (i.e., **why**). These provide the essential ingredients of the theoretical development, i.e., description and explanation. The fourth component of such development is related to the research context in terms of place, time and population, where the research is conducted (Whetten, 1989).Yet, the added value and key contribution of theory development may not totally generate a new theory from scratch, as in this research project. Instead, the process may improve the construction or structure of theories that already exist; add or subtract factors from an existing theoretical model (i.e., a new list of what(s)), a part of this work applied to TAM Model; and/or identify the value of the proposed changes in the causalities and

dynamics between the factors through integrating set of theories (i.e., a new form of How(s) and Why(s)), a part of this work applied to integrating theories to develop the MGAM (Whetten, 1989).

The study will also support the theoretical basis in the actual development of an extended model, i.e., MGAM, incorporating perceived risks, culture and personality traits as a moderating factor, as a third step. By providing evidences on the evaluation of the MGAM as an extended model using standard data collection and analysis methods, this work makes key theoretical contribution to the available literature. Furthermore, an expected practical contribution of this study from a research perspective is embedded in designing a new questionnaire that can be used or adopted by this study for data collection within the Omani context. In addition, another key contribution of this work will be the inclusion and development of key questions related to the Omani culture and society in regard to how they perceive usefulness and ease of use the technology. Yet, the research contributions in particular to theory development, practical knowledge and research methodology in the following sections.

1.7.1 Contributions to Theory Development

The value-added contribution to the process of theory development in this research attempts to demonstrate what factors can describe the end-user adoption in the area of M-Government in Oman, and what factors may demonstrate the end-user's Behavioural intention towards M-Government and actual use of this technology. Those factors as new components may list and provide novel theoretical insights toward our understanding of the phenomena, i.e., M-Government adoption in Oman.

Another theoretical contribution in this work is the new causalities and dynamics among those newly listed factors and variables. The study here thus attempts to demonstrate the key factors describing the adoption and acceptance of M-Government by the Omani end-user; consequently identifying the pre-requisite to achieving satisfaction with the use of M-Government services as a new critical domain with high costs and efforts. Thus, the study attempts to argue that the M-Government adoption in turn can be achieved through taking into account a new set of crucial factors, and the casual associations among those factors. In other words, the study attempts to identify the

factors making the constitution of the MGAM (i.e., **what**), the causalities describing the relationships among those factors (i.e., **how**), and the dynamics of the casual relationships among the factors (i.e., **why**).

Indeed, by using the TAM model, the perceived usefulness and the perceived ease of use can be seen as factors influencing the attitudes of the end-users towards using the M-Government, as a first step. This attitude then is a motive driving the Behavioural intention towards the actual use of the M-Government technology as a second step, i.e., ensuring the actual use of M-Government services. Accordingly, and based on using the theory building model (involving What, How, Why, and Who, Where and When) (Whetten, 1989), this study bridges a gap in theory in the following terms:

- Extends the TAM model to involve the end-user perception of risk and culture as new factors, i.e., ***why***, they have been reported by the literature
- Extends the TAM model to involve the impact of end-user perception of risk on perceived ease of use of M-Government, i.e., ***how***, risks may hinder the easiness of M-Government services and use.
- Added-value by involving the impact of end-user culture on the perception of risk associated with the M-Government, i.e., ***how***, culture may develop a positive or negative perception of risk.
- The application of this research and testing the proposed model within the Omani culture as a unique context, i.e., ***where***.
- The application of this research and testing the proposed model to compare the findings related to other samples from literature, i.e., ***what***.
- The application of this research and testing the proposed model in a highly evolving period of Smart and Internet technologies, i.e., ***when***, the future will witness further evolution of the mobile technologies.

1.7.2 Contributions to Practical Knowledge

There will be several issues to which this study adds value and contributes significantly to knowledge. Firstly, the use and deployment of multiple or mixture of different research methodologies to answer the research questions, as planned. The study attempts to identify the key prerequisites for the adoption and actual use of technology in the area of public services administration, and then consequently revealing the

strengths and weaknesses related to the M-Government success in Oman. It was imperative for this study to use and apply different statistical tests and methods to clarify and understand how the Omani end-users make decisions toward M-Government, and how they develop a positive attitude then intention for using this modern, new and novel infrastructure.

It is known that the perception of new technology includes the usefulness, usage and, even the repeated use of such technology; and those dimensions are determined by the user's experiences, cultural influences, knowledge, beliefs, attitudes and learning. Consequently, this study contributes to examining end-user adoption of M-Government from different angles and perspectives. Here, the work will extend the context of similar investigations or studies of this kind, like in Jordan, UAE, KSA, USA, UK or Malaysia into the Omani context. This may explain that technological solutions from western and foreign cultures may not be simply adopted or borrowed to be implemented in the Omani context and marketplace. Although a technology could be used at international levels (like Online Banking, e-Government, Online Booking Systems and others), the successful adoption of such technologies may vary from one cultural context to another, or from one country to another, and even among the different personality traits.

1.7.3 Contributions to Research Methodology

This research makes a significant shift from the simple view on technology acceptance and adoption using the TAM model which has dominated the research on emerging technology adoption. Through the inclusion of new variables, this research signifies the need to move beyond the simple view and identification of factors affecting the adoption of M-Government in particular. For example, the inclusion of personality traits of the research participants' synergies the TAM model domain with the social science, and the inclusion of culture factor makes an interdisciplinary paradigm between the technology and humanity sciences. The data collection tool developed in this study is also another novel methodological contribution provided in this study. This data collection tool, i.e., Mobile Government Adoption Questionnaire, can be used by other researchers directly, or with slight change and adjustment, to collect data on the same research problem under investigation from other countries sharing with Oman the same environment and culture.

1.8 Research Significance and Implications

There is a clear and high potential of M-Government initiatives as confirmed by the reported literature, and this has motivated this work. Conducting research toward M-Government can also be seen as an important topic as it investigates a new trend of already highly investigated eGovernment. Research gaps in the existing M-Government literature and related studies were well reported; warrant for further studies in this newly evolving field. Therefore, this research is significant in terms of the emerging importance of M-Government, and a study around this technology is an evident research topic. The overall aim of this study is to identify the factors that constitute MGAM, as defined by TAM model, the perception of risks, culture and personality traits, and consequently how those factors influence the adoption of M-Government. Thus, this research aims to provide a practical framework which the public services administrators (i.e., M-Government providers) can deploy and consider for improving the M-Government success in Oman, and even other similar cultural contexts.

In addition, although some earlier studies have been conducted toward understanding the factors that impact on the adoption of M-Government in a number of countries in the region and worldwide, there was no study conducted yet in the cultural context of Oman, and there was no study that considers the personality traits in this domain. Therefore, this investigation is crucial at both the academic and government levels as it attempts to contribute to theories and knowledge in the area of M-Government design, implementation, deployment and success. While identification of factors that work as barriers or motives to the adoption of M-Governmentis a valuable starting point, an actual benefit of this work is also to tie together the issues related to both the service providers (i.e., Omani Government) and the end-users. This will make it possible to eliminate any conflicts which may arise due to the differences in the perceptions of the service provider and end-users. For example, while the end-user would demand a very high level of risk-free solutions, the service providers will have to consider the economic cost-benefits of such measures.

Ultimately, the expected findings and conclusions of this work may also benefit many other governments because the acquisition of M-Government technologies is unavoidable and the demand in this direction will only continue to increase. Along with the different government agencies, M-Government serves many other stakeholders

including citizens, employees and business. For example, there is a need for the just-in-time flow of public and private data and information, and conducting services and transactions on an hourly or daily basis in quick, secure, reliable, accountable and transparent manners. Therefore, the conclusions will be of interest to many stakeholders when make input and contribute to the successful adoption of M-Government; this modern technology will bring new forms of revenue, mainly for the governments, as well as to other stakeholders including mobile operators, third-party systems providers, and mobile device manufacturers.

1.9 Dissertation Structure

This dissertation comprises of seven chapters. This introductory Chapter one provides brief background on the research topic under investigation, and details on the research problem, questions and hypotheses. The Chapter also introduces the proposed research model, entitled Mobile Government Adoption Model (MGAM). The Chapter finally provides discussions on the anticipated research contributions and the research significance and implications.

Chapter two provides a review of literature on the M-Government as a topic of interest in this study. The Chapter reviews the use of ICT for public affairs and administration with focus on e-Government and Smart Government, known also as M-Government. the Chapter reviews and discusses the transition from e-Government into M-Government, and the requirements for such transition with the benefits and value and success factors of M-Government. The Chapter then discusses and analyses the challenges and adoption needs for the M-Government, and provides some examples of M-Government initiatives in developed and developing countries. The Chapter finally provides an analysis on the M-Government initiatives in Oman in terms of infrastructure, earlier e-Government initiative, cultural aspects, types of services and then challenges facing M-Government adoption, particularly in Oman.

Chapter three provides a comprehensive analysis and discussions on the theoretical framework development with focus on the theories supporting this study. The Chapter provides detailed review and analysis on the different user-centred models and theories regarding the adoption and acceptance technologies, particularly the M-Government. The different aspects and factors affecting the M-Government adoption are discussed in

this Chapter to introduce a foundation for the development of the theoretical research model, i.e., MGAM. The Chapter finally introduces the hypotheses development and key concluding remarks.

Chapter four provides details on the research paradigms and methodology adopted in this research. The Chapter presents the data collection instrument (i.e., survey) development, validation and reliability. The Chapter then presents details on the approach and methods for data collection, the study population and sampling selection, and data analysis. The Chapter finally discusses the issues of research quality in terms of normality, trustworthiness, and ethical issues.

Chapter five presents the descriptive data analysis and the research results of this study with discussions on those results. The Chapter describes the issues of missing values, outliers and normality. The Chapter then presents detailed descriptive analysis of the research participants' characteristics, the use of new technologies and M-Government in Oman, and the demographics of the sample. The Chapter then provides descriptive statistics of the main components or research model constructs along with their items. The Chapter finally provides detailed discussions on the statistical results related to the proposed MGAM model with the scientific implications.

Chapter six presents the descriptive analysis of the MGAM model with detailed discussions on the model assessment and validation. The Chapter provides the statistical results of EFA, CFA and the SEM for the research hypotheses testing. The Chapter provides analysis and discussions on the moderating variable with multi-group analysis. The Chapter finally provides discussions on the factors comprising the MGAM model with scientific implications of the model, and introduces crucial recommendations for future practices.

Chapter seven provides conclusions on this study. The Chapter summarizes the main findings and research results. The Chapter finally describes the limitations of the study and then concludes this research project.

Chapter 2
Literature Review

This chapter provides a review of literature on the concept of mobile government, its benefits, the challenges it faces and the adoption of this concept by the governments. This chapter discusses also the ICT adoption and the mobile initiatives that the governments have used to deliver its services to the citizens. The status of e-government and m-government will be reviewed in the developing and developed countries to come up with the factors that mostly influence the implementation of mobile government in such countries. Finally, the status of mobile government and ICT initiatives on Oman is discussed in the cultural and demographic Omani context.

2.1. Introduction

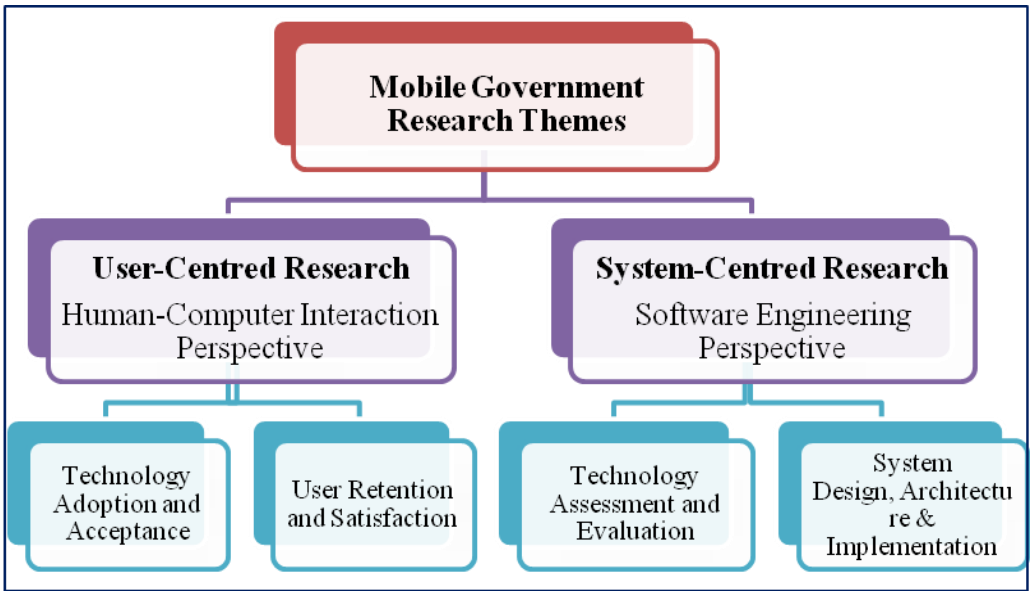
The diffusion and initiatives of Mobile Government (i.e., M-Government) are not considered as a recent trend anymore; it is recognized as a worldwide phenomenon. The predictable technological infrastructures related to the initiatives of M-Government are intended to offer employees, businesses, citizens as well as other government agents more well-organized managerial services in a more suitable way (Bhattacharya and Goswami, 2011). The services provided by the infrastructure of M-Government are predicted to be accessible and available at any time anywhere whilst utilizing connected smart devices. Previous literature and studies on M-Government in recent years propose that the M-Government initiatives have been in growth in numerous countries and consequently, further developmental, technological, managerial and practical efforts are required in order to offer m-government services with optimal user's quality (Bataineh, Abu-Shanab and Jdaitawi, 2009; Sultana, Ahlan and Habibullah, 2016).

In an attempt to utilize and advance the services provided by the Electronic Government infrastructures as well as enlarge the customer channels, the systems of M-Government are being put in place in several countries like EU, UK, US and GCC Countries (involving Oman), etc. Sweden for instance as one of the most important countries in this area has tried the m-Government's usage as well as its applications in various useful business areas (Kushchu and Kuscu, 2005; Almuraqab and Jasimuddin, 2016); Canada also is engaged with an M-Government initiative concentrating on wireless services and portal (Kim et al., 2004).

In the United states, local and federal governments have taken the guide with more concentration on mobile and wireless technologies to improve applications intended for community safety as well as respond to emergencies using the mobile applications for the information sharing between workers, maintenance of network communications, staff monitoring and governmental agents (GOL-IN, 2002).Certainly, a great number of previous studies with a great number of researches have been performed in the domains of M-Government and E-Government(e.g., Ntaliani, Costopoulou and Karetsos, 2008; Rossel, Finger and Misuraca, 2006; El-Kiki, Lawrence and Steele, 2005;Al-Khamayseh and Lawrence, 2006).

However, research trends throughout the recent years that relate to the information and communication technologies (ICT) areas (involving the disciplines of Mobile Government, Electronic Government, Internet Banking, Electronic Commerce, Information Systems etc.) could be categorized in term of research questions 'type, theoretical frameworks and models, research methods and research themes (Case, 2012; Bates 2004;Wilson, 2009). The two major themes of research as indicated in the literature involve: (i) User-centred research (this means Human-Computer Interaction perspective or Behavioural point of view) with more concentration on the two major streams, which are user retention and satisfaction as well as technology adoption and acceptance (e.g., Organization for Economic Co-operation and Development, 2011; Suh et al., 2016);(ii) system-centred research (this means Software or developmental Engineering perspective) with more concentration on two major streams: System implementation , architecture and design and technology evaluation and assessment (e.g., Schware, 2005; United Nations, 2014); Figure 2.1 shows the two streams of research with interest in this domain.

Figure 2.1: Research Themes in the M-Government Domains



(Source: (Bates, 2004; Wilson, 2009))

One of the most significant and strategic goals of any M-Government initiative is for making credible, satisfactory, accountable, reliable, sustainable and transparent interactions with individuals, i.e. end users involving governmental officers, employees, businessmen and individuals. In this context, the interaction is for the purpose of offering a simple service with enhanced access to transactions, information and data for the concerned parties, the adoption and acceptance of recent technologies will be an important player to achieve the decisive goals of the technology improvement while ignoring the recent technology will contribute in failing of these goals(Al-Hujran et al., 2015:155).Consequently, in this user-centred research, the concentration will be on the M-Government's adoption as a recent technology, more willingly than the software engineering viewpoint. In support, it has been indicated by recognized scholars (Case, 2002; Bates, 2004) that:

> *"...although the nature of information may change, and the context of information use may change, I see no end to the need to explore, partly for theoretical reasons, but increasingly for policy reasons, how people discover, access, use, store for future use, share and disseminate information of all kinds", Wilson, 2009, p. 32.*

> *"...investigations begin to branch out beyond the focus on formal channels and task-oriented needs. The emphasis shifted away from the structured "information system" and toward the person as finder, creator, and user of information", Case, 2002, p.6.*

> *"...the beginning of a modern user-centred orientation to information-seeking research. I have long been puzzled by this apparent blanking out of the rich body of information Behavior research by Paisley and many other excellent researchers...", Bates, 2004, p. 692.*

Within this Chapter, an inclusive reviews on M-Government the same as a recent occurrence from various viewpoints, involving several domains such as challenges, available opportunities, applications etc. in this chapter, A major section will concentrate on the initiatives of M-Government in Oman, as a case study of this project. In brief, the subsequent section will discover the Public Administration (PA) domain at the same time as a particular area for the deployment and utilization of M-Government tools and applications. In relation to the theories utilized for framing and modelling the M-Government success, acceptance and adaptation will be discussed in chapter 3 on the Research Theoretical Framework.

2.2. ICT for Public Administration

The innovation procedure of the public administration is intending to change the management toward support of its capabilities as well as making the government extra accountable and efficient. Also, the innovation is effecting the public management improvement, organization of the conditions for implementing public policies, deficiency endorsement and reduction of the economic growth. Consequently, the state role is becoming extra as "service" before "power". The development of ICT effects the citizen adaptation of the governmental services by improvement of the service delivery and communication. The aim for improving the relationship between citizens and government is an important element of the present advances toward electronic government. During building confidence within government as well as better public policies, the government's legitimacy is getting enhanced and the transparency will be higher (Batalli, 2015).

2.2.1. Electronic Government Stage

Digital government and E-Government are terms employed for describing the function of information and communication technologies (ICTs) for improving public services and increasing citizen participation in democratic government (Meijer et al., 2012). Public authorities and public administration have a most important role to play in triggering innovation with the use as well as integration of ICT. This, with the fact that the public sector is forced for innovating when it does not own the opportunity of selecting or choosing its customers (Archmannand Iglesias, 2010).

From the point of view of the public management, active evaluations of e-Government help public managers with making sound policy options in addition to understanding the realistic opportunities and challenges e-Government brings (Gatman, 2011). Electronic government includes every government activity and role, shaped by information and communications technologies (ICTs). Going well further than analogies to e-commerce, it includes the 4 domains of governance in addition to public administration: The state's social and economic programs; its interior operations as well as its association with the global environment, its relations with the rule of law and the citizen (e-democracy).

E-government is building on 3 evolving forces: The government itself, technology and management concepts. It has given increase to a number of phenomena which are redefining the public part environment, counting the International Institute of Administrative Sciences. 4 aspects of e-government have permanent effects on public administration: Information like a public resource, citizen-cantered service, management and accountability models and new working and skills relationships. The difficulties of e-government are still more sensitive in developing countries, even though it also offers solutions. The public administration within every country is requiring new thinking plus leadership for ensuring that e-government is realizing its full potential (Brown, 2005).

2.2.2. Smart Government Stage

The governments begin taking the e-government concept to a novel level through realising the data power they hold for improving their services, enabling an integrated, faultless service experience, engaging with citizens, expanding policies in addition to implementing solutions for the well-being of the community as well as transforming

themselves to a ‘smart government’. The appearance of big data analytics, social media, mash up technologies and mobile apps is allowing citizens for connecting with government using new and innovative ways (Harsh and Ichalkaranje, 2015).

The smart public government concept has now recently appeared within the scientific literature. Generally this concept has been practical for emphasizing the development and application of information as well as communication technologies within the public sector. Smart government is enabling a social system in addition to its subjects for operating effectively in a quickly changing as well as complex environment sensibly utilizing its external and internal resources, making adequate/pragmatic plus advanced decisions related to the exact circumstances so as to create shared value (Gaulė, 2014; Gaulė et al., 2014).

ICTs change quickly, and governments have to keep up to date with those alterations. Increasingly, businesses and citizens are using the mobile technology for example smartphones in addition to tablets for interacting through digital government (Davies, 2015).As offering novel opportunities for looking at how technology is able to offer functionality for example location-based services, the mobile computing will need on-going and new investments for exploiting mobile applications as well as ensuring that services are being distributed in an effectual manner for every type of devices (Janssen, Charalabidis and Zuiderwijk, 2012).

2.3. Mobile Government Initiatives

This section will provide a discussion about the initiatives of mobile government as well as its emergence and evolvements besides the challenges it faces and success factors. Moreover, this section will discuss the mobile development as the main aspect in mobile government concept. Mobile Government is recognized as a particular kind of strategies; this strategy contains the use of each type of mobile and wireless technology, devices, applications and services for enhancing the advantages concerning the parties contained within all the Government units as well as businesses, citizens (Kushchu, 2007, p.3). Thinking deeply about this definition, it is noticed that it contains the core elements of ICT; for instance, the mobile network, which is the infrastructure on which services offered by m-Government, are delivered. Moreover, Moon depicts m-Government as the effort of government to offer services and information for non-profit organizations, business, citizens and public employees depending on the mobile devices

and wireless communication networks such as cellular phones, PDAs, and pagers in addition to their supporting system (Moon, 2004).

It is demonstrated that there are debates about whether there are considerable differences between m-Government and e-Government. many scholars demonstrated that m-Government includes e-Government and this means that e-Government and m-Government do not consider separate units; e-Government involves the use of each technology for the purpose of delivering services to individuals and for enhancing the governments' activities, while m-Government is considered as a part of e-Government that is restricted to the usage of mobile technologies(e.g. wireless networks in delivering services, Bluetooth, Wireless Fidelity (Wi-Fi) enabled devices which are known as (Wi-Fi) enabled devices, Personal Digital Assistance (PDAs) and mobile phones, known also as Smartphones) (Kushchu, 2007).

Moreover, m-Government is recognized as a choice compared with e-Government in delivering public information and services to individuals; this is related to the reason that it is available anytime anywhere through any internet connected device (Lallana, 2008). M-Government is considered as a part of e-Government that permits it to offer mobile services. M-Government mostly deals with mobility in the context that concerns the delivery of mobile services. In addition, e-Government is known as the information and Communication Technology (ICT)'s applications through the agencies of government with the purpose of developing services or information delivery to the individuals. It offers services to the individuals depending on wired network like fixed telephones and internet. Nowadays, the internet has become the most effective and cheapest channel, which is being used through governments for the purpose of delivering information and communication services to the individuals. Nonetheless, for making the usage of a particular kind of government service (for example, exam notification) resources like an internet connection, a telephone and a computer are needed that may be obtainable by individuals. But, the existence of advanced technologies such as wireless mobile communication is significantly pushing governments for exploiting technology for delivering its services to the individuals anytime and anywhere with optimal user's satisfaction. Additionally, because of the development of broad wireless coverage in remote and rural areas the mobile phones' penetration in the developing countries is way higher than landline (Kushchu, 2007).

To be familiar with mobile government, the first step that should be taken is defining the term “mobile” and illustrating the differences between the wireless devices and the mobile ones since both of these terms are frequently confused in the mobility world, and in several cases, they are utilized interchangeably, although they are considered two different things. Mobile demonstrates to being moved or have the ability of moving. It is indicated that a mobile device is one that is moveable or has the ability of being carried by a person while satisfying the needs of communication (Lee, Tan and Trimi, 2006). On the contrary, a wireless device is known as a device with no wires, even if it is recognized as a desktop computer linked to the Internet depending on a wireless router. Based on what is previously mentioned, it is obvious that approximately every mobile device is wireless; nonetheless, wireless devices possibly will not always be mobile (Chang and Kannan, 2003).

The term “mobile” in mobile government indicates the presence of two elements, the first one is the users’ mobility and the second one is the technologies’ mobility such as handheld wireless and mobile devices (Hassan, Jaber and Hamdan, 2009).A mobile device is recognized as the one that can be carried by the persons as satisfying the needs of communication (Lee, Tan and Trimi, 2006). The following represents mobile devices (Sheng and Trimi, 2008):

- **Tablet PC**: It is mostly known as a one screen, in which the consumer has the ability to use a stylus to write on the tablet instead of writing on the conventional keyboards utilized in laptops. This device is similar to a laptop computer since it frequently carries an adequate hard drive, a wireless network card and memory.
- **Personal Digital Assistant**: A Personal Digital Assistant (PDA) is recognized as a small handheld device which has several functions such as a tablet PC or a laptop computer. PDA devices are frequently having the following characteristics: The ability to download further applications calendars, Wi-Fi, and to-do lists.
- **Smartphone:** A Smartphone is a group of a PDA and a cellular phone that links typical phone features by means of computer functionality. Smart phones frequently have the following characteristics: Voice-dialling, camera, calendars, email, Wi-Fi access and GPS. Moreover, distinctive new Smartphones permit the user to personalize the device and download further applications. Several

Smartphones have the ability to perform as a modem for the laptop computers, offering a lofty-speed Internet connection (Kroski, 2008).

- **Laptop computers:** A laptop computer is recognized as the most widespread kind of mobile computer device, since a laptop computer is known as a one-piece device, which is having the ability to handle any task generally performed by a desktop computer.
- **Notebook computers:** have several functions like laptops; however, they are sleeker and smaller, and functionality restricted to essential Internet browsing and computer programs.

2.4. The Classification of Mobile Government

Several researchers attempted to set up various classifications for the government services of the mobile. This section depicts the most significant approaches of classification and proposes a recent scheme or taxonomy of classification.

2.4.1. Transaction-Based Classification

There are researchers who categorized the mobile services depending on the kind of transaction carried out (Trimi and Sheng, 2008; Hassan, Jaber and Hamdan, 2009). M-Government is categorized into three different classes (Trimi and Sheng, 2008):

- **Informational**: it is recognized as one-way transmission wherever government sends broadcasting, notifications or alerts to the users by emails or SMS (Push services). The Informational functions are accomplished through updating and publishing information as well as sending alerts via the SMS services.
- **Transactional:** it is recognized as two-way transmission of information from the users to the government and vice versa, where the users are having the ability to contact and interact with the systems of m-Government like payments and online procurement (Pull services). The Transactional functions are permitted to carry out transactions depending on the mobile portal.
- **Operational**: where each internal operation of government happens through enabling the government employees to access the demanded information from remote places through their mobile devices. The Operational functions are usually indicated to the internal operations of government.

2.4.2. Web and Non-Web Based Classification

Mobile government is categorized into non-web-based mobile government and web-based mobile government. The services of Non web-based M-Government are recognized as the services of M-Government, which do not demand any kind of internet connection and mostly involve Short Message Service (SMS). The services of Web-based M-Government are known as the services of M-Government that have the ability to be accessed throughout the World Wide Web (Misra, 2011).

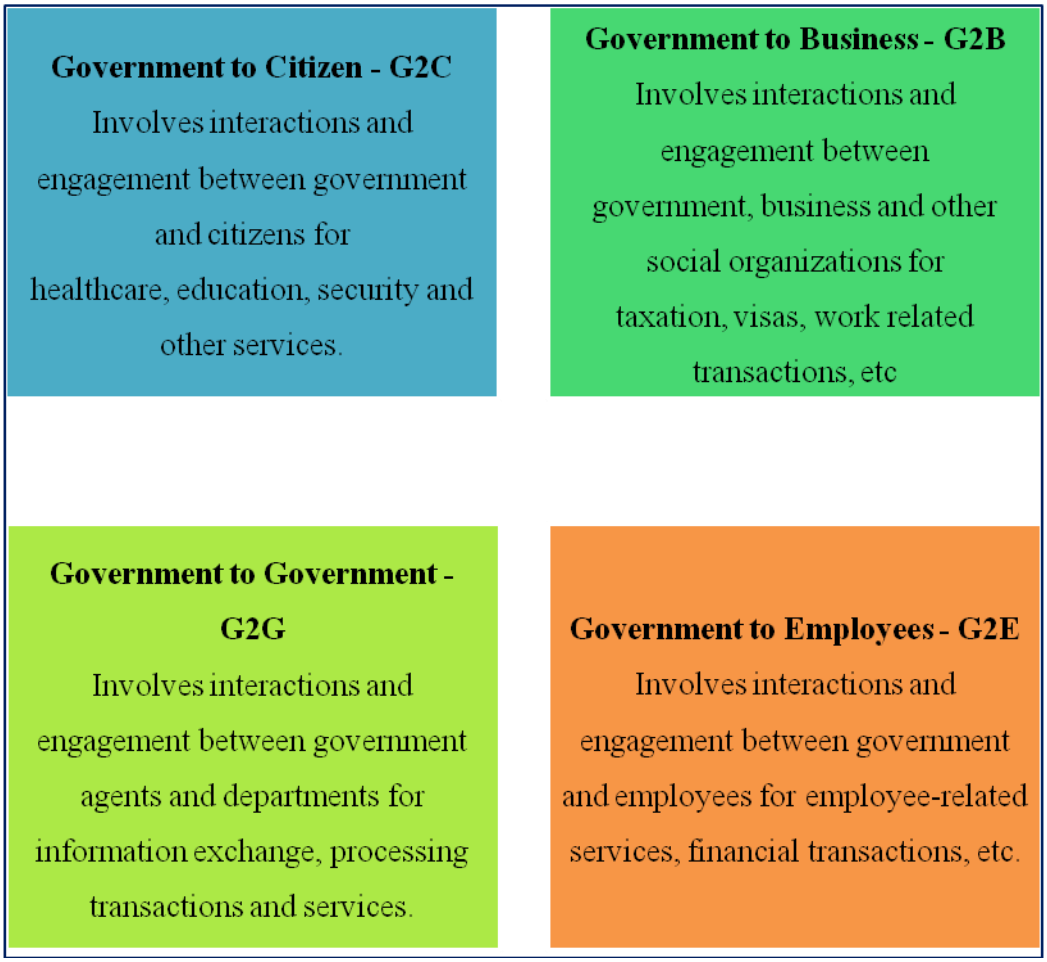
2.4.3. Direction of Service Based Classification

The services of mobile government are categorized into two major groups, which are pull and push services. Pull services are defined as the services which require the public sector in order to be active in responding and initiating services. Push services are defined as passive in the nature services (Naqvi and Al-Shihi, 2009).

2.4.4. Parties-Based Classification

The most improved level which is being run internationally is mobile Government to the individuals (mG2C) (Ntaliani, Costopoulou and Karetsos 2008). As mentioned earlier, the scope of this project therefore will be to investigate using this technology from the citizens' perspective, i.e., mobile Government to Citizen (mG2C). The business users, employee and governmental users are outside the scope of this study. Heeks and Lallana (2004) argue that, in addition to improving the delivery of information and services to citizens, the applications of m-Government may increase the productivity and effectiveness of public users and service providers. Nevertheless, m-Government were classified based on parties into four categories (Sheng and Trimi, 2008), see Figure 2.2.

Figure 2.2: Parties-Based Classification of M-Government

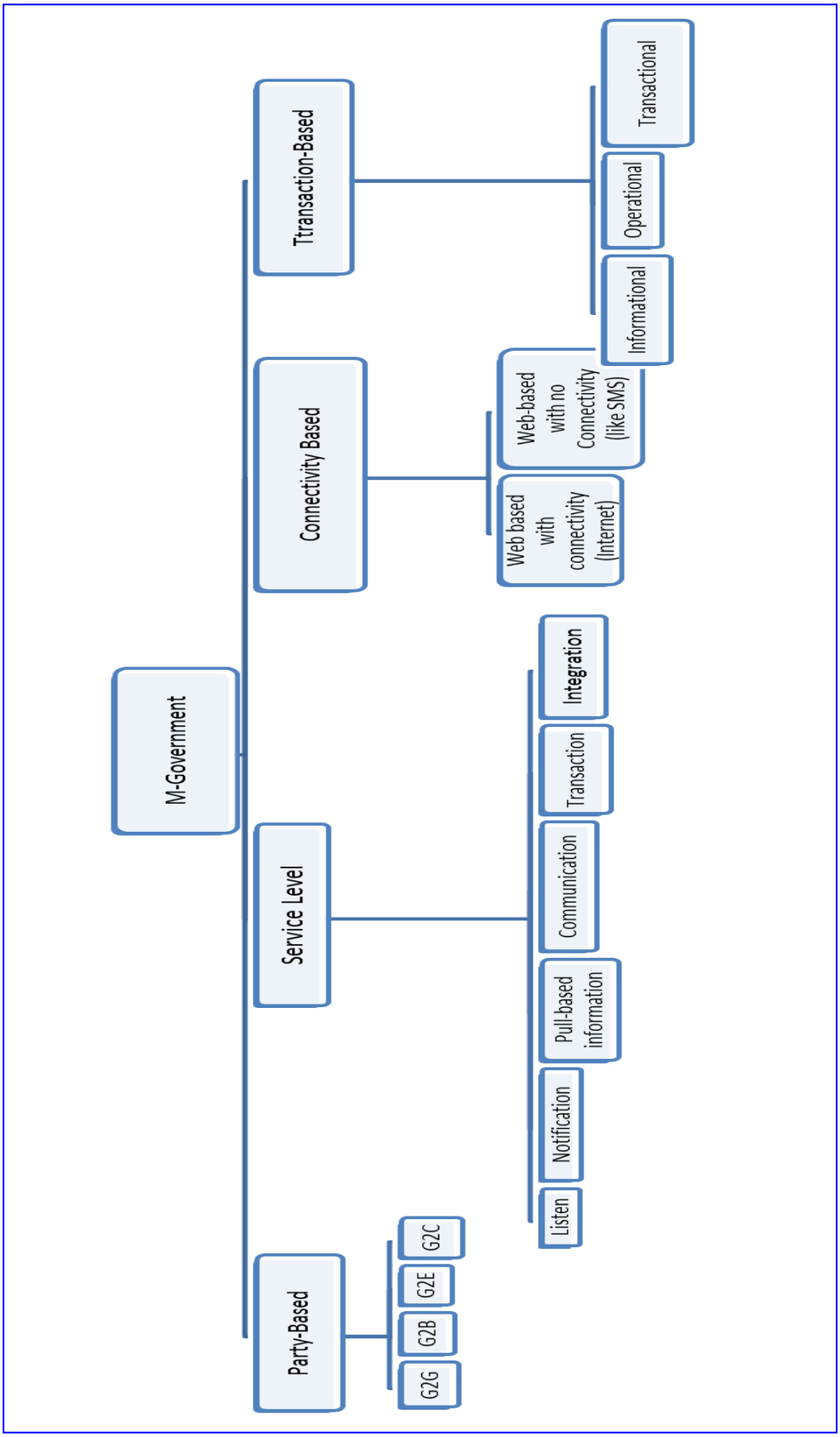


(Source: (Sheng and Trimi, 2008))

2.4.5. Level of Service Based Classification

Rannu, Saksing and Mahlakõiv (2010) proposed a classification model for SMS services based on the level of service. The model was built based on the existing service offering and not the direction of the services evolution. The model classifies SMS serviced into six levels based on the service offerings: listen, notification, pull-based information, communication, transaction, and integration. Based on the reported classifications as in the above literature, a Taxonomy of M-Government can be illustrated as in Figure 2.3.

Figure 2.3: Taxonomy of M-Government Classification



(Source: Author's development)

2.5. Transition from Electronic into M-Government

Mobile and electronic terms have many definitions. Through this section, several definitions utilized for them will be listed. Moreover, this section outlines the debates of researchers on the relationships between these terms and sums up through proposing a new definition for mobile and electronic government.

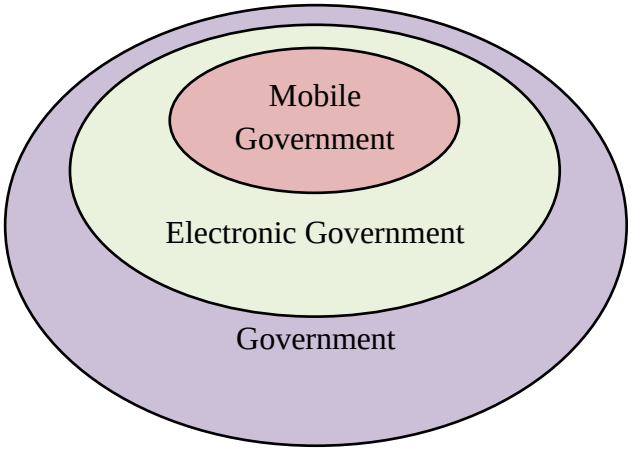
E-Government is defined as the usage of internet technology, which is wired through the organizations of public-sector to deliver their services in the best way as well as enhance their competence (Sheng and Trimi, 2008: 54). It is also defined as the delivery of public service involving transactions on the mobile devices like PDAs, pagers and mobile phones (Misra, 2011). Moreover, it is defined as the permanent optimization of governance, constituency participation and service delivery through new media, Internet and technology (Gouscos, Drossos and Marias, 2005: 221).

M-Government is recognized as the usage of mobile technologies by the government in order to deliver information and services to the individuals (Keoduangsine and Goodwin, 2009). M-Government is defined as the strategy as well as its implementation containing the employment of each kind of mobile and wireless technology for the purpose of enhancing benefits to the stakeholders of E-Government, involving government units, businesses and citizens (Kushchu and Kuscu, 2003).

It is the way that offers a recent channel of the delivery of service as well as addresses the government's mobility, whereby governments are supposed to bring context-aware, localized and personalized services to the individuals. M-Government is known as a recent tool for the governments that provide a combination of complex strategies to enhance the competence of conventional tasks of government since it strongly contributes to enabling the establishment of a good relationship between the citizens and government (Kiki and Lawrence, 2006). Mobile government is recognized as reinforcing the traditional claims of electronic government of offering more open, effective and efficient government through permitting for more participation, affordability, access and transparency (Rossel, Finger and Misuraca, 2006).

It is indicated that there are many theories that concern studying the relationship between M-Government and E-Government, and whether the former is a replacement of the latter or just an enhancement to it (Waema and Musyoka, 2009).M-Government is recognized as value-added to E-Government since it provides several advantages (Sheng and Trimi, 2008; Mengistu, Zo and Rho, 2009). M-Government is not considered as a replacement to E-Government; however, it is considered a complement to the latter (Kushchu and Kuscu, 2003). Moreover, to support these views, M-Government is known as a division of E-Government, as demonstrated in figure 2.4 (Lallana, 2004).

Figure 2.4: M-Government and eGovernment Relation



(Source: (Lallana, 2004))

Mobile Government (m-Government) is possibly displayed as a significant part of eGovernment. It is indicated to the usage of wireless and mobile communication technology in the administration of government as well as in its delivery of information and services to the firms and citizens (Östberg, 2003).On the other hand, M-Government is not supposed to be displayed as a recent kind of government, rather relatively a recent government's tool. Internet technologies and Mobile communications are having the ability to access the recent eGovernment services at any time and place. For determining the failure and success factors of any service concerning M-Government, service engineering is supposed to deal with the individuals' requirements as well as the contradictory concerns of specific roles of contained government officials (Albayrak et al., 2003).

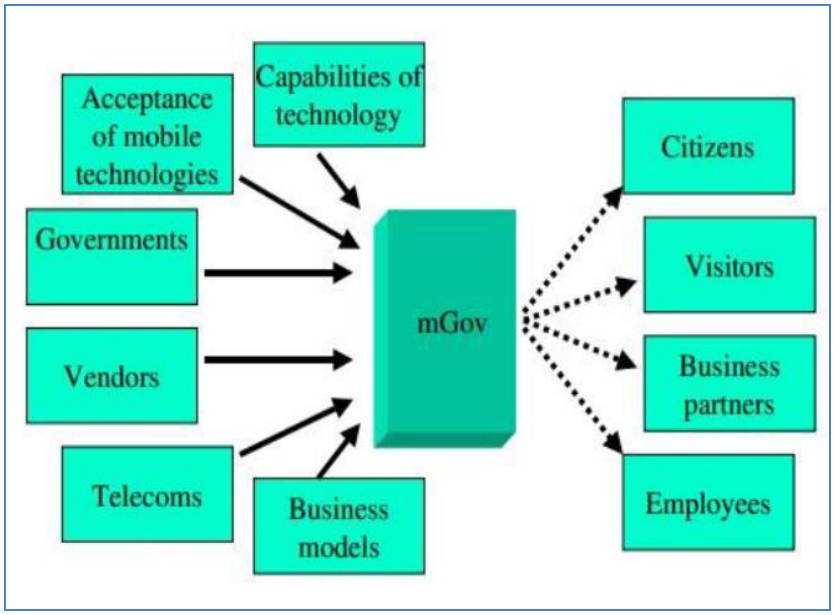
2.6. The Need for Mobile Government

The needs cover the usage and satisfaction of M-Government services. The following are the four groups presenting the domains of indicators of mobile government (Kiki and Lawrence, 2006):

- Value for money: In this major purpose, there are two factors taken into consideration; these factors are content and pricing.
- Quality of services: There are seven elements analysed according to the goal of this indicator; these elements are helpfulness, courtesy, responsiveness, accuracy, reliability, availability, accessibility and awareness.
- Efficient transactions: Security, privacy, trust of e-commerce, timeliness and usability.
- Strategic data: Usage, transparency and accountability

The success of M-Government depending on satisfying the needs and requirements of each stakeholder, particularly individuals. It is demonstrated that the author suggested a framework for M-Government; this framework presenting two groups of forces: Drivers that drive the mobile technologies' usage and citizens pulling these services. Figure 2.5 below illustrates the framework (Carroll, 2006).

Figure 2.5: Carroll Government Model



(Source: (Carroll, 2006))

2.7. Requirements of M-Government

The following is some recommendations and prerequisites that would aid in the implementation of m-Government services and applications (Kushchu, 2007):

- Devolution for the local diffusion of m-Government
- Central support of government to the local projects to support standardization;
- Soft skills, particularly communication and leadership;
- The enhancement of Skills on the job more willingly than formal training;
- Bottom-up approaches and horizontal organizations, but with powerful commitment of the top managements;
- Early involvement of individuals both external and internal.

The following are some drivers to help developing countries transform from the services of e-Government to the services of m-Government. These drivers are as follows (Khare, Dixit and Chaudhary, 2011):

- High rate of penetration of mobile users in the developing countries allowing them to have the ability to utilize the services of m-Government.
- The developing number of individuals utilizing mobiles in order to connect to the internet through the services of Wireless Application Protocol (WAP) offered over General packet radio service *(*GPRS*)*;
- Mobile phones networks/coverage: it is considered easier to set down the remote places wherever it is very hard for the internet infrastructure to be implemented. Consequently, individuals who live in rural areas have the ability to access the M-Government services through mobile phones, Smartphone applications in particular.
- Mobile phones are frequently reasonable and this is because of the low cost compared with the internet technologies.
- Mobile phones are very easy to use and this will support many individuals to adopt mobile devices easily.
- M-Government would expand the services of e-Government to some recently emerging service areas such as e-voting, e-participation, e-Democracy and other kinds of service platforms between the government and citizens.

2.7.1. Resources Accessibility

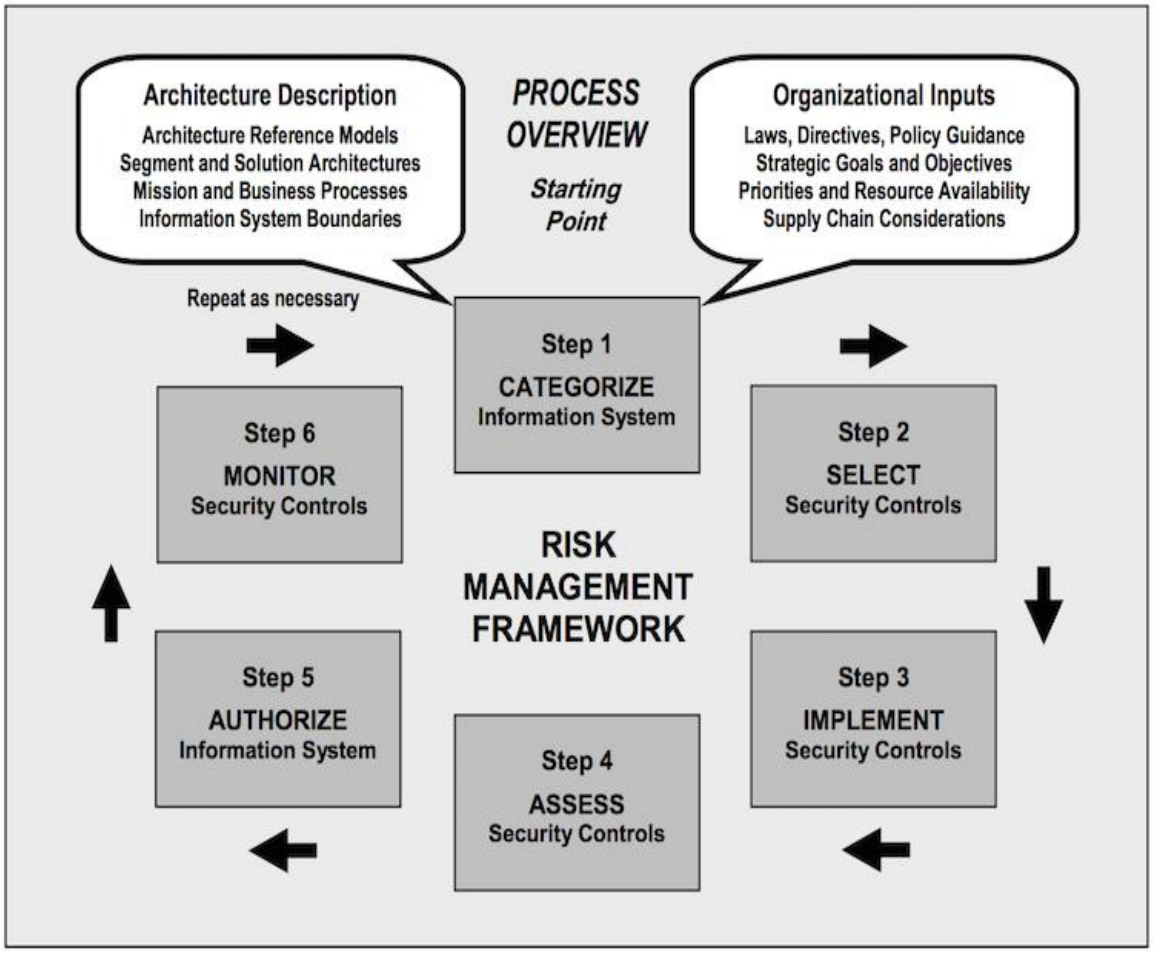
Accessibility indicates the procedures of making or securing the service in order to be accessible to a wider population of users (Usable Net, 2004), involving, where related, the evaluation of eligibility standards in addition to the agreement to the particular service design (standards and nature). Each user is supposed to access their government services in spite of any disability and this in fact may need some "add-ons" since each guideline of the global accessibility is identified by WAI (Web Accessibility Initiative). Internationally, there are 1.7 billion users of mobile phones and those are considered potential users of the mobile services.

2.7.2. Privacy, Security and Risk

Privacy is identified as “the right of individuals to utilize the provided service alone and to control the conditions in the case that information pertaining to the individual perceived service is disseminated, used and collected”. If the privacy of users is violated while utilizing the services of mobile phones, they will refrain from utilizing the phones once more, making it very hard to accomplish decisive mass (Legnini, 2006). Users are becoming more aware about the issues of privacy as well as comparing the government sites’ privacy policies with the sites in private sectors. A serious interest for the concept of “context/location awareness” is the information’s confidentiality concerning the position of a particular individual. Certainly, the incorrect use may lead to breach of privacy through exposing real time movements of individuals with some likely negative implications. It is demonstrated that individuals would usually respond poorly to such observation of their movements through the government even though it is enabled, so that the emergency services have the ability of locating the mobile phone users (Ng-Kruelle et al., 2002).

Security is not restricted to installing the newest security devices as well as organizing the recent security technologies. Information security is recognized as a mixture of technical measures, management and business on a constant basis. In a conducted study by Quocirca in 2005, it is demonstrated that two thirds of rated data that concerns information technology professionals fall into inappropriate hands through theft or the device’s loss (Bamworth, 2006). The following Figure 2.6 shows the risk management framework (Kiki and Lawrence, 2006).

Figure 2.6: Risk Management Framework



(Source: (Kiki and Lawrence, 2006))

2.7.3. ICT Literacy and Awareness

Awareness is the first step in the experience of users, as users need to know that the service is in existence, what it does and how it is relevant to them. They users need to know in which ways they can contact and access the service. For an M-Government services such as mobile voting awareness of the service is critical. In Finland, for example, all citizens can obtain motor vehicle brand name, type, vehicle owner name and municipality of residence or business, first day of usage of the vehicle, last inspection date and possible unpaid duties on the vehicle, simply by sending an SMS message to one of two Finnish Vehicle Administration telephone numbers for between 1.30 and 1.70 Euros. Awareness of this service is such that it was used 1.37 million times in 2004 and it is interesting to note that this information is not considered private or sensitive in Finland (Suomi, 2006).

2.8. Mobile Government Benefits and Value

Mobile government offers many chances. It offers more availability and accessibility since individuals have the ability to access the government information on the basis of anytime and anywhere. In general, mobile phones are always on as well as they are always carried around. Moreover, it permits the government to quickly deliver modified content to the end-users. It also permits governments to arrive at a superior number of individuals, practically the individuals who live in the rural areas as well as do not possess a great experience with the computers (Kushchu and Borucki, 2004).

The advantages can be illustrated from the view point of citizens and employees. As for the employees, M-Government offers a flawless environment for them in order to meet and communicate with no need to plug into the interface of network. Furthermore, in order to access information at any time and any place for the purpose of making faster and better decisions. From the viewpoint of citizens, M-Government contributes to saving money, effort and time through having the ability to access the government information and services on the basis of anywhere and anytime (Kiki and Lawrence, 2006). M-government provides several benefits including the benefits represented in enhancing the delivery of government services and information; consequently, the individuals have the ability to get instant access on the basis of any time and any place. Moreover, mobile technology (M-technology) is recognized as the best resolution to overcome the problems of internet connectivity and the issues of digital divide because mobile technology have been more consistently dispersed among various layers of society. Additionally, wireless networks are recognized as a cost-effective option for several countries in the case of difficult terrain and dense populations. Furthermore, M-Government develops effectiveness and efficiency of government employees, since they have the ability to access the needed information instantly as well as update records on the spot. Furthermore, M-Government has the ability to open up extra channels for the participation of citizens (Sheng and Trimi, 2008).

There are several advantages of mobile government, particularly within the agricultural sector, involving ubiquity and improved mobility, developing emergency management, ease of use, on-time delivery of information, time saving and provision of location depending on the services (Ntaliani, Costopoulou and Karetsos, 2008):

- Greater reach for the government services since mobile phones are obtainable to a large number of people.
- Mobile phones are devices that are accessible at any time and place.
- More personalized choices because the mobile devices are designed for one user.
- The cost of M-Government is effective for citizens and government.
- Mobile government will make government officials able to manage resources in the best way.
- Faster flow of information between government as well as its in-field employees.
- Developed democracy throughout citizens' proactive participation in decision-making.
- Mobile government is recognized as the best resolution to digital divide.
- Mobile government through the services of SMS has the ability to develop communication with hearing-impaired people.

Mobile communication technology has three benefits compared with wired technologies: It removes the constraints of space and time, hence enhancing communication; it takes out the constraints of infrastructure, thus lessening the digital divide and takes away the cost constraint of possessing a computing device. Superior reach in terms of citizens and area, and developing efficiency and effectiveness of the government employees; supporting the democracy by offering citizens the means to participate in the processes of decision making. The state of M-Government in Saudi Arabia reached the conclusion that there are benefits for the M-Government and these benefits are represented in the following advantages: Developed effectiveness and productivity of the public services, delivery of government services and information, ease of use, government services reaching a large number of people (Alsenaidy and Ahmad, 2012).

The techniques of location awareness and Personalization allow for developing the M-government services as well as create several chances. The techniques of location awareness and personalization in some M-government services are examined according to the geographical location of users. The techniques of personalization are categorized as follows (Al-Khamayseh, Lawrence and Zmijewska, 2006):

- ***Collaborative filtering personalization***: This technique of personalization involves two kinds of collaborative filtering, item-based and user-based. Both kinds identify the patterns of difference and similarity in that the collaborative filtering systems of the user-based identify the patterns of similarity between the choices of users, whereas the collaborative filtering systems of item-based identify the patterns of similarity between the demanded items.

- ***Location based personalization***: In this technique, the individuals tend to get information that is greatly connected to their location. Consequently, the user's location is supposed to be determined depending on one of the subsequent two positioning techniques:
    - Tracking the constant signals sent through mobile phones into their base stations.
    - Using GPS or any kind of equivalent technology.

2.9. Mobile Government Success Factor

E-government's success needs energetic engagement through government and its citizens. A superior challenge is possibly to accomplish wide deployment and acceptance, constant usage of the government through its citizens (Carroll, 2005: 79). Moreover, the mobile government's success is mostly based on the number of users within it, the citizens, (Kushchu, 2007). Nonetheless, a less visible issue influencing the success of the applications of m-Government is that the needs of individuals to access the public sector services through mobile technologies are being ignored (Carroll, 2005). The major restrictions of mobile government are the restrictions related to the problems of the devices themselves, such as low size and memory, no widespread criteria, and the mobile technology is still developing as well as the restrictions of security, particularly while dealing with sensitive information (Bataineh, Abu-Shanab and Jdaitawi, 2009).

A mismatch between the applications of mobile government and mobile technology will lead to several challenges in the development process. Application infrastructure issues, accessibility, privacy and Security were identified as the major challenges intended for the mobile government (Sheng and Trimi, 2008).

There are a number of design guidelines which should be followed in order to overcome some of the technical challenges of mobile computing (Hassan, Jaber and Hamdan, 2009):

- Because of the small size of screens of mobile devices, the authors propose that the use of graphical content is supposed to be minimized.
- The services of government are supposed to be represented in the mobile portal as a hyperlink menu.
- Public services are supposed to be ranked by mobile users depending on their preferences and ability to remove them from the browsing experience.

Constructing a model for the success factor of the service delivery of mobile and electronic government has to concentrate on the factors as well as their relations. For showing the success factors' complexity, authors modelled and presented two success factors; these factors are business delivery and process as well as informatics organization and infrastructure (Gunadi and Sandy, 2009).

2.10. M-Government Challenges and Adoption Needs

2.10.1. Mobile Government Challenges

Mobile government is facing several big challenges like the lack of mobile technology standards, the concerns of privacy and the concerns of security such as theft, device loss or hacking. Also, the costs of offered solutions is significant challenge since the government must offer secure and affordable mobile services (Al-Khamayseh and Lawrence, 2006).

It is demonstrated that several researchers consider the mobile usability to be the major challenge to the success of mobile government and mobile computing (Kushchu, 2007). The following seven decisive success factors with security and privacy ranking peak on the list. According to the percentage of participants who select that factor, the critical success factors are listed below (Al-Khamayseh, Elaine and Zmijewska, 2006):

- Security and Privacy: Making sure about the applications' security as well as the users' privacy.
- Infrastructure: The infrastructure of M-Government involves mobile access devices and wireless networks.

- User preferences and needs: The fulfilment of the users' preferences and needs.
- User-friendly applications and Quality: The applications of quality mean user-friendly and simple applications.
- E-Government: The existence of services of electronic government.
- Acceptance: The acceptance of users to the applications and services of M-Government.
- Cost: Cost of accessing services is supposed to be low.

The following are some of the success factors for mobile government (Carroll, 2005): Users' convenience, Mobile tasks simplicity, Mobile Traffic control, Usability and Security and privacy concerns.

There are four groups of barriers as follows (Kiki and Lawrence, 2006):

- Organizational: Vision issues, legal issues, financial and economic issues, and lack of leadership.
- Technical barriers: Scalability and reliability, interoperability and open-source.
- Social barriers: Trust and usability, security, privacy, pricing and awareness
- Governance barriers: Participation and accessibility, openness, transparency and accountability.

There are many major challenges of mobile government in the developing countries as follows (Mengistu, Zo and Rho, 2009):

- The issues of security and privacy, since the wireless networks depend on the usage of public airwaves for transferring data which could be accessed/produced by hackers and vulnerable people. As a result, it is vital for governments to ensure security and privacy.
- People readiness: In developing countries, there are many individuals who are not aware of the meaning and influence of M-Government and E-Government.
- Solid legal frameworks intended for the electronic services are not at rest until now.
- Compatibility: There is no international standardization of the content as well as the significance of interoperability across various agencies of the government.

- Restricted power supply of Mobile computers.
- Download speeds and low bandwidth.
- Mobile Internet high cost in a number of developing countries.

2.10.2. Mobile Government Adoption Needs

Adoption of M-Government can deliver a number of challenges (Kushchu and Kuscu, 2005). The following needs are some of the most relevant M-Government needs namely privacy and security, infrastructure development, mobile penetration rate, legal issues, and accessibility (Lanwin, 2002):

- Increasing accessibility and encouraging mobile penetration.
- Developing related infrastructure and mobile networks and wireless.
- Developing and regulating legal aspects of mobile applications and the services use.
- Providing security and protecting privacy for the interactions and data.

2.11. Examples of World M-Government Initiatives

2.11.1. M-Government Initiatives in Developed Countries

In the developed countries, M-Government is spreading and coming from different opportunities and channels in order to engage with the public administration. Consequently, M-Government is mostly utilized for convenience, due to the functionality and availability of smart phones (Zefferer, 2011). In Sydney (Australia), SMS is provided by the MGM Wireless Company which also provides other services that serve citizens. The provided mobile services give the opportunity to use the web services besides the Fire-watch that is based on the SMS service. That is a system that send alerts, by SMS messages, to citizens if there is an accident caused by fire within 15 kilometers (Rannu, Saksing and Mahlakõiv, 2010).

One of the leading countries globally in m-Government services is Estonia, where the mobile penetration exceeds 100 per cent. The government in Estonia has adopted a powerful and convenient way in order to provide information and communication from government and office, i.e., SMS tool (Rannu, Saksing and Mahlakõiv, 2010). The following mobile services are available in Estonia in particular in Tartu, which is considered the leading city in Estonia for introducing m-services: Mobile Parking,

Mobile Bus Ticket, T-number, Mobile Payment, Tartu city short code 1789, M-neighbourhood watch and M-library.

Mobile technology is widely popular in European governments due to the high number of used mobile phones which have raised quickly in the years 2004-2007 from 90% to 100%. Moreover, the concept of m-technology is widely accepted as well as the m-government services. For example, London citizens who are involved in London Police Department have the ability to receive SMS about emergency alerts and security threats from the Department. Furthermore, bus drivers receive SMS about slow down or speed up timelines and maintain an equal time between buses from the Bus Operator Metroline **(**Trimi and Sheng, 2008).

2.11.2. M-Government Initiatives in Developing Countries

In this section, the significant reasons to develop countries to apply mobile government applications are presented and a number of cases of the mobile government implementations within developing countries are illustrated. Governments within the developing countries try to extend to their people. Mobile government is bringing many opportunities for the developing countries. The developing countries have a mobile penetration rate more than the fixed-line Internet rates that opens doors to opportunities for the countries to link the digital gap in addition to gain a superior reach during mobile government. Below is a list of some features forcing governments within developing countries to adopt M-Government services (Mengistu, Zo and Rho, 2009):

- In several areas, mobiles are the only way to connect to Internet.
- Improved mobile penetration.
- Remote areas with insufficient infrastructure to run the wired Internet
- Accessibility anywhere
- Simplicity of learning
- Low-cost technology
- Government continuous efforts for improving E-Government
- Mobile infrastructure is able to be simply installed

The majority of developing countries has little people readiness because of many factors; thus, a lot of E-Government applications are not implemented, and if so will not

be successful. The authors identify the following benefits of mobile government within the developing countries (Kushchu and Kuscu, 2003):

- The costs for owning mobile devices are small.
- M-Government will permit governments to avoid building all requisite heavy infrastructures to use in E-Government.
- The large rate for mobile penetration within developing countries
- Governments are able to reach an improved outreach for the public.
- Ease of use; every common person is able to use it for access information.

M-government within developing countries can be the only viable option, hence confirming the following factors as the rationale for using mobile government in East Africa (Hellstrom, 2008): larger reach, more access, lower cost, adoption, higher efficiency and more interaction. Also, there were a couple of reasons which will encourage citizens of developing countries to adopt mobile government: The mobile phone technology lower cost versus Internet technology in addition to the ability of connecting remote areas that were left out of the wired infrastructure.

M-Government projects within developing countries signify an opportunity for governments for delivering services to users who have no access to the wired Internet; thus, it is helping to defeat the digital split (Zefferer, 2011). M-Government is mainly suited to the developing world since the mobile phone penetration rates are greatly higher than the Internet access rates (Rannu, Saksing and Mahlakõiv, 2010). The mobile government initiatives in Beijing, China have reconstructed trust between government and citizens due to closer interaction as well as efficient service release. Also the study focused on the top leadership involvement and their support as the mobile government key success factors (Gang, 2005).Mobile government is a necessity for developing countries to bridge the digital divide. There are six issues in front of the mobile implementation of electronic government: Mobile payments infrastructures, infrastructure development, user-friendliness, privacy and security, compatibility and interoperability, legal issues (Antovski and Gusev, 2005).

In Jordan, the most important mobile government worries from the interviewees' perspectives are: Lack of device maturity, security and privacy, data presentation and limited display capacity and bandwidth limitations (Abu-Samaha and Abdel Samad,

2008). The mobile government in China has the following positive influences as reported by a study (Li, Guan and Fan, 2009):

- Advancing social civilization by providing continuous contact to the government information plus providing a novel channel to the citizens' political participation.
- Reducing bureaucracy.
- Advancing government administrative improvements as well as changing functions by improving efficiency, accelerating innovation in addition to accelerating transformation for government functions.

Some of the suggestions that could be applied in China are; making the right laws, standards and regulations to tackle a lot of issues, for example SMS validity, security and privacy. Moreover, setting up the perfect mobile government security system and optimizing and reengineering the process of administrative business (Li, Guan and Fan, 2009). Despite all the mobile government benefits in developing countries, the following main challenges restrain its adoption (Mengistu, Zoand Rho, 2009):

- Security and privacy concerns.
- Interoperability, usability and compatibility issues.
- Mobile power restriction in addition to wireless networks small bandwidth and download speeds.
- Legal issues.
- Citizens' readiness in requisites of education and training.

The significant success factors to develop mobile government plans in Oman is affected by the fact that Oman is one of the Arabian Gulf countries where there are cultural issues that can contribute in developing those plans more than the technical issues (Naqvi and Al-Shihi, 2009). Mobile phone penetration is extremely greater than Internet penetration in Kenya. So, the mobile government case in Kenya is poorly implemented where the government services are not able to reach all the citizens (Waema and Musyoka, 2009).

Another study revealed that there are no M-Government applications in Albania, although these applications are the only way for serving Albanian businesses and citizens. E-Government services are prepared, but the majority of these services are impractical for the most of businesses and citizens because of the small access rate of the fixed Internet given the prohibitive cost and the small penetration rate of the PCs in Albania. They quarrelled that M-Government applications will be the most efficient solution to Albania, particularly with a large mobile penetration rate as well as the presence of WIMAX technology. On the other hand, the following challenges have to be overcome by the Albanian government (Trimi and Sevrani, 2010):

- Achieve public education and awareness.
- Applications must be designed based on the user wants and needs.
- Privacy and security concerns.
- Financing M-Government projects.

On another study, an exploratory research for discussing the main opportunities and challenges of M-Government in Malaysia was conducted. The authors performed exploratory research taking into account that M-Government is an emerging discipline; consequently, they have employed a combination of quantitative and qualitative techniques. The study results showed the subsequent outcomes (Al Thunibat, Zin and Sahari, 2011):

- Citizens acknowledge M-Government services' values.
- Mobile government services practice is low.
- M-Government services awareness is practically high.
- M-Government challenges are distinct as: Trust and privacy concerns, Usability issues and Interoperability (multi platforms, roaming).

The implementation of M-Government services within Egypt was studied (Abdelghaffar and Magdy, 2012). The authors illustrate that the following factors have a significant effect on the acceptance of M-Government amongst the youth within Egypt: Face-to-face interaction, perceived usefulness, social influence and awareness. Researchers dialled out a questionnaire amongst students in 4 universities, consequently these conclusions are not able to be generalised to every citizen of Egypt. While analysing the

state of M-Government in Saudi Arabia, it was affirmed that there are a number of challenges, such as security, trust and privacy, given the fact that M-Government inside Saudi Arabia is in its early stages (Alsenaidy and Ahmad, 2012).

In 2003, the Dubai Government initiated its SMS services. The Push SMS services which are accessible to drive license renewals, trade license renewals, traffic jam information and health card renewals. Additionally, there are Pull services obtainable in Dubai, which include information pertaining to trading license status, flight information and traffic fines payment. Additional, in September 2005, the Dubai government started the mobile portal that is the single point to access every public service. This has helped the Dubai citizens and government to decrease the complexity and speed up the routine procedures. Additionally, the single point portal advantage is that it is allowing individuals to access visa information and police services, for example traffic fine payments and enquiries, and obtain prayer timings plus searching for hotels, checking departures and arrivals to Dubai airport; moreover, obtaining financial services data and entertainment information (Ewan, 2006). M-Dirham is another significant application introduced through the Dubai government. This service or application allows people to deposit money during a 3rd party financial institution so as to use it to pay diverse municipal services (Ewan, 2006).

In Jordan, the government started planning seriously for e-government as the Program Management Office was started by the Communication Technology and Ministry of Information. On the other hand, in one year, the Jordanian government could accomplish thirteen e-government initiatives plus thirty separate associated projects. These comprised the improvement of an e-government operations centre connecting several ministries to a secure government network as well as email. Additionally, the Jordanian government built a lot of online services for example income tax filing and company registration (Samer and Mohammed, 2008).

2.12. Mobile Government Initiatives in Oman

This section provides literature and discussion around the M-Government in Oman. The Models for M-Government, mobile technologies, applications as well as social and cultural contexts will also be reviewed.

2.12.1. ICT Evolution and Infrastructure in Oman

In Oman and other GCC countries, ICT sector is at a primary phase of development; however, it is rapidly gaining force. In a survey that was held in 2001 through NFO MERAC, that is a leading regional research firm market, it was presented that about 17% of the population in GCC countries reported online shopping then they spend $US1068 million per year on average with electronic commerce with a $US480 million B2C trade value. This considerable internet purchasing level exceeds some developed countries, like Australia. In 2001, 10% of the bought services goods in Australia w`s done on the internet where $US285 was the average value of on-line purchase, with a $US380 millions B2C trade value (Ernst and Young, 2002). Most of the research recommends that e-commerce and e-readiness diffusion in western and developed countries is significantly more developed compared with those in the GCC countries. But, in Oman, $US22 million is the B2C trade value in 2002 where it is expected to reach about $US44 million in 2005. Also, this research projected the value of B2B internet trade in Oman to be $US193 millions in 2005 (AlShihi, 2006).

2.12.2. Mobile Technologies in Oman

Oman is one of the developing countries that seeks to implement M-services. The innovative mobile technology is becoming the key component that helps Oman to move forward and assist in the process of national development in Oman. Penetration of internet in the developing countries such as Oman is low when it is compared to mobile spreading. Even with the strategies and plans of the government to improve internet distribution, subscribers of internet include nearly 2.5% of the overall Omani population. However, mobile phones holders' number raised considerably as these services launch in 1996. SMS services were presented in 2001 and are now popular among the subscriber communities. The present initiatives of m-government in Oman and the users' feedback on the SMS-Parking Service are recently introduced through a Muscat Municipality joint venture and by the Oman Mobile company that offers mobile services to the citizens (Naqvi, Al-Shihi and Ali, 2011).

2.12.3. Electronic Government in Oman

The society in Oman is diverse and small in many ways. The research reveals that the society consists of a small segment of adopters of internet-based or electronic systems, nearly 23.7%. This segment contains people who hold a secondary school certificate or

above. Despite the government efforts to provide a well-organized educational system, the rates of illiteracy are high, i.e. 22% of the population in Oman (AlShihi, 2006).

2.12.4. Mobile Government in Oman

In Oman, His Majesty Sultan of Oman has a lasting vision of Oman for encouraging the Omani government for moving forward quickly in stipulations of ICT provision. An Information Technology Authority (ITA) was formed in the year of 2006 via a Royal Decree to oversee and plan for national ICT projects (ITA, 2010). These projects comprise the e/m-Government services implementation throughout the whole country of Oman. Consistent with the (ITA) in the year 2010, the strategy of Oman's e-government was revealed on May 7th 2003, followed by a number of modernizing projects intended to improve the ICT sector in addition to advance the digital capacity and awareness (ITA, 2010).

Many organizations both public and private have determined to open novel mobile channels and provide mobile services for communicating with their customers anywhere anytime. These services are classified into 2 groups - Pull and Push. The former is wherever clients obtain notifications from organizations about exact events, and the latter is wherever clients have additional privileges in initiating, receiving and/or responding to services offered by organizations.

Consistent with the newest United Nations (UN) e-Government willingness report published in (2008), the Oman e-readiness rank has improved by twenty eight points to get to the 84th position in 2008 from 112th position in 2005 (UN, 2008). This indicator is showing a good progress as well as the Omani government commitment to driving the development of the ICT sector although when contrasted to further GCC countries (Qatar, Bahrain, Saudi Arabia, UAE and Kuwait), it falls behind all of them. Additionally, in the year of 2011, Oman was at the 41st position amongst 138 countries in the Networked Readiness Index (NRI). The Networked Readiness Index (NRI) observes the way that the countries are ready to employ ICT efficiently. Able to be noticed as compared to preceding years, Oman has witnessed a great deal of improvement in ICT provision in recent years. Table 2.1 below summarizes every mobile Government services in Oman.

Table 2.1: Mobile Government Services in Oman

M-Government Services	Description	Target Audience	Operator	Source
Apply Job Ministry of Civil service	This is a push and pull SMS service for candidates who are searching for a job.	Job seekers	Oman mobile. nawras	Ministry of civil service. 2006.
Mobile parking service	This is a push and pull SMS service to send a request to Muscat municipality to reserve a car parking using short message service.	Citizens/residents	Oman mobile. nawras	Muscat municipality. 2007
SMS exam grades	This is a push and pull SMS to request the final exam grades.	Students	Oman mobile. nawras	Ministry of higher education. 2007
Jawab SMS services	This is a push and pull SMS service to notify subscribers of completion of transaction, their cost and any other important information needed.	Citizens/residents	Oman mobile. nawras	Ministry of manpower,2010
SMS violation enquiry.	This is a push and pull SMS to enquire about traffic offences by sending SMS.	Citizens/residents	Oman mobile. nawras	Royal Oman police, 2010
SMS tender announcement notification service	This is a push and pull SMS to receive SMS about announcements of new tenders, award of tenders and tender amendment notifications to unsuccessful applicants.	Citizens/residents	Oman mobile. nawras	Tender board Oman, 2004
SMS telephone regulatory authority(TRA)	This is a push and pull SMS to inform customers about whether their transaction is ready to be collected or not complete.	Citizens/residents	Oman mobile. nawras	Telephone Regulatory Authority, 2009

2.12.5. Cultural Context of Oman

The cultural issues in Oman that affect the development of eGovernment services include the people's acceptance to pay online as they are afraid to make a wrong transaction. The gender factor is another aspect of the cultural context where females are more willing to pay online since they have not the total freedom to move and go outside to complete their works. A language barrier is also evident when it comes to new technologies. The misunderstanding of the used mobile language could cause a lack of acceptance of mobile services. Rural people are facing serious issues in this matter beside the illiteracy problem (AlShihi, 2006).

2.12.6. Mobile Government Push Services in Oman

Over 50% of the population in Oman are using mobile devices. Therefore, the government in Oman has started to use this to reconnect with the citizens. The main m-government services are categorized Oman in two main groups namely, push and pull services (Naqvi, Al-Shihi and Ali, 2011).

Muscat Securities Market has established a paid service which enables investors to take steady updates on stock alerts and market by SMS. It allows users to receive SMS every 30 minutes regarding the market movers - top winners, losers and most active companies. Moreover, the weather forecast service is available for most towns in Oman, which allows the citizens to receive weather reports on their mobiles. This is in addition to SMS messages about certain events and activities. Moreover, the Ministry of Manpower and Tender Board send notification to clients about their transactions, job vacancies and new tenders, etc. (Naqvi, Al-Shihi and Ali, 2011).

2.12.7. Mobile Government Pull Services in Oman

This includes the m-parking system that allows motorists to pay fees for parking by SMS. The service generates a confirmation message containing the vehicle plate number, the allocated time and is sent to the drivers by SMS. The municipality sends a reminder message to drivers warning them to move their vehicles before taking them. Moreover, a new mobile service for drivers allows them to receive information about their traffic offences. The final general certificate results are sent to the students by the

Ministry of Education by SMS. Instead, students can ask about their grades by SMS too (Naqvi, Al-Shihi and Ali, 2011).

2.12.8. End-users in Mobile Government in Oman

M-government end-users in Oman include in general all the citizens who accepted this kind of technological advance. This segment of the society includes educated people generally. The target group in m-government initiatives are students, traders, drivers, etc. (Naqvi, Al-Shihi and Ali, 2011).

2.12.9. Challenges Facing Mobile Government Adoption

Adoption of M-Government can deliver a number of challenges (Kushchu and Kuscu, 2005). The following challenges are some of the most relevant M-Government challenges namely privacy and security, infrastructure development, mobile penetration rate, legal issues, and accessibility (Lanwin, 2002):

- Increasing accessibility and encouraging mobile penetration.
- Developing related infrastructure and mobile networks and wireless.
- Developing and regulating legal aspects of mobile applications and the services use.
- Providing security and protecting privacy for the interactions and data.

2.13. Summary

In this chapter, the concept of mobile government was discussed as the use of mobile and ICT technologies to spread the governmental services. This concept is facing some real challenges that can be summarized into economic, social and cultural challenges. The adoption of mobile government in the developed countries is at a sufficient level where the acceptance of such initiatives is relatively high; also, the economic status of both citizens and governments is suitable for such services. The mobile initiatives in the developed countries include the parking, health, educational, sending alarms from fire stations, etc.In the developing countries, the adoption of mobile government is still in its early stages where the acceptance is lower. The GCC countries are facing the same issues where the literacy is still subjugating a large percentage of the population. Oman case is a bit different where different mobile initiatives were proposed by the Omani government. This chapter also emphasises on the role of mobile government in the

public affairs and administration where citizens are more engaged with the decision-making processes. The effect of the cultural and social context on the adoption of mobile government was seen to be significant where people's acceptance of mobile initiatives is a major factor.

Chapter 3

Theoretical Framework

This chapter will provide analysis of several widely developed, validated and used user-centred models and theories with focus on factors affecting the adoption, acceptance, use and success in the area of Information and Communication Technology (ICT) oriented products and services, including M-Government. This brief theoretical background will be the foundation for the description and development of the research framework or model and hypotheses for this research (Section 3.1). Following the introduction, detailed review of the different user-centred models and theories regarding the adoption, acceptance, use and success of technologies, particularly the M-Government, will be provided.

These include Theory of Reasoned Action (TRA) (Fishein and Ajzen, 1975), The Technology Acceptance Model (TAM)(Davis, 1989), Diffusion of Innovation Theory (DOI) (known also as Rogers' Theory of Diffusion (RTD) or as Theory of Innovation Diffusion (TID)) (Rogers, 2003),The Task-Technology Fit (TTF) Model (Goodhue and Thompson, 1995), the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, et al., 2003), Customer Culture Theory (CCT) , The Theory of Planned Behavior (TPB) (Ajzen, 1991), The Theory of Prospective Gratification (LaRose et al., 2001), Personality Trait Theory(McCraeandCosta,1987) and Psychometric Paradigm Theory (Tversky and Kahneman, 1974). The different aspects and factors affecting the M-Government adoption, use and success, and their interrelationships will be highlighted to provide a better explanation of the research model and hypotheses development to be used in this project.

3.1. Introduction

The acceptance, use and adoption of mobile and related technologies and services have been a key concern and at the core of mobile research. Researchers from several other disciplines including sociology, media and communication, psychology, innovation and Information and Communication Technology(ICT) have contributed to this area of research from their different perspectives. Therefore, several theories and models have been developed, customized and extended to capture all the different perspectives of technology and mobile acceptance and adoption (Venkatesh et al., 2003). Different scholars proposed fundamental scientific models and examined how, what form and at what levels of technology acceptance use and adoption can be derived. However, despite huge efforts have been made to extend knowledge in relation to the theories of technology acceptance and adoption, some are only broadened but not deepened by introducing additional predictors and factors affecting the adoption and acceptance (Bagozzi, 2007), mainly in the new areas or domains such Mobile Government (M-Government). It has been reported that the generalization of the models and theories articulating the acceptance and adoption is undoable within different cultures, among different users or for different technologies. The application of such models and technologies makes them unwieldy applicable and consequently conceptually impoverished. Therefore, it has been frequently recommended for more extensions of some models and theories, and advised to apply or use such models and theories to the new areas of ICT technologies and other evolving domains such as Smart Government or M-Government (e.g., (Bagozzi, 2007)).

Several researchers have recommended for richer modelling and theorizing of acceptance and adoption in the area of technologies and systems related research, however, few efforts have actually been done at the user level compared with the organizational level, or at the levels of Information Systems and Internet utilities and technologies, and consequently, further modelling and theorization will be needed in the areas of new technologies applications for governments, banking and others (e.g., (Antioco and Kleijnen, 2010; Govender and Sihlali, 2014; Brown, et al., 2003).

This chapter will present the development of the theoretical research framework, named as Mobile Government Adoption Model (MGAM) with specific focus on the users of

M-Government in Oman; the anticipated model is expected to provide further insights to increase the understanding of the M-Government adoption. This model is expected to firstly help in identifying the factors that influence users to accept, use, adopt M-Government, and to secondly support identifying the factors making those users feel more satisfied with more intention to use the M-Government services, particularly in Oman. For building this theoretical framework, the general focus will be on the concepts related to the use and adoption of technologies and information systems, and then a particular attention will be considered in regard to the M-Government related factors and their interrelationships.

3.2. Theoretical Perspectives on Mobile Government

The utilization of ICT applications and deployment of Mobile-oriented services in public and private organizations, particularly in governmental organizations, have been reported to impact on humans and make changes to their intention and habits unpredictable. As explained earlier, several researchers have developed theories and models, and tested them to recognize the diffusion and adoption of ICT in diverse scenarios and domains (e.g., (Farzianpour et al., 2014; Wu et al., 2007). In particular, the adoption of ICT means such as Mobile devices and application for either Electronic Government (E-Government) or M-Government has gained significant interest from the researchers within the last years.

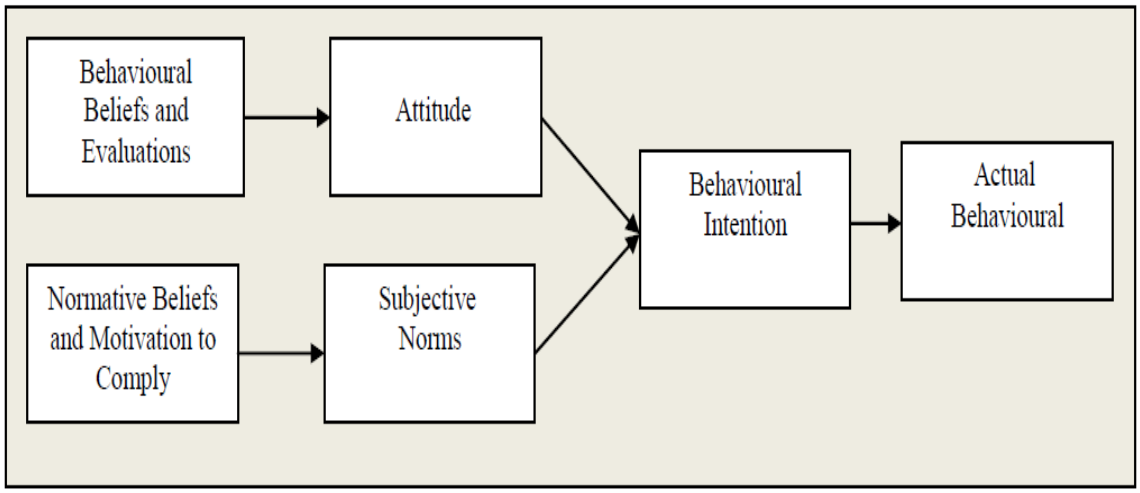
The most commonly used and tested of these theories and models in the area of ICT adoption with focus on the end-users include Technology Acceptance Model (TAM) proposed by Davis et al. (1989), Theory of Reasoned Action (TRA) proposed by Fishbein and Ajzen (1975)and used by Gefen et al. (2003), Theory of Planned Behavior(TPB) proposed by Ajzen (1991), Task Technology Fit (TTF) model developed by Goodhue and Thompson (1995) and used by Dishaw and Strong (1998), and other theories and models. The following sections will provide explanations on those models and theories, their variables with discussions on their use.

3.2.1. Theory of Reasoned Action

The TRA is a well established model from social and Behavioural psychology research, which is concerned with the determinants of consciously intended Behaviours (Fishein and Ajzen, 1975). It is concerned with rational and systematic Behaviour; for example,

Behaviour over which the individual has control (Fishein and Ajzen, 1975). The TRA consists of several variables, mainly: Attitudes toward Behaviour, social influence (known also as Subjective Norms) and Intention variables to predict the Actual Behaviour of users, Figure 3.1.

Figure 3.1: The Theory of Reasoned Action (Fishein and Ajzen, 1975)



According to the TRA as in the above figure, a customer Behaviour is determined by the customer's Behavioural Intention (BI) to perform the Behaviour towards a service or product; this is a function of the user's attitude (A) toward the Behaviour and his/her subjective norms (SN), with relative weights typically predicted by regression, thus, the following formulas can be extracted based on this theory:

$$BI = A + SN \qquad (3.1)$$

As a term, Attitude (A) is defined as "an individual positive or negative evaluation of performing the behaviour" (Fishbein and Ajzen, 1975, p. 216). The TRA assumes that an individual's attitude towards Behaviour is determined by his/her salient beliefs (BI) about consequences of performing the Behaviour multiplied by the evaluation (Ei) of those consequences. A Behaviour belief (Bi) refers to an individual's subjective probability that performing the target Behaviour will result in a particular outcome. The evaluation (Ei) defines as "an implicit evaluative response" to the consequence (Fishbein and Ajzen, 1975, p. 29). The TRA postulates that the subjective norm (SN) of a user is determined by a function of his/her normative beliefs (NBi), and his/her motivation to comply (MCi) with these expectations (Fishbein and Ajzen, 1975). Normative beliefs are concerned with the likelihood that important referent individuals

or groups would approve or disapprove of performing the behaviour. Therefore, Attitude and Subjective Norm can be illustrated below, and, ultimately, the following formula can be concluded, based on the above formulas, to illustrate the Behavioural Intention of the end user of a technology-oriented service or product:

$$A = \sum_{i=0}^{n} Bi * Ei$$

$$SN = \sum_{i=0}^{n} NBi * MCi$$

$$BI = \sum_{i=0}^{n} Bi * Ei + \sum_{i=0}^{n} NBi * MCi$$

where,

Bi: Behaviour Belief, an individual's subjective probability that performing the target Behaviour will result in a particular outcome.

Ei: Evaluation, an implicit evaluative response to the consequence.

NBi: normative beliefs, the beliefs are concerned with the likelihood that important referent individuals or groups would approve or disapprove of performing the behaviour

MCi: the motivation to comply with the expectations.

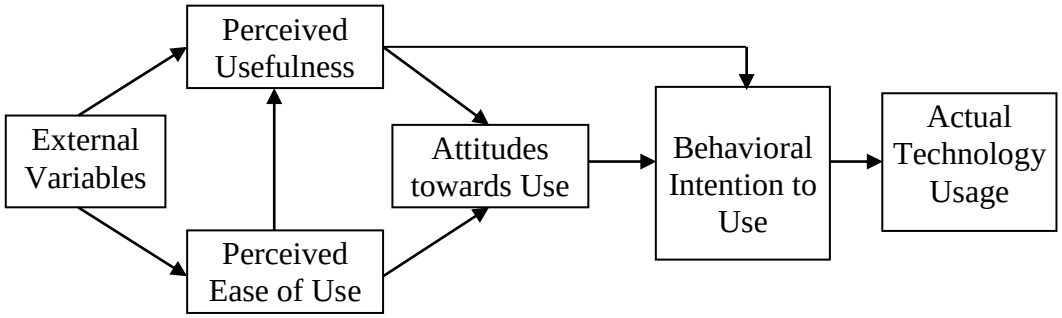
Researchers have not only investigated the adoption of ICT-oriented services and products using TRA as a standalone model, but also through the lens of other models and theories, i.e., integration with other similar models or theories, otherwise, through the extension of TRA using other factors or variables. For example, researchers have integrated the TRA and TPB models in the context of Internet Banking adoption in Taiwan; the results showed that both models provide a good fit. Another study by Wan et al. (2005) also found that additional factors, mainly psychological beliefs, were the main factors behind the adoption of Internet Banking and web services. The study contended that the TRA is less applicable when the customer shows habitual Behaviour for the adoption of some services, mainly the branch or telephone banking channels. As reported by many studies, it has also been suggested that demographic factors are important for the adoption decision of electronic or online services (Daniel, 1999).

3.2.2. The Technology Acceptance Model

The TAM is another well-known model that is relevant to the adoption of ICT-oriented services and products developed by Davis (1989). TAM considers the adoption and intention to use as being influenced by two factors – the Perceived Usefulness (PU) and the Perceived Ease of Use (PEoU). The model defines perceived ease of use as "the degree to which a user believes that using a particular system would be free from effort" and perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance".

According to Davis and Venkatesh (2004), TAM was initially built to investigate general technology adoption but it has been expanded significantly by other researchers to highlight critical issues that affect adoption of specific technologies and innovations such as Internet Banking, E-Government and Electronic Commerce. For example, Venkatesh et al. (2003) have extended TAM to develop a new model known as the Unified Theory of Acceptance and Use of Technology (UTAUT) model to examine the factors affecting adoption of new specific technology, the UTAUT model will be discussed later. Therefore, TAM can clearly be altered or extended to support a more user-centred design and used in technology development and implementation to determine the usefulness of those solutions that are proposed to certain problems, context or domain, like education, health, finance or government. Davis and Venkatesh (2004) have also concluded that TAM can be enhanced to study planned product concepts in the customer service industries. Therefore, it can be seen that the perceived usefulness is influenced by the perceived ease of use while the intention to use influences real usage behaviour, see Figure 3.2.

Figure 3.2: Technology Acceptance Model (Davis et al., 1989)



According to the literature, both TAM and UTAUT have been the most commonly used models to explain adoption of new technology-oriented services and products in many

domains. The models look at both drivers and inhibitors of adoption of new technologies. However, one of the problems is over generalization of the variables meaning that these models do not provide practical solutions. Another problem with these models is that they are excessively focused on drivers and less focused on inhibitors. In societies such as Oman which is ranked high in uncertainty, avoidance inhibitors may also have an influence on the adoption of new technologies similar to the drivers. In other words, people are also concerned about the risks rather than only getting driven by the benefits. In this respect, focusing on perception of risk is also critical especially in the context of countries like Oman.

Earlier studies reported that TAM model is easier to apply compared with other theories and models, because there are standard instruments for it, while measures of some other models need to be developed for each domain. Many scholars reported that TAM has been widely used in the area of technologies and information systems because of its parsimony and the wealth of empirical support for it (Agarwal and Prasad, 1999; Hardgrave and Johnson, 2003). Further, the TAM has been applied in different types of technologies; for example, spreadsheet software, e-mail, word processing and graphics software, the World Wide Web and other technologies (Chau and Hu 2001).

Yet, TAM model was used within different countries and cultures. For example, Straub, Keil and Brenner (1997) compared the TAM model across three different countries: USA, Switzerland and Japan. The study was conducted by administering the same instrument to employees of three different airlines in these three countries, all of whom had access to the same information technology innovation, which was e-mail. The study found that the TAM model was significant in explaining usage Behaviour in both the U.S. and Switzerland, but not in Japan. Moreover, perceived usefulness was significant for both the U.S. and Switzerland, but not for the Japanese sample. Perceived ease of use was not significant for any of these countries' samples. Thus, TAM research remains inconclusive, TAM is quite robust and can be applied to a range of technologies, domains, cultures and contexts, and thus will be considered in this study to investigate M-Government adoption in Oman with specific focus on the end-users.

In the context of this project, TAM with incorporating new factors is expected to explain the factors affecting the adoption and acceptance of M-Government in Oman. In terms of this work and according to the TAM Model, the perceived ease of using M-

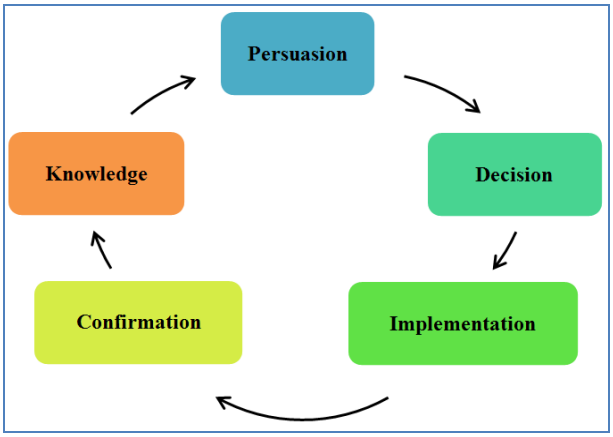
Government is expected to increase the users' perception about the usefulness of this technology, and to develop a positive attitude towards it. Having a positive perception about M-Government usefulness is expected to develop a positive attitude towards the technology and increase the users' intention to use it. In addition, developing a positive attitude towards using M-Government is expected to increase the users' intention to use it which can influence the actual use. Chapter 3 will provide comprehensive details on this issue and dynamics among the TAM Model variables.

3.2.3. Diffusion of Innovations Theory

The DIT was developed by Roger's (2003) as a theory of innovation diffusion, wherein five innovation attributes were considered to explain adoption rates: Compatibility with the customers' expectation, complexity or ability to experiment with it and decide whether to adopt it and to observe its successful use. Some other findings were that adopters tend to be faster when they can control time, their region and on personal characteristics. These customers also showed an increase in activity by performing more transactions, acquiring more products, etc. Furthermore, customers that adopted online banking were less likely to leave the bank. Additionally, there was also a correlation found in the amount of activity and the density of that region with respect to Internet banking users as opposed to users that lived in other regions. An efficient customer often shows a high post-adoption profitability and also a high service demand.

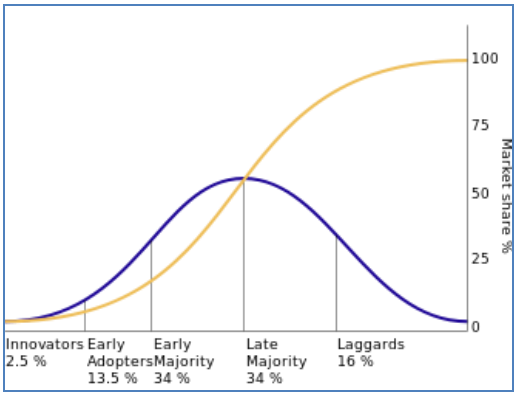
The DIT was described as a process by which an innovation is communicated to the members of a social system used by different end-users. Every member of this system then faces a five-step decision-making process: Knowledge (where a person learns now the innovation functions and what it is about), Persuasion (where person forms an opinion (favourable or unfavourable)), Decision (where a person makes a choice to adopt or reject innovation based on some performed activities), Implementation (where the users use the innovation), and finally, Confirmation (where the user evaluates the results of the innovation), Figure 3.3. According to the DIT, the success or adoption of an innovation can be empirically represented on an S-shaped curve, see Figure 3.4., where initially 10-25% people adopt it, following which there is a period of rapid adoption and finally the rest of the people adopt as well. According to Olatokun and Igbinedion (2009), this happens in accordance with the diffusion of Innovations theory which states that the decision made by members in a social system depend on the decisions made by other members.

Figure 3.3: Diffusion of Innovations Theory



(Source: (Roger, 2003))

Figure 3.4: S-shaped Curve of the Diffusion of Innovation Process



(Source: (Roger, 2003))

The unfamiliarity and the newness of the innovation also contributes greatly to the uncertainty associated with it, which often results in a delay in decision making while they try to gather more evidence. However, Olatokun and Igbinedion (2009) reported that some diversity in the decision making processes based on their personal characteristics which makes innovation adoption possible. The DIT theory has been applied to many business contexts including medical sociology, communications, marketing, organizational studies, knowledge management and others. Yet, despite several studies have considered the use of DIT theory in different domains, the DIT framework as a paradigm for ICT evolution and domain must broaden in scope from focusing on interpersonal communications to encompass the social influences on the technology related players. In other words, innovation diffusion should be treated as the process of the market penetration of new products and services that is driven by social

influences, which include all interdependencies among consumers that affect various market players with or without their explicit knowledge (Olatokun and Igbinedion, 2009). Therefore, vendors such as businesses and government offering ICT-oriented services and products may consider the DIT theory to understand the diffusion process of those technologies to enable understanding and identifying the success or failure factors of a new product or service; this makes more proper ICT-oriented services ensuring proper management of the spread of new products or services such as those in M-Government.

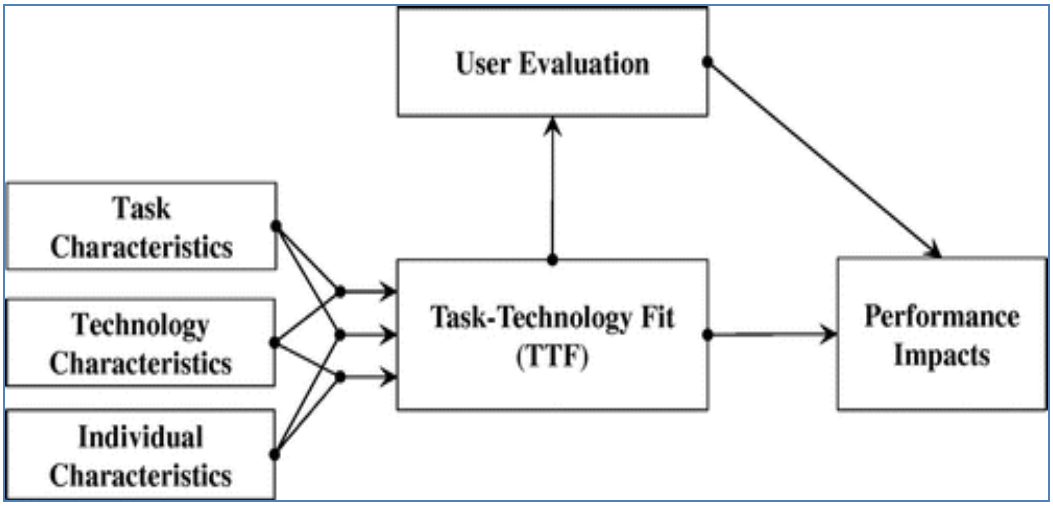
3.2.4. The Task-Technology Fit Model

The Task Technology Fit (TTF) model is another model of technology acceptance developed by Dishaw and Strong (1998); the model extends the TAM by considering how the task affects use (Goodhue and Thompson, 1995). The fundamental argument of fit models postulates that IT will be adopted and will provide advantages if the functions available to the user supports the activities of the user (Dishaw and Strong 1998). There are a number of versions of the TTF model that include downstream and upstream variables (Dishaw and Strong, 1998). On the downstream side, TTF models may include factors that are affected by fit, such as attitude towards tools, intention to use, tool utilization and performance, while on upstream variables the models may have factors that affect fit (e.g. technology, task and individual characteristics).For example, task and technology characteristics typically are assumed to directly affect fit and individual characteristics, such as computer experience, sometimes moderate these relationships (Dishaw and Strong, 1998).

A task, in the TTF literature, is broadly defined as ‘the action carried out by individuals in turning inputs into outputs’ (Goodhue and Thompson, 1995, p. 216). Tasks can be software maintenance (Dishaw, 1994), or be of a decision-making nature (Goodhue, 1995), or perform bank services available online, such as making a payment or checking accounts. Technologies, in the task-technology fit literature, are viewed as ‘tools used by individuals in carrying out their tasks’ (Goodhue and Thompson, 1995, p. 216). Technologies include a wide range of information technologies; for example, hardware, software, data, user-support services or any combinations of these. In the context of internet banking, technology refers to the bank website. Individuals may use technologies to assist them in performing their tasks. Individual characteristics, such as experience and training, could affect how easily and well he or she will utilize the

technology (Goodhue and Thompson, 1995). They state that the antecedents of task-technology fit constructs are the interaction between task, technology and the individual. Therefore, certain kinds of tasks require certain kinds of technology functionality. The TTF model will be reduced if the gap between the requirements of a task and the functionalities of a technology widens, Figure 3.5.

Figure: 3.5: The Task Technology Fit



(Source: (Dishaw and Strong, 1998)

There are a number of researchers who have extended the TTF to increase the explanatory power of the model. Moreover, computer self-efficacy has a direct effect on tool utilization. This study found that computer self-efficacy increased the explanatory power of the model over one with only task characteristics, technology functionality, and the fit (interaction) between them. In another study, Lee et al. (2007) extend the TTF by adding individual differences construct, which includes demographic variables (gender, age, education and position experience), computer experience, cognitive style and computer self-efficacy to explore the factors affecting the effective adoption of mobile commerce in the insurance industry. The major findings reveal that position, experience, cognitive style and computer self-efficacy are major factors that can predict the fit of applying personal digital assistance technology for insurance tasks. Other demographic variables, such as gender and age are found to be non-significant.

Further, the TTF has been combined with other different models, such as TAM. For example, Dishaw and Strong (1998) demonstrated that the efficacy of using a combined TAM and TTF model for workplace technology adoption. In the study, the results

indicate that the TTF was more effective than the TAM for predicting use in work-related tasks. However, the results conclude that a combination of the TAM and TTF into one model explains significantly more of the variance in utilization than either the TAM or TTF alone. In that study, task and technology are found to affect task-technology fit and task-technology fit directly affected perceived ease of use and actual use. Surprisingly, task-technology fit did not affect perceived usefulness as expected. The influence of task-technology fit in perceived ease of use is also supported by Wu et al. (2007) who conducted an empirical study to investigate what determines end user computing acceptance. They found that TTF has only a direct influence on the perceived ease of use.

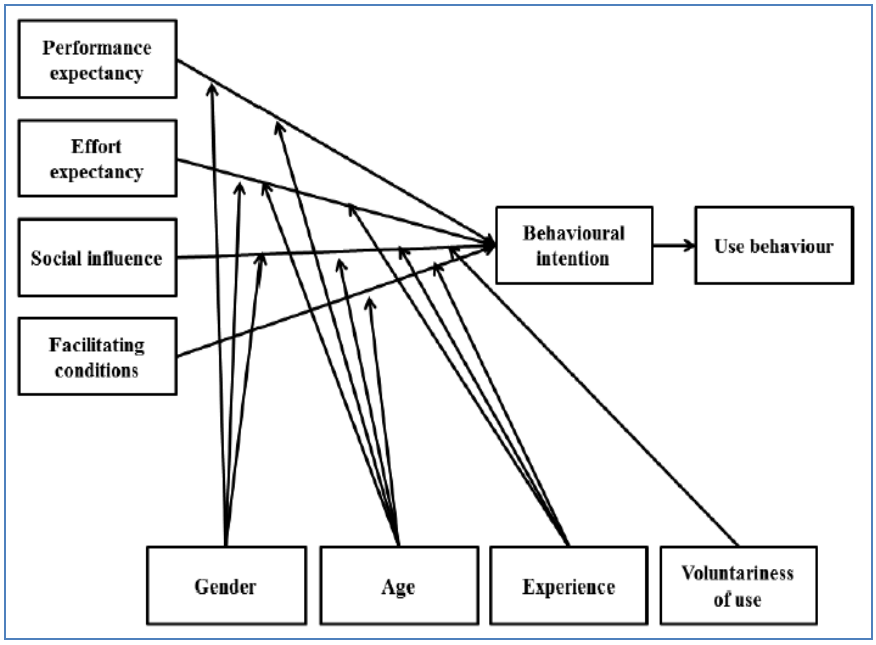
3.2.5. The Unified Theory of Acceptance and Use of Technology

The Unified Theory of Acceptance and Use of Technology (UTAUT) model was developed by Venkatesh et al. (2003), and aims to explain user intentions to use an information system and subsequent usage behaviour. The model incorporates performance expectancy, effort expectancy, social influence, and facilitating condition; as constructs that determine usage intention and behaviour, and according to Venkatesh et al. (2003), age, gender, and experience are expected to mediate the impact of the four key constructs on usage intention and behaviour. In the UTAUT, the model developers formulated a unified model which integrates elements from eight known and well-tested models (social cognitive theory, TRA, TPB, model of PC utilization, motivational model, DOI, TAM, combined TAM and TPB) covered in the acceptance and adoption of technology literature.

The UTAUT was validated on four business organizations in different industries and then cross-validated using two additional organizations. The model was able to explain 70% of the variance in the intention to use technology, which is significantly higher than previous acceptance models (ranging between 17 and 41 percent). Venkatesh et al. (2003) developed their research model by (1) reviewing and discussing eight models of acceptance, (2) empirically comparing these models and their extensions with each other, (3) formulating a unified model that integrated elements from the eight models, and(4) empirically validating the final unified model. The intentions for accepting technology are determined with four main constructs (performance expectance, effort expectance, social influence and facilitating conditions) and four moderators (gender, age, experience and voluntariness of use). Performance expectancy was defined as the

"degree to which an individual believes that using the system will help him or her to attain gains in job performance (Venkatesh, et al., 2003, p.447), see Figure 3.6.

Figure: 3.6: The Unified Theory of Acceptance and Use of Technology (UTAUT)



(Source: (Venkatesh et al., 2003))

Studies based on the UTAUT model showed that the model is able to explain the acceptance of technology in a more realistic and complete way than earlier models. However, UTAUT has been criticized for its inability to measure acceptance of technology outside the boundaries of organizations and working environments (Hill and Troshani, 2010). Indeed, e-government acceptance is not limited to these boundaries. Users of these electronic services are not necessarily affected by the organizational mind-set captured by UTAUT.

3.2.6. Customer Culture Theory

The CCT theory was emerged to understand the theoretical perspectives that identify the dynamics governing the relationships between three main variables: Customer actions, the marketplace, and cultural meanings (Arnould and Thompson, 2005). The CCT concerns with the aspects related to the consumption context such as the symbolic nature of the consumed products and services (i.e., cultural meanings parameter, could be also a social context), and then the experiential aspects of the consumption activity such as data related to customer that can be collected via M-Government (i.e., customer actions parameter), and data collected about the marketplace Behaviour during the

whole interaction stages (i.e., marketplace parameter). Thus, M-Government providers need to understand such concepts including users' reactions, attitudes and Behaviours during the preceding, during and after of services acquiring process (Arnould, 2004).

When M-Government providers understand users' Behaviour, they can exist to satisfy their needs. Therefore, M-Government providers can only satisfy these needs to the extent that they understand the people that will use their products and services before and after they use it (Solomon et al., 2010). It has been also reported that the reasons for ICT services providers understanding customer Behaviour is to identify why and how customers make their online decisions, and then be able to design more effective development and services offering strategies (Hansen et al., 2008). The use of ICT tools has changed how customers and M-Government providers communicate and interact, and consequently a new culture emerged, i.e., M-Government culture (Wang et al., 2012). Users for example can directly interact with governments and they expect to find all details they need on services by directly interacting with M-Government providers, as a part of the online culture; about 42% of individuals using ICT services expect an answer to a question that they ask online within one hour (Jaffe, 2010). This brings about new challenges for M-Government providers that have to change the way they interact and communicate with the user within the context of the new culture; mainly when the Behaviours of a user are driven by new rules and principles of this culture such as grouping, information releasing and environment for openness.

3.2.7. Personality Trait Theory

The Personality Trait theory was developed by (McCrae and Costa, 1987) to identify the significant moderating role and may impact on the relationship between the Intentions to Behaviour and Actual Behaviours of an individual. McCrae and Costa (2006) regarded traits as made up of the underlying inclinations, which are biologically triggered; thus, they are established biological aspects that make an individual behave the way he or she is acting. These underlying inclinations work in correlation with environmental impacts to create adjustments of trait like interests, attitudes, and convictions. The relationship of traits with personal convictions is an aspect that explains stability of personality traits in the Five Factor Model (FFM). Thus, the Five Factor Model is an indicator of theoretical confirmation of the relationship between personality traits and personal convictions.

The idea of personality trait originated majorly from moral and religious writing texts. It was in the 1920s' when personality trait was introduced in the studies that examined psychological aspects as a subject matter for social and deviant psychological studies. It was in the late 1930s' when the study work incorporated the subject matter of personality trait into its own research (Pervin and John 2010). The knowledge of personality trait started with the work of Allport and Odbert (1936) innovative discourse that was the initial effort made to comprehend the expressed ideas behind personality traits. Cattell (1946), then, improved the study of Allport and Odbert and started to describe classifications of qualities of personality traits. Furthermore, Tupes and Christal (1961) improved and refined qualities of personality traits that came in a climax with the studies of McCrae and Costa and the NEOPI (Neuroticism, Extraversion, Openness Personal Inventory) assessment tool and its use for business activities including other ecological aspects.

The research work of Allport and Odbert (1936) was derived from the works of Jeremy Betham produced in 1820s' and 1830s' that embraced the need for defining personality traits. Nevertheless, the process was cumbersome and complex to accomplish (Allport 1924). Typically, Betham's research was positivist in ordinary sense that influenced the 1936 work of Allport and Odbert (1936). In 1930s, the psychological discourse produced was significant since it created the informative studies, which finally identified the Big Five Personality traits. In the 1930s', the discourse produced was an aspect of Allport's work produced in the 1920s' to study and categorize the personality traits (Allport, 1924). In 1924, a study was made as an effort to classify the personality traits based on four categories (Allport and Odbert 1936). A method of integration was introduced to study personality traits. An inference regarding personality traits explained that traits could be combined and studied. The inference justified that personality traits were majorly correlated; overall classifications of personality traits could be made, and real factors making up a personality of an individual could be identified (Allport and Odbert, 1936). Lastly, the study tried to use daily activities to assist people to acquire understanding of personality traits without knowledge of a specific fixed point.

Allport and Odbert (1936) illustrated that the aim of the research was to hypothetically try to categorize personality traits based on four classes to offer a realistic application for psychologist professionals (Allport and Odbert 1936, p. 6). Moreover, Allport and

Odbert (1936) preferred to use scholastic or academic realism to obtain ordinary concepts in the dictionary so as to get classifications of common concepts. This hypothetical study failed to particularly study a particular population (Allport and Odbert 1936). Nevertheless, it can be deduced that the population consisted of psychological experts and other professionals who speak English and offer treatment interventions to patients who also speak English. This deduction is founded on the idea that the Webster's dictionary and the related Thesaurus were utilized to study and classify more than 17,000 terms into four classes. The research had its weaknesses; for example, every assessor who analysed the terms had divergent internal implications to a specific term. Another weakness was that the implication of a term was not objective. The study was conducted with a detailed methodological approach and adequate time and, therefore, fulfilled its desired aim of classifying terms into four classes.

Allport and Odbert (1936) developed and improved the research in the 1940s'. Raymond Cattell, then, refined and made publications of personality traits in reference to potential analysis and classification. Besides that, Raymond Cattell intended to develop measurable classifications of terms to define personality traits. In 1940s', the technique of the study used the external aspects that defined traits, and these were regarded as the key method of describing personality traits depending on what was being observed. Cattell (1946) used a practical design principle to study common grounds across and within various groups. The study responded to the question that was asked at the start of the Cattell's book about assessment and definition of personality traits. The outcomes offered domains of personality traits in reference to the measurable research study. Another aspect of the study discovered was the structure of the external aspects of traits (Cattell, 1946). Based on the observed co-variation, it helped to better develop the knowledge of correlation of the traits.

Based on the theoretical model of the analysis, potential discoveries were identified through evaluation of cross-examined outcomes using the application of pilot test and statistical analysis techniques to compare the results with psychological clinical evaluation. Based on the self-inventory tools, Behavioural classification was used to create the outcomes of the study, which formed the key basis of the traits (Cattell 1946). The study created eleven personality traits, yet, those have been cut-down later.

In 1950s, Stogdill conducted an advanced research derived from the three specific inferences of the Ohio State University (for example, group company is a noticeable evident reality, companies can be methodologically analysed, and factors affecting company can be studied individually). Stogdill (1950) derive the definition of leadership based on the organizational point of view rather than an individual point of view. Besides that, the research work enabled leadership to be studied based on the relations, techniques, and operations point of views (Stogdill, 1950). The first research of Stogdill enabled research of leadership work to be measurable, focused, and significant to a wider population since the actions and traits that would be analysed were identified in different companies. An important research work was made in the 1960s and through 1980s after Stogdill's research in late 1940s' and in the early parts of 1950s'. The initial evidence of the "Big Five" Personality traits was identified based on the research in 1960s conducted by the US Air Forces (USAF), which was an observational research project of eight groups that consisted of various USAF trainees, officials, and mid-level officeholders (Tupes and Christal 1961).

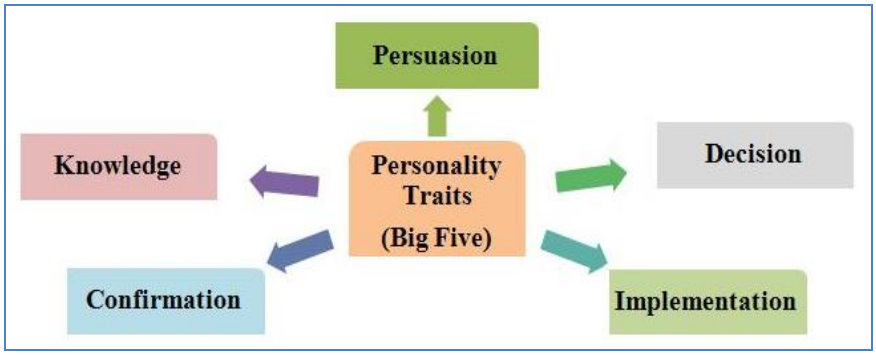
Moreover, both genders were used in the research; thus formed a population of sampled 1,836 respondents. Based on the experimental, measurable research, Tupes and Christal (1961) managed to group thirty five measurable traits into the "Big Five" Personality traits in the field of personality traits. The aim of the research was to give clear explanation of the field of personality developed-classification (Tupes and Christal 1961, p.2). Furthermore, Tupes and Christal intended to distinguish and develop a significant objective of the field of personality trait-classification that could be used in different samples. Tupes and Christal accomplished the aim of the study since they discovered five reappearing traits in various groups; the *Big Five Personality* traits consisted of Culture, Surgency, Emotional Stability, Agreeableness, and Dependability. The research was developed to be utilized for military purposes; the populations that were sampled differ significantly ranging from 20 to 790 consisting of entire population of 1,836 respondents (Tupes and Christal 1961). Although, the groups varied, the *Big Five Personality* traits were consistent in the entire eight various groups of populations sampled. Based on the outcomes of Tupes and Christal (1961), the basis of the modern's FFM (The Five Factor Model) or "the Big Five Personality key character traits" started its development. Tupes and Christal (1961), however, did not explore the facts about limitations, strengths, and shortcomings of the research in detail.

McCrae and Costa (1987) were the researchers who published the last discourse that improved the Norman's 1963 taxonomy which was developed from the Tupes' and Christal's research work in 1961. The aim of the study was to build a detailed variety of traits for methodological assessment between personality traits and other related factors (McCrae and Costa, 1987). The aim of the study was to develop a relationship between the linguistic resolutions and other methods to study the detailed structure of a personality (p.711).Based on the personality traits, the model developed general ideas about people. The research work adopted a quantifiable method with participants of the research being officials of the BLSA (Augmented Baltimore Longitudinal Study of Aging). The strength of this study was based on the relationship with other distinguished accounts of personality traits. The study had a general limitation of reproducing mixture of traits that had to be categorized into particular cultural traits to the “Big Five” Personality traits.

According to this literature study, personality has no commonly approved definition. Majority of studies consider personality traits as the combination of biological processes, activities of life events, and personal adjustments (Caprara and Cervone 2000). Based on human behaviour, the definition of McCrae and Costa (2003) defined personality traits as relatively steady framework of emotions, thoughts, and behaviours. The American Psychological Association (2014) defines personality as a set of variations seen in an individual as a Behavioural way of acting, expressing emotions, and thinking. Allport’s definition points out that personality is an energetic framework in a person’s physical and psychosocial structures influence his actions, thinking, and feelings (Allport 1961).

Personality represents the special characteristics of each person, the traits which reveal human nature; personality is displayed in all an individual’s behaviours, feelings, and thoughts. Since traits contribute a universal function in a person’s action and thoughts, it is justified to understand that personality contributes an important role in different IS-correlated processes and impacts (Devaraj, Easleyand Crant, 2008). Personality trait is commonly identified as the “Five Factor Model” or the “Big Five”, as in Figure 3.7.

Figure 3.7: Five Factor Model of Personality (Big Five)



(Source: (Tupes and Christal, 1961))

Yet, personality traits can be seen in any assessment of a personality of a person. The past studies revealed that the Big Five classifications of personality traits, which offered a vital early exploratory system for most significant qualities of personality traits (Goldberg 1990). Personality traits are made of five key aspects such as Neuroticism, Conscientiousness, Extroversion, Agreeableness, and Openness to experience (Brown et al. 2002). The findings of the study confirm the vastness, inclusiveness of cultural diversity, and strong physical makeup of personality traits (Digman, 1990). The facets constitute the five-factor model that is regarded as the predecessor of personality so that to develop the research tools.

3.2.8. Personality Trait Theory - Extraversion

This is a trait revealed when an individual has interest in others and has trust in them. It is a vital quality because it deals with social interaction and consists of other traits that include human interaction, positive regard, openness, and lively involvement. People who are extraverts are inclined to positive feelings, experience, and interaction (Costa and McCrae, 1992). Extraversion deals with the degree in which people are receptive, friendly, and outgoing rather than unsociable, cowardly, and silent (Salgado 1997). Extraversion is a trait in which an individual is able to readjust to socially interact. Devaraj, Easley and Crant (2008) made a research study that justified that people who are extraverts are typically predisposed to make their reputation and other social impacts of their actions and thus are more prone to reflect how they behave based on their attitude of ideas behind how others are important. Qualities of extraversion include the predisposition to like others, to like being part of a bigger group, and longing for jubilation and happiness, predisposed to be open, lively and communicative.

3.2.9. Personality Trait Theory - Agreeableness

Agreeableness concerns with the ability of a person to agree with others. People who are agreeable are typically joyful and generous and thus appear to be more concerned with their business. Such people are kind, sociable, selfless, caring, and they try to limit their selfish gain for others to benefit. Costa, McCrae and Dye (1991) clarified that agreeableness needs to be associated with joyfulness since people who are agreeable have higher interest to fulfil their relationship with others that contribute to higher levels of comfort and welfare. Salgado (1997) explained that agreeableness deals with the extent in which people are welcoming, collaborative, delightful, and friendly rather than hostile, bad-tempered, and unfriendly. Agreeableness is the predisposition to be friendly and cooperative in social interaction that shows interest of an individual to collaborate with others.

Qualities of agreeable traits consist of caring, understanding, collaborative, innocent, and polite, and naturally such people have positive attitudes (Barrick and Mount, 1996). Moreover, agreeableness is considered to be firmly associated with technological knowhow ideologies when understanding technologies promote partnership, association, and role achievement (Devaraj et al. 2008).

3.2.10. Personality Trait Theory - Conscientiousness

This is related to being reliable, orderly, punctual, and determined. Individuals with conscientiousness trait normally organize their activities in a planned manner and channel their energy toward task fulfilment (Costa et al., 1991). Individuals with conscientiousness trait are people who are orderly, reliable, result-oriented, and determined (Barrick and Mount, 1996). This explains why people with conscientiousness trait are passionate about carrying out their duties in which they are interested to achieve. Salgado (1997) conducted a research that explained that conscientiousness is an important trait that shows that an individual is performance-oriented. Besides that, people with conscientiousness trait are typically more dependent, more passionate and more determined. Since technological application is based on enhancing performance, people with conscientiousness trait are considered to highly embrace the use of technology. The qualities of conscientiousness traits include orderly, hardworking, reliable, result-oriented and motivated.

3.2.11. Personality Trait Theory - Neuroticism

Neuroticism is a contrary term of emotional stability. Neuroticism is the lack of ability to adjust feeling, which is accompanied by a feeling of negative impacts like unkindness, self-doubt, and nervousness. This consists of traits such as nervousness, depression, torridness, self-doubt, and ill-temper. Neuroticism is often related to being bad-tempered, ashamed, self-doubting, distressed, and frustrated (Barrick and Mount, 1996). Neuroticism deals with the level in which a person is worried, doubting, frustrated, and bad-tempered rather than being relaxed, assertive, and friendly (Salgado 1997). Such individuals are mostly nervous, sad, self-doubting, and worried and in certain cases experience difficulty to control their impulses and delaying satisfaction or acceptance (Devaraj et al. 2008).

People with a low level of neuroticism have steady emotions and are able to adjust their feelings better than individuals with high neuroticism who are worried, self-doubting, over-suspicious, and are likely to experience negative feelings and negatively react to work-related demands (Devaraj et al. 2008). Qualities of neuroticism include predisposition to feel negative impacts like fury, hatred, grief, shame, and nervousness.

3.2.12. Personality Trait Theory - Openness to Experience

This refers to the predisposition to be visionary, flexible, independent, and radical. Qualities of such a trait include having passion of being visionary and thoughtful. Receptive to experience is associated with inventive and scientific innovation (Feist 1998). The facet of receptive to experience involves people who are interested to venture in new and unique experiences (Devarajet al. 2008). The qualities of traits of being receptive to experience include being visionary, intellectual creativity, awareness of inner emotions, thoughtfulness, and inclination to a variety of things (McCrae and John, 1992). People with a low level of receptivity to experience have relative stable emotions and are unwilling to accept change (Devaraj et al. 2008). On the other hand, people with a high level of receptivity to experience are considered to have a positive perception and understanding of embracing work associated with technology since they embrace change, which is significant in driving technology. Such people are eager to venture in new experiences that finally influence their decisions regarding using technology. Qualities of receptivity to experience include predisposition to develop

dynamic vision, inventive responsiveness, intellectual creativity, and awareness to inner emotions.

All the five factors are made up of many dimensions. Assessments and quantitative statistical analyses confirm the consistency and scope of the Five Factor Model including its effects on many factors associated with works of (Barrick and Mount, 1996; Mount and Barrick 1998; Salgado 1997). A work that is commonly cited in this field is Parks-Leduc, Feldman and Bardi (2015), which is a quantitative statistical analysis (meta-analysis), illustrated the importance of personality traits by applying sixty research studies.

3.2.13. Psychometric Paradigm Theory

Behavioural theories have discussed concept of risk extensively and in most of these theories, the terms “risk” and “uncertainty” are often used interchangeably. What these Behavioural theories also talk about is the concept of “perception of risk,” which has a strong and deterministic impact on human behaviour. However, it is also agreed that risk is only psychologically constructed, that is, it is constructed by humans in their minds to signify our fear of the unknown. Since it is psychologically constructed, the perception of risk will depend significantly on the individual context, in which this psychological construction takes place. It is also to be noted that our perception of risk is not always based on facts. For example, individuals are far more scared of flying than driving even though the probability of accident while driving is far more than the probability of accident in airplane. This could be driven by our lack of control and knowledge about flying than driving. Our perception may also be driven by experiences of others around us even if we have experienced anything similar. For example, the perception of risk in M-Government may rise as a result of hearing of a friend or relative being defrauded even though it may have been a fault of the victim. Thus, individual perception is constructed on the basis of social and cultural learning and experiences and may not represent the whole truth.

The concept of risk perception started to get recognized in policy making arena in around 1960s. Since then, several researchers have attempted to understand perceived risk and what it means to different individuals. Currently, there are two primary paradigms dominating the research on risk perception; the first paradigm is the ‘psychometric paradigm’ which is mainly linked with decision science and psychology

discipline. According to the psychometric paradigm, risk is cognitively constructed by humans through a process of deciphering the signals it receives from their environment. Thus, risk may not be based on objective reality; it is not independent of our own belief/perception and cannot be reliably and accurately measured (Slovic, 1992). Risk is related to fear which is individual's self cognition in response to some type of threat which is not voluntary and not controllable.

Thus, according to psychometric paradigm, risk is a subjectively created perception of the future uncertainty and its impact on individuals' welfare. This perception of formed risk is a result of the learning and experiences of individuals originating from individuals' socio-cultural, psychological, economic and institutional context. Another paradigm of risk, known as the "cultural paradigm" has also been discussed under sociology and anthropology disciplines. According to cultural paradigm, the subjective perception of risk is created not only by an individual's own experiences and learning but also the experiences and opinions of others, within the same socio-cultural context as them (Slovic, 1992). Thus, while psychometric paradigm looks at the construction of perception of risk at individual level, the cultural paradigm looks at the construction and development of perception of risk at the group level.

One of the most notable works in this regard is that of Geert Hofstede who proposed a national culture evaluation framework. He included, uncertainty avoidance, as one of the key aspects of his culture evaluation framework. Uncertainty avoidance is directly linked to individual's perception of risks and when individuals have a negative perception of risk (in terms of either of both, likelihood and impact) then they tend to avoid taking risks. On the other hand, certain societies such as Western societies tend to be more risk averse and do not have a bad perception of risks i.e. they consider risk as part of life and consider it as an opportunity. Hofstede framework is one of the most significant examples that an individual's perception of risk is influenced by his/her culture. This perception is also influenced by other aspects; for example, how media portrays risks, how much emphasis is given to risks in a society, what are the basic principles of society (for example, is it progressing or playing safe), what legal and technical tools are available for individuals to manage the risks. In brief, risk perception is influenced significantly, could be positively or negatively, by cultural, institutional and environmental factors (Shah et al. 2014).

This suggests that the perceived risk in M-Government could differ from country to country and thus it is important for us to investigate it in context of the country and its culture. As the researcher is Omani, it will be useful for his future ambitions to investigate this concept in the context of Oman. Yet, Turban (2001) suggest that ICT-oriented services and products providers, such as M-Government providers, should take care of the following factors in order to reduce the customer's perception of risk, and those will be considered in this project:

- System Security
- System Reliability
- Internet service reliability
- System Responsiveness
- Distrust of service providers

Yet, although the psychometric tests may case bias with differences in average scores across demographic groups, the reliability and validity of the test can easily be assessed using statistical methods, as to be performed in this project. The Pearson correlation coefficient for example can be used to assess the consistency of the results over repeated measures or with large samples; the study sample in this project is planned to involve more than 400 participants. Another advantage of the psychometric test in this project is not to use the results given by the test in an abstract manner, but with results given about other factors such as culture, personality traits, etc.

3.3. Theoretical Research Model Development

3.3.1. Theoretical Analysis - Criticism and Selection

Based on the review of literature, it can be concluded that the definitions of M-Government mentioned by many scholars remain inconsistent. The concept still lacks of comprehensive understanding the different perspectives including adoption, acceptance, retention, etc., mainly when applied within the governmental context for different beneficiary parties. In addition, Ho and Ko (2008) have reported that most of the earlier studies concern with the technology adoption and acceptance, or even users' resistance to use, have focused on user intention, with no focuses on user acquisition; little research has examined user intention of actual use, both are considered user-cantered.

Some studies even suggest that attitudes are more accurate predictors of Behaviour than are intentions (Bagozzi and Yi, 1989, p. 266).

Subjective norms directly affect ICT-oriented services and products usage among users (Loch, Straub and Kamel, 2003, p. 51). These findings may suggest that the predictors of using and adoption of M-Government may vary, even have not widely been examined. Furthermore, these predictors as proposed in past studies have shown mixed findings. For example, the prior studies on similar technologies to the M-Government adoption factors have produced mixed results, which have culminated in the difficulty of articulating the drivers and factors of M-Government adoption. Thus, research on M-Government remains inconclusive.

Within the few extant studies, however, there are conflicting results with respect to the relative importance of the factors and drivers that explain the M-Government adoption (Ndubisi and Sinti, 2006, p. 16).Moreover, from the empirical viewpoint, some studies showed that the antecedents of user's attitude, subjective norm and perceived Behaviour control remain indecisive and have very inconsistent results. For example, while Tan and Teo (2000) found risk to be a very significant factor toward M-Government user's attitude, Ndubisi, Sinti and Chew (2004) found it to be only marginally significant. Many researchers (e.g., (Chau and Hu 2001; Agarwal and Prasad, 1999; Hardgrave and Johnson, 2003) have reported that TAM has been widely used in research projects related to the adoption and acceptance of ICT means, such as M-Government, by the end users and other adoptions by business units including organizations. Although the earlier theories explain which factors contribute to an individual's decision to engage in a particular Behaviour such as adoption of a new technology or M-Government, however, the research became stagnant from there on. Research by Eid (2011) and Al-Ghaith et al. (2010) have called for further research in the Middle East nations including Oman to examine the facilitators and inhibitors of technology adoptions.

Existing research has provided little practical benefits in relation to the M-Government adoption; for example, some of the constructs used by researchers are quite arbitrary in practical terms. For example, UTAUT model uses a construct "perceived usefulness." Usefulness of M-Government is a perceptual term and despite acknowledging this, most researchers continue to use objectivist ontology and positivist philosophy to investigate perceived usefulness in M-Government. One of the key issues with existing researches

is their extremely broad scope which means researchers fail to focus on specific issues which could lead to possible solutions. This research aims to fill this gap by looking specifically at perceived risks, what factors influence it and how it can be reduced to increase adoption of M-Government in Oman. Furthermore, there is a lack of research on the inhibitors which inhibit the adoption of new technologies.

This research will take one step further than the research into the user related factors affecting adoption of M-Government and will aim to investigate deeply into the factors that may affect adoption of M-Government in practice within a specific culture, in Oman. In particular, this research will focus on culture, risks and drivers affecting the adoption of M-Government. While there is a general consensus that perceived risks will and do affect adoption of M-Government, Farzianpour et al. (2014) reported that none of the researchers have looked deeply into how perceived risks could be reduced to increase adoption of M-Government. The implementation of this new technology, i.e., M-Government, is already done using some frameworks, theories or models; however, it is important to revise the existing approaches used in the industry, and it remains crucial to conduct further research in this new technology area, because:

- The emergence of ICT-oriented services in Public Administration is still growing.
- The emergence of Mobile phones and applications among nations is still evolving, and provides novel opportunities to attain services with less costs and high quality.
- There are conflicting results with respect to the key factors and drivers that explain the adoption of new technologies such as M-Government, particularly when applied within the cultural context of Oman.
- There is a difficulty to articulate and list the drivers or factors of M-Government adoption. Thus, research on M-Government remains inconclusive and open for debate.
- Some of the existing studies were conducted with broad scope such as Internet or ICT adoption, which means that researchers failed to focus on specific issues, and may be able to implement their conclusions within the context of some specific technology(s), but not contexts of all technologies, mainly the ones in new domains.

- Some of the existing frameworks or models are too technical which means that they ignore the soft issues (e.g. culture, user perception, mobile phone penetration etc) and their impact on the success of systems or technologies.
- Many of the existing studies with focus on adoption theories or models have been mainly conducted within the developed nations, and their findings may not be suitable for the developing nations such as Oman, where the social and cultural dimensions are different from the developed nations.
- The normative literature indicates that there is an absence of sophisticated theoretical model and theories in the area of M-Government.
- The literature highlighted that there is an uncertainty about the impact of using evolving ICT means for all types of services in the Middle East including Oman; Mobile phones and applications for governmental services are considered new.

3.3.2. Hypotheses Development

According to reviewing literature, M-Government is expected to receive a huge acceptance due to the growing levels of awareness of this technology. End-users are beginning to realise the advantages of Mobile Application and are increasingly accepting and shifting to it as well; its appeal lies in the low cost as well as easy access it provides. However, the key determinant of the success of M-Government is now adoption and acceptance. In the following sections, the factors in association with the M-Government will be discussed for the development of the Mobile Government Adoption Model (MGAM), and the development of the hypotheses to be tested through data collection and analysis in this project.

3.3.2.1. The Relationship between Perceived Ease of Use, Perceived Usefulness, Attitude and Behavioural Intention

The TAM postulated that Behavioural intention was jointly determined by the person's attitude toward using the system and perceived usefulness (Davis et al., 1989). This means that the original theoretical conceptualization of TAM depends on the attitude construct. However, based on a longitudinal study, Davis et al. (1989) later found that the power of TAM remains equally good and is more parsimonious without having an attitude construct. There were three reasons to remove the Behavioural intention construct from the TAM. First, there was a strong direct link between perceived usefulness and attitude in both, after one hour and fourteen weeks later, in their

longitudinal study. Second, a weak direct link between the perceived usefulness and intention was found. Third, attitude was an important mediator showing the impact of beliefs on intentions, and both perceived ease of use and usefulness.

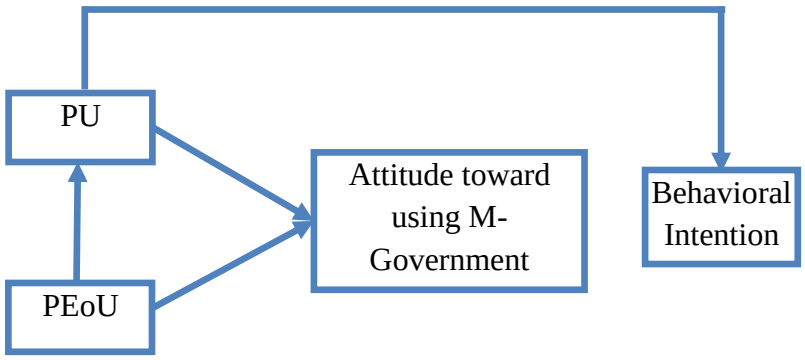
Childers et al. (2001) has also expanded such research by explaining what it might be about online shopping that shoppers are attracted to; customers like how online shopping enables them to shop the way they want to, in a way that requires less mental effort and less time. Thus, users may continue to use online services even when they have bad experiences, as long as the services are easy to use. Earlier studies also have explored customer feedback, and showed that this feedback has consistently revealed that positive customer attitudes towards online shopping, a similar technology to M-Government, are linked with increased intent to use websites for online purchases (Chen, et al., 2002).

A positive attitude related to the actual adoption with expectations meeting the standard may positively affect users' adoption, i.e., the confirmation or disconfirmation of a customer are based on the actual adoption and experience. The development of positive attitude towards M-Government may later result in increased customer satisfaction and long term adoption. Figure 3.8 illustrates the relationship between Perceived Ease of Use, Perceived Usefulness, Attitude and Behavioural Intention; and based on the above literature analysis and TAM model, it can also be hypothesised that:

- ***H1: Perceived ease of use of M-Government among the Omani end-users will have a positive association with the perceived usefulness of M-Government, and will positively influence their attitude toward using M-Government in Oman.***

- ***H2: Perceived usefulness of M-Government among the Omani end-users will have a positive association with their Behavioural intention, and will positively influence their attitude toward using M-Government in Oman.***

Figure 3.8: The Relationship between Perceived Ease of Use, Perceived Usefulness, Attitude and Behavioural Intention (based on TAM Model)

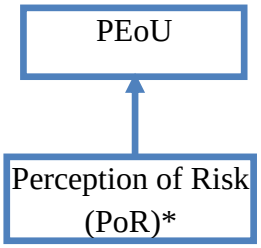


3.3.2.2. Relationship between Perception of Risk and Perceived Ease of Use

The importance of customer's perception of risk in the area of Internet banking is very crucial for the success of such innovation, although the trust and security issues are taken into account by banks. Due to the fact that the development of information technology businesses is becoming more transparent and this increases customer risk perceptions, therefore this has become an important topic for firms that provide Internet-based services. Several researches in the context of e-commerce study the risks associated with online transactions. Keeping in mind the different perspectives, the researchers studied risks at the various stages of online transactions. For instance, they focused on security and privacy risks, reliability of the other party, time risk (Vijayasarathy, 2004. The risks can be categorized as hard or soft risks – hard risks being more tangible such as loss of funds and time risks that can be measured. While there are also soft risks associated with online transactions, which depend on the context and perspective of an individual and cannot be measured. When people are asked questions about these risks, it is often seen that they are easily able to answer those pertaining to the tangible risks while they can answer about the soft risks vaguely, at best. This is because individuals cannot assess soft risks due to the intangible nature. It is also found that these risks are also more difficult to solve. For instance, if a customer loses money due to a fraud committed online, their bank is able to refund the money but cannot relieve the stress the situation caused. However, both types of risk have a significant impact on perception and are therefore important components of the risk perception model. Based on those earlier studies (Farzianpour et al. 2014; Lee et al. 2013), Figure 3.9 illustrates the relationship between Perception of Risk and Perceived Ease of Use, and it can also be hypothesised that:

- ***H3: The perception of risk acquired by the end-user of M-Government will have a positive association with their perceived ease of use of M-Government in Oman.***

Figure 3.9: Perception of Risk and Perceived Ease of Use Relationship



3.3.2.3. Relationship between Culture, Perception of Risk and Attitude

This research criticises the past assumption that all individuals living in any location in the world have similar perceptions and expectations about the elements of online environment including confidentiality dimensions. This assumption is highlighted in ignorance of culture variable in most of the studies conducted on adoption of M-Government. Researcher's criticism is confirmed by researchers (such as Eid, 2011; Wu et al. 2007; Peikari, 2010) who investigated the phenomenon in a cross-country context and found different results. Most of the earlier studies have been conducted in countries like US and UK which rank quite high in cultural dimensions such as individualism and low on uncertainty avoidance. Yet, culture in countries like Oman rank quite low on individualism and high on uncertainty avoidance and hence the findings of studies conducted in western nations cannot be applied to culturally distant nations such as Oman (e.g., (Peikari, 2010)). In addition, there is a big difference in ICT, particularly e-commerce, infrastructures between developing and developed countries and hence research into adoption of e-commerce in these countries and other similar countries should be conducted separately (Peikari, 2010).

Culture has a significant impact on how people behave in different situations and how they perceive things such as technology. Researchers have carried out extensive research on how culture affects our Behaviour and perception towards different aspects of technology. For example, Hiller (2003) fund that people from different cultures have different perceptions towards usefulness of multilingual websites. In the context of adoption of technology, Narteh (2012) speculated that adoption of technology may be

significantly influenced by users' socio-cultural belief, values and experiences. Hence Narteh (2012) recommends aligning ICT-oriented services like M-Government with the socio-cultural perspective of the customers in order to increase its adoption.

Furthermore, Omani culture embraces values such as family values, society and community and this is quite evident in each and every aspect of life (Hofstede, 2015). Individuals mostly think collectively considering the wider impact on the family and social network. For example, when individuals take decisions, they consider how their decision will be perceived by other members in the social network. Individuals thus tend to follow the established norms and principles of society. In case of Oman, religious principles are set of principles commonly followed by almost all Omani individuals. This brings uniformity in their Behaviour which is also likely to reflect in their adoption of technology, such as M-Government. If it becomes accepted as a norm in the society, the adoption is likely to be rapid. But until it happens, it is very likely that adoption will remain low, regardless of the technology advantages.

There is a possibility that the Behaviour of individuals as far as adoption of technology is concerned can be influenced by their culture. However, more empirical researches are required to ascertain the truth. Lee et al., (2013) for example employed using Hofstede's cultural dimensions and bass diffusion model to investigate the difference between American and South Korean customers' adoption of mobile phones. Their findings indicate that while US culture plays a vital role in adoption of innovation, South Korean culture promoted imitation. This indicates that in individualistic societies like US, individuals' decisions are based on their personal views and not the collective views of the society. Individuals here are likely to seek direct information and on their own.

On the other hand, in collectivist societies such as South Korea, individuals tend to seek information collectively. In such societies, the decision to adopt or reject is taken at the collective social level. Oman is a collectivist society (Hofstede, 2015) and hence decisions are expected to be taken collectively. This means that the adoption of M-Government will be either very high or very low based on the collective perception of the society. At the current levels, it seems to be in the lower side (Eid, 2011). Gupta et al (2012) studied the role of organizational culture in the adoption of technology in a government agency of a developing country like India, and found that it is a precursor to the users' acceptance and use of the Internet technology (UTAUT). UTAUT is a

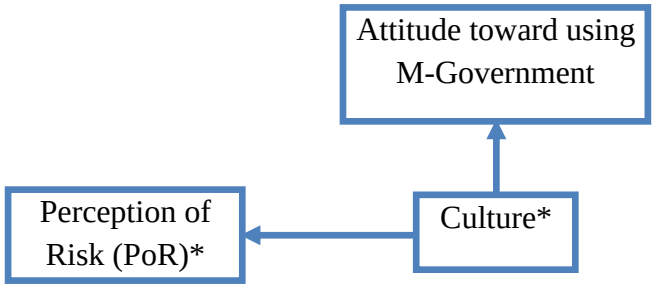
well-researched and used model to study adoption of technologies in developing nations. Sana et al. (2010) used a sample of sixty-four countries to study the influence of culture on adoption of technology, specifically wireless communication.

Their findings indicate that the technology diffusion patterns are similar in countries which share cultural attributes. Furthermore, they found that while masculinity aspect of culture has no significant bearing on the adoption of technology but uncertainty avoidance aspect, which is directly related to the perception of risk, does have a significant influence on the adoption of new technology. They recommend conducting further research to understand how the culture influences adoption of technology.

Setlock and Fussell (2010) found that due to higher value of personal relationships among Chinese customers as compared to US customers, Chinese customers are more likely to interact face to face with other individuals and often use video chats to interact (Wang et al, 2009). In fact, most Asian societies are high context cultures and tend to prefer video-based chatting as compared to North Americans (Kayan et al, 2006). This is relevant for this research because if Omanis are found to be of similar characteristics as Chinese, it would mean that they are more likely to value their personal relationships and more likely to adopt the M-Government model where they can meet the teller face to face. Based on this analysis of those earlier studies, Figure 3.10 illustrates the relationship between Culture, Perception of Risk and Attitude, and it can also be hypothesised that:

- ***H4: The Omani culture and its impact on the end-user of M-Government will have a positive association with the perception of risk acquisition; and will positively influence users' attitude toward using M-Government in Oman.***

Figure 3.10: The Relationship between Culture, Perception of Risk and Attitude



3.3.2.4. The Role of Personality Trait as a Moderator between Behavioral Intention and Actual Use

The relationship between Behavioural intention and actual use has different judgments. Therefore, past empirical studies have provided evidence on the positive relationship between Behavioural intention and actual use of Information Systems, as well as ICT-oriented services and products, similar to the M-Government (Parks-Leduc et al. 2015), while other studies found that no significant impact between Behaviour intentions and actual use according to Tao (2009). Personality has been theorized to significantly impact the relationship between intentions and Behaviours, although few studies have yielded conclusive evidence (Ajzen 2005; Gountas and Gountas, 2007). Moreover, the personality trait is an indication of theoretical support for a connection between personality traits and beliefs. Therefore, this research investigates the role of personality as a moderator of the intention Behaviour relationship. Likewise, drawing on Baron and Kenny (1986) a moderating variable should be considered when empirical findings offer inconsistent results. Thus, the moderating role of personality trait has been theorized significantly by Personality Trait Theory (McCrae and Costa, 1992). Moreover, the theoretical framework which was proposed in the last studies supports the existence of this relationship (Behrenbru et al. 2013; Parks-Leduc et al. 2015).

According to Goldberg (1981), the current research uses Five Factor Model to give evidence that the theoretical model applied in the research as the Five Key Factors is a significant instrument for assessing personality (Howard, Medina and Howard, 1996). Goldberg (1981) said that an agreement is coming up that the Five Factor Model approach of describing personality traits, commonly identified as the ‘Big Five’ can be utilized to define the most important features of personality. The personality trait can be identified in any assessment of characteristic structure as well as assessment of the trait, statistical assessment of existing complex dimensions in which professional experts create judgments depending on the existing dimensions (McCrae and John 1992; Mount and Barrick 1998).

Many studies have incorporated the regulation function of personality traits on the relations between thoughts and the real application of Behavioural action with different outcomes (Shropshire et al. 2015; Parks-Leduc et al. 2015; Behrenbruch et al. 2013; Devaraj, et al. 2008). Personality trait has been utilized in management research and

psychology to predict impacts of Behaviour and attitudes. Nevertheless, influence of personality traits has been disregarded in the area of information technology. Moreover, it can be easily seen that the earlier research is looking forward to adopt technology and management matters into a theoretical framework. Based on this study, thus, it may be expected that the potential use of integration of these factors into this work by utilizing the personality traits in the perspective of embracing technology framework and willingness to adopt M-Government.

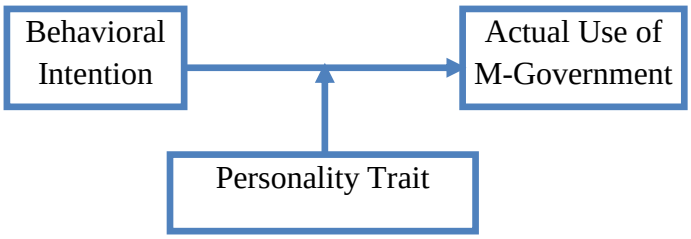
Shropshire et al. (2015) said that agreeableness and conscientiousness moderated the relation between actual use and intent. Salgado (2002) discovered more important relations; despite the different outcomes that have been seen, one key concept appears to be recurring in these studies, that is the relation between traits and the real application of Behavioural action. All these studies did not concentrate on respondents of people who use ICT, including M-Government, in the public sectors in their assessments. Nevertheless, these studies have indicated discrepancies in which specific traits are associated with the ICT-oriented services and products (McElroy, Hendrickson, Townsend and Demarie 2007). Thus, it is crucial to assess which traits constantly associate with the use and adoption of M-Government. Figure 3.11 illustrates the relationship between Behavioural intention and actual use with the role of Personality Trait as a moderator, and based on the above analysis of the earlier literature, it can be hypothesized that:

- ***H5: The Behavioural intention of the end-users of M-Government will positively influence their actual use of M-Government in Oman.***

- ***H6: The personality trait of the end-users of M-Government will be a moderating factor with a positive impact on the relationship between the Behavioural intention and their actual use of M-Government in Oman.***

- ***H7: Some of the demographic variables of the end-users of M-Government in Oman (including, gender, age and education) will positively impact on the factors that constitute a Mobile Government Adoption Model in Oman.***

Figure 3.11: The Role of Personality Trait as a Moderator between Behavioural Intention and Actual Use

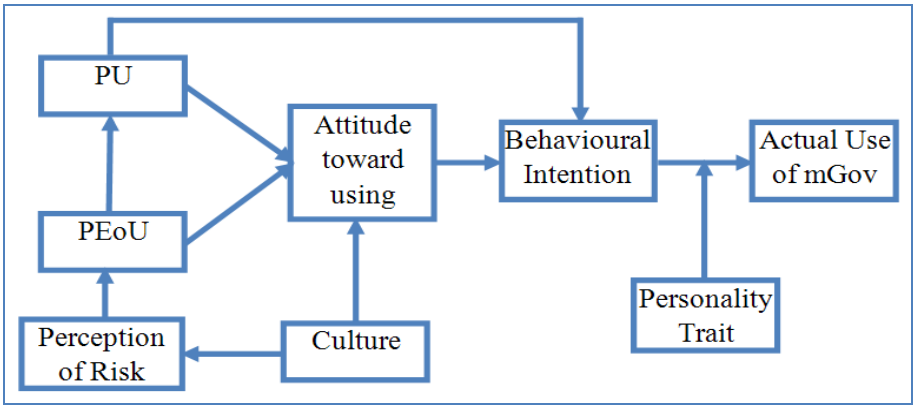


3.3.3. Proposed Theoretical Research Model

This research makes critical extensions of the TAM model: Perceived risks, culture and the role of personality traits. In simplistic thinking, when users develop a positive perception of the risks associated with the M-Government, it will be expected to more perceive the ease of use of the M-Government services. The users' culture is expected to have a positive or negative impact on the customer perception of risks, and this depends on how the Omani culture observes the risks associated with the M-Government; this culture is also expected to have an impact on the attitude of users, be it positive or negative. Once the user develops a positive attitude toward the M-Government, it is expected that the user will be more satisfied, and then will be more ready to adopt M-Government; otherwise, the user will experience a low level of adoption and then low actual use.

Therefore, this work will extend TAM model to validate the model given in Figure 3.12 to identify, and then evaluate their impact, the user-centric factors affecting or influencing the adoption and acceptance of M-Government in Oman. This work will ultimately enable the development, and empirically test and validate, a novel adoption and acceptance model in the area of M-Government, will be named Mobile Government Adoption Model (MGAM).

Figure 3.12: Research Model – Mobile Government Adoption Model (MGAM)



Mathematically, the above MGAM model and the interrelationships between the variables can be expressed as the following functions. Yet, those functions and formulas will need validation within the context of M-Government in Oman, and will be used to develop a novel mathematical model for articulating the factors affecting the adoption of M-Government in Oman. The model and variables in the following formulas will be validated and presented later in this thesis:

$$PoR = Wi * CL \quad (1)$$

$$PEoU = Wz * PoR \quad (2)$$

$$PU = Wx * PEoU \quad (3)$$

$$AB = Wa * PU + Wb * PEoU + Wc * CL \quad (4)$$

$$BI = Wh * AB + Wj * PU \quad (5)$$

$$AU = Wm * BI + Wn * PT \quad (6)$$

Such that,

W_j : The regression coefficients among latent variables.

PoR : Perception of Risk

$PEoU$: Perceived Ease of Use

PU : Perceived Usefulness

CL : Culture

AB : Attitude towards Behaviour

BI : Behavioural Intention

AU : Actual Use

PT : Personality Traits

According to this proposed MGAM Model and in the context of using M-Government applications and services in Oman, it can be expected that the Perceived Ease of Use may explain the Perceived Usefulness of the technology, the Perception of Risk may explain the Perceived Ease of Use of this technology, and the Culture may explain the Perception of Risk related to the M-Government. In the same manner, it can also be expected that the Perceived Ease of Use, Perceived Usefulness and Culture may explain the Attitude towards using the technology, and the Perceived Usefulness and Attitude of the users may explain the Behavioural Intention of the technology. In addition, while the Behavioural Intention of the users using M-Government Applications and service in Oman is expected to explain the Actual Use of the technology, the Personality Trait is expected to strengthen this positive relationship.

3.4. Summary

Throughout the tremendous increase in the number of theoretical and empirical research on ICT acceptance, use and adoption, scientists and researchers tried to understand how customers and users come to accept, use and adopt the technology, such as the development of mobile technologies and applications, as well as the Internet driven services. There have been increasing attempts to modify, expand or enhance the existing adoption and acceptance theories and models; some of them are contradicting and conflicting as they involve varying constructs at different levels of analysis, businesses, governments and customers or the end-user perspectives. Fundamental to these studies is the definition of adoption as a static event and the excessive attention given to the prediction of intention of the customers to adopt through the use of TAM, TPB, TTF, etc, and their derivatives. While these existing studies contribute to the understanding of why users accept a certain ICT technology, gaps remain in the understanding of the process by which users decide whether to consider new technologies such as M-Government and then use, and finally adopt the service. Many studies also showed that the factors affecting the technology adoption can be a user-cantered rather than to a technology-related and thus further work is needed to investigate such issue.

The theoretical rationale for this research is to examine the factors influencing the adoption of a newly developed technology, i.e., M-Government, and then identify how high level of adoption can be achieved within a specific cultural context, i.e., Oman.

This scientific and Behavioural problem should be treated as a multistage process to involve ICT acceptance, use and adoption as an initial stage, and then identify the diverse beliefs and attitudes that affect the rates of adoption and actual use of the technology. To achieve understanding, the overall phenomenon of adoption and acceptance in the area of M-Government, combining the existing constructs from ICT acceptance studies and models remains of interest. For the purpose of this project, TAM Model will be considered with the embedded constructs, perception of risks, culture and personality traits will be the key constructs to develop the novel M-Government adoption model.

Chapter 4

Research Methodology

This chapter provides a detailed description of the research methodology used in this research. The chapter revisits the research questions, identifies the research dependent and independent variables, and develops the research hypotheses. The chapter then presents details on the approach and methods for data collection, and details on the study population and sampling selection. The development, validation and reliability of the data collection instrument (i.e., Survey) and questionnaire design with the procedures used for data collection are presented in this chapter.

Furthermore, this chapter discusses the statistical and graphical modelling techniques used for data analysis and description including Descriptive and Inferential Statistic, Structural Equation Modelling (SEM), Comparative Fit Index Analysis, and the Statistical Software Applications including SPSS and AMOS Applications. Finally, the chapter provides data on the research Trustworthiness and Normality with results in Reliability and Validity Measurement, Exploratory Factor Analysis (EFA), Normality of Distribution and Pilot Survey; Research Ethics are also discussed in this chapter.

4.1. Research Framework - Revisiting

4.1.1. Mobile Government Adoption Model

The research theoretical framework integrates several aspects of approved scientific theories and integrates their different variables to understand the user-centric factors

affecting the adoption of M-Government in Oman, as discussed in Chapter 3, see Figure 3.12 illustrating the model named the Mobile Government Adoption Model (MGAM).

4.1.2. Research Questions - Revisited

As mentioned earlier and based on the scanning of literature on M-Government, several key questions in regards to the development of a roadmap towards m-Government planning and implementation remain to be answered. This has prompted the key and main research question that underpins the current project "What are the user-centric factors affecting the adoption of M-Government in Oman?" Thus, to answer this main question, this research will seek to answer the following questions:

1. What are the factors that make up the construction of a Mobile Government Adoption Model for the successful implementation and adoption of M-Government in Oman? (i.e., what constitutes the Mobile Government Adoption Model (MGAM)?).
2. To what extent can the Omani culture impact on the perception of risk acquired by the end-user of M-Government (and influence their attitude towards using the technology)?
3. To what extent can the perception of risk by the end-user of M-Government influence their perceived ease of use of M-Government in Oman?
4. To what extent can the end users' perceived ease of use of M-Government impact on their perceived usefulness of this technology (and on their attitude towards using M-Government in Oman)?
5. To what extent can the usefulness perception of the end-users of M-Government impact on Behavioural intention towards this technology? and on their attitude towards using M-Government in Oman?
6. To what extent can the Behavioural intention of the end-users of M-Government impact on their actual use of the M-Government in Oman?
7. To what extent can the personality trait be a moderating factor with impact on the relationship between the Behavioural intention of the end-users of M-Government and their actual use of the M-Government in Oman?
8. To what extent can the demographic variables of the end-users of M-Government in Oman (gender, age and education) impact on the factors that are the constituents of an M-Government Adoption Model in Oman?

4.1.3. Research Variables and Hypotheses

4.1.3.1. Independent Variables

As mentioned earlier, the positivist position of this project treats any scientific phenomenon as having a fixed nature characterized by patterns of cause on one side (i.e., independent variable in this case) and effect on the other side(i.e., dependent or outcome variable) which are capable of being described and predicted. The independent variables in a study are manipulated through some form of investigation in order to measure their effects on the dependent variable(s). As such, a "predictor variable" is a name also given to such independent variable(s).

The independent variable can influence the dependent variable in a variety of ways, for example, there can be positive, negative, mediating and moderating effects between the two, or even more, variables (Cavana, Delahaye and Sekaran, 2001). It is important to note that, while one variable may be an independent in a single or direct relation or link with another variable, this independent variable may become dependent in another case of a single or direct relation or link with another variable. For example, while Attitude is an independent variable of the Behavioural Intention, it is, i.e., Attitude, a dependent variable on Perceived Ease of Use and Perceived Usefulness. Thus, the independent variables of focus and interest in this research involve the Culture in Oman, the Perception of Risk, Perceived Ease of Use, Perceived Usefulness, Attitude, Behavioural Intention and Personality Trait.

4.1.3.2. Dependent Variables

The main dependent variables in this project involve Behavioural Intention of the users and their Actual Use of M-Government; those variables are the primary interest of this research. This research proposes to measure Behavioural Intention and their Actual Use using the independent variables mentioned earlier.

4.1.3.3. Research Hypotheses

As illustrated in the Mobile Government Adoption Model (MGAM), the key issue here involves the user-centric factors affecting the adoption of M-Government in Oman, particularly those factors with impact on the attitude towards using this new technology. The use of such new technology will then impact on the Behavioural intention, and consequently affect the actual use. Throughout this process, the project tries to investigate the validity of the following hypotheses:

- ***H1***: Perceived ease of use of M-Government among the Omani end-users will have a positive association with the perceived usefulness of M-Government, and will positively influence their attitude towards using M-Government in Oman.
- ***H2***: Perceived usefulness of M-Government among the Omani end-users will have a positive association with their Behavioural intention, and will positively influence their attitude towards using M-Government in Oman.
- ***H3***: The perception of risk acquired by the end-user of M-Government will have a positive association with their perceived ease of use of M-Government in Oman.
- ***H4***: The Omani culture and its impact on the end-user of M-Government will have a positive association with the perception of risk acquisition; and will positively influence users' attitude towards using M-Government in Oman.
- ***H5***: The Behavioural intention of the end-users of M-Government will positively influence their actual use of M-Government in Oman.
- ***H6***: The personality trait of the end-users of M-Government will be a moderating factor with a positive impact on the relationship between the Behavioural intention and their actual use of M-Government in Oman.
- ***H7***: Some of the demographic variables of the end-users of M-Government in Oman (including, gender, age and education) will positively impact on the factors that constitute a Mobile Government Adoption Model in Oman.

4.1.4. Units of Analysis

The variables are categorized into the groups according to the framework which was developed in this research. Variables are measured in ways that enable hypotheses testing. However, in an attempt to reduce the scale bias, Likert scales are used to measure the dependent and independent variables (Sekaran, 2006). The questionnaire that will be used utilises closed questions that are mutually exclusive, quick, easy to interpret and easy to answer. The questions (or statements) were constructed with each dimension of the variables in mind based on a comprehensive review of the relevant literature in the domain.

The research here focuses on assessing the user-centric factors with real impact on the adoption of M-Government within the context of Oman. Therefore, the unit of analysis for this study is individual people who are using M-Government applications and services in Oman, the sample will comprise around 500 respondents. The appropriate sample size recommended by Sakaran (2003) is 500 respondents for this kind of study. These respondents will be chosen for this study as long as they use M-Government applications and services, otherwise, the participant(s) will be excluded. This would provide a more reliable answer to our research questions about the target factors and enable assessing the impact of those factors on the attitude, intention, Behaviour and actual use of the M-Government in Oman.

4.2. Research Context

4.2.1. Study Population and Sample Selection

The respondents in this study will be selected through purposive sampling. The purposive sampling used is based on making judgement; this activity will involve the choice of subjects who are in the best position to provide the information required by respondents and are typically chosen using non-probability methods (Sakaran, 2003). First, the researcher will select Social Networking Sites (SNS) for the online survey distribution, uploaded online using the paid service for data collection at "www.SurveyMonkey.com", to around 600 people for different universities and organizations in Oman as study samples. The target respondents are the individuals with the use of M-Government applications and services, and similar technologies, over the last one or more years; geographically, the sample selection is conducted in the main cities in Oman, and is reached online via the data collection service provider.

The selection of participants through SNS from the main universities and organizations in the main cities in Oman contribute to ensure the validity of the data collection and the overall study, as they have similar experiences in regards to the use of M-Government technology. Those choices are also fed by the purposive sampling technique and this is justified by ease of access to these locations in person and via online services for data collection; this research therefore has adopted the "purposive sampling" technique. The participants are selected for inclusion in this project as long as they are mature, university students, and use applications and services provided by the M-Government, regardless of their nationality. Those participants are expected to have access to M-

Government channels, and to experience services offered by the government through mobile applications.

4.3. Data Collection Methods

4.3.1. Instrument and Questionnaire Design

A survey questionnaire was defined as "any written instruments that present respondents with a series of questions or statements to which they react either by writing out their answers or selecting from among existing answers" (Brown, 2001). In this project, the process for developing the research instrument was based on the guidelines suggested in the literature (Churchill 1979; Davis 1989; Moore and Benbasat 1991; Hinkin, 1998). The instrument developed for this research is titled "User-Centric Factors affecting the Adoption of Mobile Government (M-Government) in Oman", Appendix A.

An opening paragraph is the main component of the survey, i.e. a "Welcome Page", for welcoming the participants and informing the research aim, confidentiality statement, ethical considerations and appreciation for their participation. The questionnaire then introduces the key concepts related to the study such as M-Government and Mobile Phone Applications; some of the participants may not be aware of those concepts. The questionnaire then will involve two main sections of questions and statements: Section A and Section B. The measurement used is a nominal scale which will help to split data into mutually exclusive and collectively exhausted categories for further analysis (Sekaran, 2006).

Section A involves questions to collect Demographic Data, including age, gender, level of education, etc., and Data about the use of new technologies related to the applications and services of M-Government, such as the Internet, Smartphones, etc. Section B involves statements to collect data about the factors affecting the adoption of M-Government in Oman; the respondents in this section will be asked to indicate their degree of agreement or disagreement with each item on a five point Likert – type scale will be used with 1 = "strongly disagree" to 5 = "strongly agree". A very common issue to consider here in scale construction is the number of items for each construct. It has been reported that there are no hard-and-fast rules guiding this issue; however, keeping the measurement process short is an effective way to minimize response biases caused

by boredom or fatigue; this is in addition to saving time for development, data collection and data analysis (Hinkin, 1998). Furthermore, it was recommended that at least four items per construct or scale are needed to test the homogeneity of items within each construct (Hinkin, 1998); this work will develop five items for each construct.

In particular, the items or statements for the measurement scales of all constructs in Section B were taken from earlier studies whilst taking into account related theories as explained in Chapter 3. Table 4.1 lists the statements or items used to obtain data about the major constructs as in the Mobile Government Adoption Model (MGAM); some of the statements are modified slightly for clarity and language consistency with M-Government adoption constructs, while some others will be self-developed by the researcher where no statements have been cited in the literature.

Table 4.1: List of Constructs and Items to be used in the MGAM Survey

Constructs	Codes	Items	Sources
Perceived Ease of Use (PEU)	PEU11	It is easier to obtain governmental services using Mobile Government Applications.	(Mahadeo, 2009)
	PEU12	It is easier to make payments using the Mobile Government Applications.	(Mahadeo, 2009)
	PEU13	The Mobile Government Applications are user friendly and understandable.	(Mahadeo, 2009)
	PEU14	I find the Mobile Government Applications easy to download and use.	(Mahadeo, 2009)
	PEU15	The Mobile Government Applications provide full details and complete information I need.	(Gummerus et al., 2004)
Perceived Usefulness (PU)	PU21	It is more efficient to use Mobile Government Applications when I am doing more than one service.	(Mahadeo,, 2009)
	PU22	Using the Mobile Government Applications makes it easier and simpler for me to obtain services approval and confirmation.	(Mahadeo, 2009)
	PU23	Using the Mobile Government Applications enhances my effectiveness by saving time in preparing my requests.	(Mahadeo, 2009; Bisdee, 2007)
	PU24	I find the Mobile Government Applications useful in preparing my services and providing me with full details of the services and policies.	(Mahadeo, 2009; Bisdee, 2007)
	PU25	Using the Mobile Government Applications provides easy services-related information prior to requests.	(Davis, 1989; McCloskey, 2004)
Attitude To Use (AT)	AT31	I like the idea of using Mobile Government Applications for requesting governmental services.	(Mahadeo, 2009)
	AT32	Using the Mobile Government Applications is useful and beneficial to me.	(Mahadeo, 2009)
	AT33	Using the Mobile Government Applications is a good and pleasant experience.	(Mahadeo, 2009)
	AT34	I feel positive about using the Mobile Government Applications to obtain services and information.	(Barkhi et al., 2008)
	AT35	The features of the Mobile Government Applications help me obtain more services effectively.	(Childers et al., 2001)
Behavioral Intention (BI)	BI41	It is likely that I will use the Mobile Government Applications again for other services.	(Mahadeo, 2009)
	BI42	I expect that the Mobile Government Applications will make governmental services even easier in the future.	(Mahadeo, 2009)
	BI43	I expect using Mobile Government Applications whilst engaging in other entertainments and enjoyments.	(Davis, Bagozzi, and Warshaw, 1992)
	BI44	I expect the Mobile Government Applications would be considered a major and strategic investment.	(Oliver, 1997).

	BI45	I expect that my loyalty is strong with a commitment to re-use of Mobile Government Applications in the future.	(Oliver, 1997).
Perception of Risk (PoR)	PoR51	I am concerned that the Mobile Government Applications may not deliver the expected standard of service, or may deny me access to my account due to some unknown faults.	(Nicolaou et al., 2013; Alsomali, 2015)
	PoR52	I am concerned that the Mobile Government Applications may not be able to complete my transaction due to some problem.	(Nicolaou et al., 2013; Alsomali, 2015)
	PoR53	I am concerned that the Mobile Government Applications may not be able to protect my personal details, and that someone may access my account without my permission.	(Usman and Shah, 2013; Alsomali, 2015)
	PoR54	I am concerned that the Mobile Government Applications may not be reliable or secure enough to conduct services and finish transactions.	(Usman and Shah, 2013; Alsomali, 2015)
	PoR55	I am concerned that the Mobile Government Applications may cause financial or data loss when I make payment to the government.	(Polatoglu and Ekin, 2001; Alsomali, 2015)
Culture (CT)	CT61	I am not completely sure or aware about the benefits of Mobile Government Applications and their services.	(Arnould and Thompson, 2005; Farzianpour et al., 2014)
	CT62	I prefer seeing things like government services happening with my own eyes rather than using Mobile Government Applications.	(Arnould and Thompson, 2005; Farzianpour et al., 2014)
	CT63	I am concerned that Mobile Government Applications do not allow me to control my governmental services as I normally do in governmental offices.	(Arnould and Thompson, 2005; Farzianpour et al., 2014)
	CT64	I am not comfortable using Mobile Government Applications over governmental offices.	(Arnould and Thompson, 2005; Farzianpour et al., 2014)
	CT65	I am concerned that Mobile Government Applications is not compatible with my religious beliefs and culture.	(Arnould and Thompson, 2005; Farzianpour et al., 2014)
PTAgreeableness	AGR71	I see myself as someone who easily tends and accepts to go along with others.	(Goldberg 1992; Shropshire, Warkentin and Sharma, 2015)
	AGR72	I see myself as someone who is loyal and unselfish with others.	(Seibertand Kraimer, 2001)
	AGR73	I see myself as someone who is polite and likes to cooperate with others.	(Goldberg 1992; Shropshire, Warkentin and Sharma, 2015)
	AGR74	I see myself as someone who is cold, calm and is generally trusting	(Seibert and Kraimer, 2001)
	AGR75	I see myself as someone who is helpful and kind to almost everyone.	(Goldberg, 1992; Shropshire, Warkentin and Sharma, 2015)

PTConscientiousness	CON81	I see myself as someone who makes plans and follows through with them.	(Goldberg 1992; Shropshire, Warkentin and Sharma, 2015)
	CON82	I see myself as someone who can be somewhat capable and does things efficiently.	(Goldberg 1992; Shropshire, Warkentin and Sharma, 2015)
	CON83	I see myself as someone who is a reliable worker and tends to be well-organized.	(Goldberg 1992; Shropshire, Warkentin and Sharma, 2015)
	CON84	I see myself as someone who tends to be hard working and does the work on time.	(Goldberg 1992; Shropshire, Warkentin and Sharma, 2015)
	CON85	I see myself as someone who exercises patience and keeps trying until the task is finished.	(Goldberg 1992; Shropshire, Warkentin and Sharma, 2015)
Actual Use	APR91	The services I conduct and request using the Mobile Government Applications are clear and can be considered high or very high.	(Davis, 1989; Cheung and Vogel, 2013)
	APR92	Many of my friends have conducted and requested services using the Mobile Government Applications for several times.	(Davis, 1989; Cheung and Vogel, 2013)
	APR93	The services I conduct and request using the Mobile Government Applications vary and are for many governmental services.	(Davis, 1989; Cheung and Vogel, 2013)
	APR94	Some members of my family have conducted and requested for several time services using the Mobile Government Applications.	(Davis, 1989; Cheung and Vogel, 2013)
	APR95	The general volume of using and requesting services through the Mobile Government Applications is high or very high.	(Davis, 1989; Cheung and Vogel, 2013)

4.3.2. Survey Translation

The survey was translated by an official translation service provider, English into Arabic as the participants are mostly non-English speakers, Appendix B. Following this process, the Arabic edition of the survey was sent to proficient academics in both Arabic and English to be reverse translated into English, and both English editions were then compared. Some recommended modifications were made to the translated Arabic version based on the feedback received; this included using simple language and shorter statements, as some of the participants may not be highly educated. The pilot survey included both the Arabic and English versions, this process involved around 20 participants, allowing the researcher to obtain extra feedback on the translation.

4.3.3. Data Collection Procedure

As discussed earlier in this Chapter, the survey questionnaire will be used as the primary source of data collection. This method refers to information that is developed or gathered for the research project at hand (Burns and Bush, 2006). The questionnaire will be distributed online using data collection service provider, and the researcher will use e-mail with a link to the questionnaire uploaded online to collect the data. The advantage of using a website questionnaire survey is that they are efficient and relatively inexpensive. Another advantage is that it is easy, quick to deliver and convenient for the target respondents. The questionnaire will be distributed to respondents in Oman via SNS; the distribution time will give a response period of four weeks for the respondents to complete the questionnaire.

In addition, the responses provided by the participants from such questionnaires are captured and stored on a database that can be accessible to the researcher. The questionnaire follows a general visual structure (often electronic text), with no graphics, audio and hypertext links. In most cases, respondents receive a hyperlink via email or via SNS, which they click to move onto a consent page, which is followed by the survey. Ample research has described the benefits that e-surveys offer over traditional methods (Goeritz 2006); some of such benefits involve the low cost, shorter time to administer the data, and fewer mistakes due to typographic errors and interpretation of the respondent's handwriting.

4.3.4. Instrument Validity and Reliability

To reduce errors in data collection, it is important to rigorously develop a reliable and valid research instrument (Churchill 1979; Straub 1989; Moore and Benbasat 1991; Hinkin 1998). The content validity, construct validity, and reliability are some of the essential evaluation criteria for instrument development (Gefen et al., 2000). Content validity is a qualitative evaluation of the extent to which the measures or items of a construct actually capture its real nature, i.e., data. Content validity of the instrument is normally established through a pre-test which helps to eliminate measurement error caused by poorly worded or ambiguous questions or instructions, ensuring that all questions are appropriate and understood (Gefen et al. 2000).

Construct validity assesses whether the measures chosen are true measures of the constructs describing the event or if they are simply artefacts of the methodology per se (Cronbach 1971; Gefen et al. 2000). If the constructs are valid, then it can be expected that there are quite high correlations between measures of the same construct using different measurement items, and low correlations between measures of constructs that are expected to differ (Campbell and Fiske 1959; Hair and Anderson, 1995). In this chapter, both convergent and discriminant construct validity will be established (Campbell and Fiske 1959; Straub, 1989).

Convergent validity is the degree to which two or more attempts to measure the same concept are in agreement and it can be evaluated through Confirmatory Factor Analysis (Baggozi, 1993). Meanwhile, discriminant validity is the degree to which items are theorised to reflect the construct differs from those that are not believed to form the construct (Straub, 1989). Discriminant validity is commonly demonstrated using Confirmatory Factor Analysis (Baggozi, 1993). Finally, reliability analyses the extent to which measurements are repeatable (Straub, 1989; Straub, Boudreau and Gefen, 2004). The reliability of a multi-item measure can be estimated using tests and values given by Cronbach's Alpha (α) and Composite Reliability (CR) (Cronbach 1971; Field 2009).

4.4. Data Analysis Techniques

Quantitative data analysis is about making sense and meaning of collected data (Merriam, 1988). This process was reported to be a complex process that involves "working with data, organizing them, breaking them into manageable units, synthesizing them, searching for patterns, discovering what is important and what is to be learned, and deciding what you will tell others" (Bogdan and Biklen, 1992).

4.4.1. Descriptive Statistic Analysis

Descriptive Statistics is one of the statistical techniques that are used for data analysis in this project. The descriptive statistics provides the calculations related to the demographic data and study variables under investigation in terms of frequencies, percentages, means and standard deviations, using statistical software SPSS application. The data is then tabulated and exported to MS-Excel, where graphs are constructed and analysed. The purpose of descriptive analysis is also to represent raw data transformed into a form that will make it easy to understand and interpret. The items in section B of

the survey were measured based on 5 point Likert scale, where 1 represents "strongly disagree" and 5 represents "strongly agree" (Table 4.2). The average scores of independent variables including culture in Oman, the Perception of Risk, Perceived Ease of Use, Perceived Usefulness, Attitude, Behavioural Intention and Personality Trait, are all calculated and discussed one by one in the Chapter 5.

Table 4.2: Likert Scale Category

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
SD	**D**	**N**	**A**	**SA**
1	**2**	**3**	**4**	**5**

(Source: (Sugiono, 2005, p.87))

4.4.2. Inferential Statistic Analysis

Inferential Statistics is also used in the form of multiple regression and Structural Equation Modelling (SEM) (Gefen et al. 2000). Regression analysis can be a useful technique to test and explore relationships between different constructs. They are a set of statistical techniques that allow the researcher to investigate the relationships between one dependent variable and several independent variables (Gefen et al. 2000). Regression analysis can also be applied to a data set in which independent variables are correlated with each other and/or with the dependent variable (Hair et al., 1995).

There are two types of relationships among variables to be investigated in this study: Directional and non-directional. Directional relationships represent hypothesized linear directional influences of one variable on another. Non-directional relationships represent hypothesized co-relational associations between variables (MacCallum, 1995). For example, the link between Culture and Attitude may represent a directional association between the two variables, while the link between Culture and Intention may represent a non-directional association between the two variables. Each of these directional and non-directional associations can be thought of as having a numerical value associated with it. The numerical values associated with directional effects are values of regression coefficients. Numerical values associated with non-directional relationships are covariance or correlation values. These regression coefficients and covariance are called model parameters. A major objective in SEM is to estimate the values of these parameters.

4.4.3. Structural Equation Modelling

Structural Equation Modelling (SEM) will be used in this project to assess the overall fit of a model as well as test the structural model overall (e.g., (Gefen et al. 2000)). SEM evaluates an entire hypothesized multivariate model, including the hypothesized structural linkages among variables, and between each variable and its respective measures (Bagozzi and Baumgartner, 1994). SEM is a family of multivariate statistical techniques used to examine direct and indirect relationships between one or more independent variables and one or more dependent latent variables (Gefen et al. 2000). SEM can be seen as a flexible modelling tool for conducting many multivariate statistical analyses, including regression analysis, path analysis, factor analysis, canonical correlation analysis, and growth curve modelling (Cheung and Chan 2004).

4.4.4. Comparative Fit Index Analysis

The Comparative Fit Index (CFI) will be used as a first procedure in this project to validate and asses the model developed for this study. The CFI compares the fit of the hypothesised model to an independent model or null model. Its value ranges from zero to one, with values above 90% indicating a good fit of the model under investigation, i.e., MGAM (Hu and Bentler, 1999). As the final step is the model modification, if the fit of the hypothesized model is less than satisfactory, then the model can be modified to improve its fit. There are two ways to improve the fit of the model. One is to delete parameters that are not significant. However, if they are important in the theory, they will remain in the model (Schumacker and Lomax, 2010). The second way is to include additional parameters with impact.

The AMOS program will be used for model modification through applying one of three techniques: The Modification Index (MI), the Expected Parameter Change statistic (EPC), and the Standardised Residuals (SR) (Byrne, 2001). The MI indicates the expected drop in overall χ^2 values if each fixed parameter was to be freely estimated in a subsequent run. The larger MI for a particular fixed parameter would suggest that a better model fit by allowing this parameter to be free. The EPC indicates the estimated change in the magnitude and direction of each fixed parameter if it was to be free. The SR is known as the Z scores in AMOS analysis. Larger scores of Z value indicate a

particular relationship is not well explained by the model; it is suggested that values greater than 2.58 are to be considered as large (Jöreskog and Sörbom, 1988).

The second procedure in evaluating the fit of the model will be to assess the fit of the entire model. The AMOS program provides a number of fit indices. However, this study used the following major indices as recommended by Byrne (1998). These were the Chi-square (χ^2) test, the Normed chi-square (χ^2/df), Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA). These indices are explained below.

- The traditional fit index is the chi-square χ^2 test and it is the only statistical test of significance in SEM. A non-significant chi-square value indicates that the hypothesized model fits the sample data well. The Normed chi-square is the ratio of the χ^2 divided by the degree of freedom and a value less than 3.0 indicates acceptable fit (Hu and Bentler, 1999). However, χ^2 is affected by sample size and normality of the data (Kline, 1998; Tabanchnick and Fidell, 2001; Schumacker and Lomax, 2010). Therefore, the χ^2 test should be used in combination with other indices.

- The GFI and AGFI are similar to squared multiple correlations. They indicate the relative amount of sample variance and covariance explained by the model under investigation. The AGFI differs from the GFI in that it adjusts the number of degrees of freedom in the specified model. Both indices range from zero to one, with values exceeding 0.90 indicating a good fit model (Byrne, 2001).

- The CFI compares the fit of the hypothesized model to an independent model or null model. Its value ranges from zero to one, with values above 90% indicating a good fit, i.e. an acceptable model (Hu and Bentler, 1999).

- The RMSEA represents the discrepancy per degree of freedom between the population data and the hypothesized model. According to Browne and Cudeck (1993), RMSEA values of less than or equal to 0.05 can be considered as a good fit, values between 0.05 and 0.08 as an adequate fit, and values between 0.08 and 0.10 as a mediocre fit, whereas values above 0.10 are unacceptable and the model then is not fit.

4.4.5. Statistical Analysis - AMOS Application

The Analysis of Moment Structures (AMOS) software is an added SPSS module. This application is mainly used to conduct Confirmatory Factor Analysis and Structural Equation Modelling (SEM). The application is helpful in generating graphical models using computationally simple and quick tools.

4.4.6. Statistical Analysis - SPSS Application

The statistical package SPSS will be used to analyse the data collection in this study. For data processing, four statistical techniques are used for different purposes. SPSS is a useful and important program as it is able to provide tests that help to validate the statistical significance of the results. No numerical data that involves specific rates or equations has been used in this research, i.e. this renders non-parametric tests suitable for the data potentially generated in this research. Pearson's chi-square will be used to study the correlation between two variables. This is the most valid test for the analysis of categorical data as it compares assumed frequencies to expected frequencies, and the likelihood that any effects occur. The data is then fed into a tabular format and then these tables are exported into MS-Excel and SPSS software applications where the graphs are interpreted. Each graph represents the data that is fed into the table. These included frequency, descriptive statistics, validity and reliability tests, correlation analysis, regression analysis and other findings.

4.5. Trustworthiness and Verifying Data Characteristics

4.5.1. Reliability Measurement

Reliability measures represent the degree of correlation between items within an individual construct (Straub, Boudreau and Gefen, 2004).Reliability refers to the extent to which the respondent can answer the same questions or close approximations in the same way each time they answer the questionnaire statements, i.e. it evaluates consistency and accuracy (Straub, 1989). To assure reliable results, the wording of each question should be precise, clear and unambiguous. This is to guarantee as much as possible that every participant of the research population will be able to understand and interpret the questionnaire statements easily and accurately, i.e., obtaining the same results as much as possible if the study is duplicated. While reliability may be calculated in a number of ways, the most commonly accepted and used measure in field studies

similar to this study is internal consistency reliability using Cronbach's α (Cronbach 1971; Hinkin 1998).

In the specific cases similar to this study where the theoretical foundation is based on Technology Acceptance and Expectation Confirmation models, nearly all researchers prefer internal consistency statistics for reliability testing (Straub, Boudreau and Gefen, 2004). The generally agreed upon lower limit for Cronbach's alpha is 0.7 but it may be lowered to 0.6 in exploratory research (Straub 1989; Hair and Anderson, 1995). While a low Cronbach's α (i.e., lower than 0.60) may indicate poor construct definition or a multi-dimensional construct, a very high Cronbach's α (above 0.95) may suggest the presence of common methods bias (Straub, Boudreau and Gefen, 2004).

To achieve the reliability of a data collection instrument as a research tool, a pilot survey on the user-centric factors affecting the adoption of M-Government in Oman was conducted. The primary aim of this pilot stage is to test the reliability of the various scales used in the questionnaire (Cronbach 1971; Hair and Anderson, 1995; Field 2009). In order to achieve this goal, the questionnaire was presented to a sample whose background is similar to the target population of the final study (Hinkin, 1998). In this case, the pilot study was conducted on Omani users of mobile devices and applications for governmental services. The next stage of the instrument development process comprises a "full-scale" pilot study, i.e., the actual study and survey of this project. The main findings of the pilot survey and conclusions are used to the reliability, normality as well as factor analysis of using the theories to develop the MGAM Model. The statistical tests used during this stage involve Kolmogorov-Smirnov and Shapiro-Wilk tests for data characteristics verification, Skewness test as a part of the descriptive statistics analysis, Cronbach's α test as a first reliability assessment, and Bartlett's Test of Sphericity, Kaiser-Meyer-Olkin (KMO) for Exploratory Factor Analysis (EFA) to assure sampling adequacy.

4.5.2. Normality Testing

The normality assumption is important for many statistical tests (Field 2009). Normality is tested using Kolmogorov-Smirnov and Shapiro-Wilk tests as well as by calculating Skewness and Kurtosis ratings (Hairer al., 2010; Field 2009). Skewness is a measure of the asymmetry of a distribution while Kurtosis measures the degree to which scores cluster in the tails of a distribution (Hairer al., 2010; Field 2009). Most authors consider

that a data set is normally distributed if the Skewness and Kurtosis ratings are within the +2 to -2 range; while some others indicate that +3 to -3 for Kurtosis is acceptable (Hair and Anderson, 1995; Tabachnick and Fidell 2007; Field 2009). Scores outside of this range may have the potential of restricting the data analysis and subsequent interpretation of results, but for moderate samples (200+) this risk is reduced (Tabachnick and Fidell 2007). The results of the Kolmogorov-Smirnov and Shapiro-Wilk tests indicated that the data was reasonably close to being normally distributed with Skewness and Kurtosis ratings within the +2 to -2 range (-1.48, 1.95) so we proceeded with data analysis if the normality assumption holds.

4.5.3. Missing Data Testing

All responses from the questionnaire survey have already been filtered and only usable questionnaires used in the data file, but some missing data values existed in the data file, which was very minimal and excluded from our study. Only five responses were excluded resulting in a set of 450 respondents that were included in our data analysis.

4.5.4. Outliers Testing

According to Hair et al., (2010) an outlier is defined as distinct from other observations due to high or low scores. Researchers agreed that outliers can result in non-normality of data and distorted statistical results (Kline, 2005; Tabachnick and Fidell, 2007). However, there are some widely accepted rules of thumb which suggest that within univariate outliers (a case is outlier if 1) the standard score for small sample size (80 or fewer) is ± 2.5 or beyond, while on the other hand for large sample size the standard score can be considered up to 4.2 value more than ± 3.0 standard deviations away from the average is regarded as an outlier (Hair et al., 2010).

In the current study, for detecting the univariate outliers, items are grouped together to represent a single variable. Using the SPSS function of descriptive statistics, the data values of each observation are converted to standardized score also known as z-scores (Hair et al., 2010). The results indicate that data set contains few univariate outliers. Box plot also used indicated that only 3% of observations were found as mild-outliers (i.e. within 1.5 Inter Quartile Range (IQR) range). If outliers are found in data, we decided to retain them as SEM and do the same check for any problematic outliers if they exit in the data.

4.5.5. Item analysis and Reliability Assessment

The purpose of conducting an item analysis is to select those items that will provide the most accurate and appropriate description of the Behaviour under investigation (Kumar and Beyerlein, 1991), i.e., the Behaviour towards the adoption of M-Government. The final items must be able to discriminate respondents who have positive attitudes from respondents who have negative attitudes in the survey (Cooper and Schindler, 2001). The discriminating power of each item is computed by using item-remainder-score correlation or corrected-item total correlation index (Roderick, 1999). Corrected-item-total correlation was selected instead of using item-total-score correlation to avoid the occurrence of increased total score variance from adding item scores (Roderick 1999). Items with negative or low item-remainder-score correlation should be excluded to ensure that the final items yield discriminating power in distinguishing respondents with high score from those with low score.

Cronbach's α was calculated using SPSS 21 and a $0.7 < \alpha < 0.95$ threshold was adopted. Table 4.3 presents the summary of the initial reliability test. It shows that all Cronbach's α score were within the target range (Moore and Benbasat, 1991). Moreover, the correlation scores were above the 0.5 thresholds for all factors. As it can be seen in Table 4.3, all values of the Cronbach's alpha test range between 0.90 and 0.94 and correlations are between 0.67 and 0.92 (significant at the 0.01 level), with no increase in Cronbach's Alpha values when item is deleted, so no variable is excluded in this project, i.e. the model variables remain for data analysis and results discussions.

Table 4.3: Reliability Assessment for all Variables and Factors

Factor	Item total correlation	Cronbach's α if Item Deleted	Factor	Item total correlation	Cronbach's α if Item Deleted
PEoU 5 variables Cronbach's α= 0.912			**PU–5 variables Cronbach's α= 0.915**		
PEoU11	0.72**	0.91	PU21	0.78**	0.90
PEoU12	0.75**	0.90	PU22	0.84**	0.88
PEU13	0.87**	0.88	PU23	0.76**	0.90
PEoU14	0.79**	0.89	PU24	0.71**	0.91
PEoU15	0.78**	0.89	PU25	0.83**	0.89
Attitude (AT) 5 variables Cronbach's α= 0.945			**BT–5variablesCronbach's α= 0.949**		
AT31	0.80**	0.94	BI41	0.83**	0.94
AT32	0.82**	0.94	BI42	0.87**	0.94
AT33	0.88**	0.93	BI43	0.92**	0.93
AT34	0.83**	0.94	BI44	0.86**	0.94
AT35	0.92**	0.92	BI45	0.83**	0.94
PoR-5 variables Cronbach's α= 0.94			**CT–5 variables Cronbach's α= 0.93**		
PoR51	0.78**	0.94	CT61	0.83**	0.92
PoR52	0.83**	0.94	CT62	0.78**	0.93
PoR53	0.91**	0.93	CT63	0.81**	0.92
PoR54	0.90**	0.94	CT64	0.85**	0.91
PoR55	0.92**	0.93	CT65	0.85**	0.91
PT_AGR-5 variables Cronbach's α= 0.908			**PT_CON–5variablesCronbach's α= 0.94**		
AGR71	0.67**	0.91	CON81	0.78**	0.94
AGR72	0.70**	0.90	CON82	0.87**	0.93
AGR73	0.79**	0.88	CON83	0.89**	0.92
AGR74	0.86**	0.87	CON84	0.84**	0.93
AGR75	0.85**	0.87	CON85	0.86**	0.93
AU-5 variables Cronbach's α= 0.895					
AU-91	0.72**	0.88			
AU-92	0.79**	0.86			
AU-93	0.86**	0.84			
AU-94	0.58**	0.91			
AU-95	0.77**	0.87			

** Correlation is significant at the 0.01 level (2-tailed).

Such that,

PoR: Perception of Risk, $PEoU$: Perceived Ease of Use, PU: Perceived Usefulness, CL: Culture, AT: Attitude towards Behaviour, BI: Behavioural Intention, AU: Actual Use, AGR: Agreeableness, and CON: Conscientiousness.

4.5.6. Exploratory Factor Analysis (EFA)

There are many issues confronting users of EFA such as determining the suitability of data for factor analysis, deciding the factor extraction method, choosing the number of factors to retain, and selecting the method for rotating factors. Determining the suitability of data for factor analysis can be achieved by analysing the sample size in relation to number of variables, examining the inter-correlations of the entire correlation matrix, using principal component analysis with Varimax rotation and Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Field, 2009). One of the most important values in the evaluation of the applicability of factor analysis is KMO value. The result of Bartlett's Test of Sphericity should be below the 0.05 significance level to indicate that sufficient correlations exist among the items. On the other hand, the Kaiser-Meyer-Olkin test measures the sampling adequacy, which should be greater than 0.5 for a satisfactory factor analysis to proceed (Hair and Anderson, 1995; Field 2009).

As illustrated in Table 4.4, our sample value of Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.91, and the significance level of the Bartlett's Test is less than 0.001, indicates that the overall inter-correlations assumptions are met. The data was therefore considered appropriate for conducting EFA.

Table 4.4: Bartlett's test of Sphericity and Kaiser-Meyer-Olkin (KMO)

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.912
Bartlett's Test of Sphericity	Approx. Chi-Square	14071.886
	df	920
	Sig.	.000

Principal Component Analysis (PCA) with Varimax rotation was used as it simply reduces the number of variables by creating linear combinations that retain as much of the original measures' variance as possible. The variance rate, explained by 9 factors was 82.4% (see Table 4.5), which is higher than the required 60%, Appendix C.

Table 4.5: Factor Loading Matrix and Communality

Rotated Component Matrix[a]									
	Component								
	PEoU	PU	AT	BI	PoR	CT	AGR	CON	AU
PEoU11						0.632			
PEoU12						0.800			
PEoU13						0.847			
PEoU14						0.796			
PEoU15						0.743			
PU21									0.711
PU22									0.803
PU23									0.790
PU24									0.688
PU25									0.709
AT31					0.750				
AT32					0.791				
AT33					0.797				
AT34					0.783				
AT35					0.856				
BI41		0.806							
BI42		0.808							
BI43		0.857							
BI44		0.876							
BI45		0.785							
BI_A		0.904							
PoR51				0.791					
PoR52				0.873					
PoR53				0.884					
PoR54				0.900					
PoR55				0.899					
CT61	0.830								
CT62	0.843								
CT63	0.853								
CT64	0.879								
CT65	0.877								
CT_A	0.965								
AGR71							0.693		
AGR72							0.638		
AGR73							0.822		
AGR74							0.750		
AGR75							0.855		
CON81			0.761						
CON82			0.840						
CON83			0.805						
CON84			0.835						
CON85			0.884						
AU91								0.754	
AU92								0.844	
AU93								0.879	
AU94								0.678	
AU95								0.748	
Extraction Method: Principal Component Analysis.									
Rotation Method: Equamax with Kaiser Normalization.									
a: Rotation converged in 10 iterations.									

Such that,

PoR: Perception of Risk, PEoU: Perceived Ease of Use, PU: Perceived Usefulness, CL: Culture, AT: Attitude towards Behaviour, BI: Behavioural Intention, AU: Actual Use, AGR: Agreeableness, and CON: Conscientiousness.

In summary, the following factor extraction rules were implemented:

- Factor extraction method: Principal Component Analysis
- Number of factors to retain: Eigenvalues >1 and 4 hypothesized factors
- Rotation method: Varimax
- Factor loading threshold: 0.6
- Cross-loading Threshold: 0.4.

Eigenvalues greater than 1 are considered significant in latent root criterion whilst a solution that accounts for 60% of cumulative total variance or more in the percentage of variance criterion is considered to be satisfactory (Hair et al. 2010; Kaiser 1960).

4.5.7. Pilot Survey Conclusion and the Model under Investigation

After taking into account all the findings shown earlier, the suggested questionnaire was adequate for the study. The overall aim of the research is to investigate the factors affecting the adoption of Mobile Government within the social and cultural Omani Context according to the theories used to develop the MGAM presented earlier in Chapter 3. The pilot survey was conducted to purify the scales that measured factors related to the variables and model constructs. The pilot survey showed the suitability of all variables and factors under investigation as shown in the hypothesized model earlier, with all correlations having the expected sign.

4.5.8. Validity Measurement

Validity refers to the extent to which a measure actually measures what it purports to measure. A pilot study was undertaken in this research as a step to examine the validity of the questionnaire used. Item, criterion, and content validity are three different validity tests. Item validity explores the quality of an item and how closely it addresses the topic it is aligned with. The formulation coefficient that was used in this study is product moment (Sutrisno, 1991). In order to identify the level of item validity, the r-value in the correlation table can be used. Measuring criterion validity requires the comparison

of existing, validated instruments with newly developed instruments. Of course, both sets of instruments must measure the same construct or phenomenon (DeVaus, 2002). This research uses previous literature to carry out these checks. As such, 45 statements have been extracted from the related literature. Table 4.1 shows these statements and the sources that were used to construct them.

The content validity refers to the ability of the items within the instrument to represent the content of any given construct (DeVaus, 2002). To ensure content validity, expert validation was employed; the instrument was introduced to experts in the field prior to the final approval stage and before the formal data collection process to examine the content of the questionnaire. The draft questionnaire was emailed to five experts from the technology adoption in governmental industry who was invited to mainly focus on the fundamentals and essentials of M-Government services. The process also involved a focus group interview using mini face-to-face interviews with six experts from the governmental services industry. Experts from the industry living in Oman were asked to review and examine the questionnaire for items and content. The experts were e-mailed copies of the questionnaire and information sheets which explained the background and purpose of the research. In the focus group interview, hard copies of the questionnaire and an information sheet explaining the purpose of the study and research model were provided. In the mini face-to-face interviews, they subjects were asked about the items' content validity and reliability, where their answers and comments were recorded and considered in questionnaire modification and re-wording.

The feedback through those validity tools has been integrated into the instrument and involved some statement changes, re-wording and statement cancelation and creation due to the fact that some of the study population may not understand some concepts or statements directly. For example, the statement "*Using the Mobile Government Applications makes me able to get approval and confirmation on the services*" was changed into the statement "*Using the Mobile Government Applications makes it easier and simpler for me to obtain services approval and confirmation*". Some statements are also merged to form one statement such as the statements "*Using the M-Government is a pleasant experience*" and "*I have a positive attitude towards the products and services provided by M-Government*", were replaced by the statement "*Using the Mobile Government Applications is a good and pleasant experience*". In contrast, some statements were broken down into two statements. For example, the statement "*I expect*

that the Mobile Government Applications make governmental services easy and engage me in other entertainments and enjoyments" was broken into two statements "*I expect that the Mobile Government Applications will make governmental services even easier in the future*" and "*I expect using Mobile Government Applications whilst engaging in other entertainments and enjoyments*".

Concerning the classification data, for example, the question "*Do you have your own computer and Internet access at home?*" was changed into two questions "*Do you have your own computer at home*?" and "*Do you have an access to Internet at home*?" due to the fact that a participant may have a computer at home but with no Internet access. Similarly, the question "*What is the level of your knowledge about using computers and the Internet?*" was re-worded and changed into two separate questions "*How would you describe your knowledge of using a computer?*" and the question "*How would you describe your knowledge of using the Internet?*" due to the fact that a participant may have experience in using a computer but not the Internet. On the other hand, ecological validity is for strength of this research, the study was conducted to investigate the actions and attitudes of users in their natural settings with no affect made by the researcher or other parties (Bryman, 2001, p.31).

4.6. Research Ethics

This research follows the ethical guidelines of the home university (Brunel University London) of this project in the UK, and then British Educational Research Association (BERA, 2004), with approval from Research Ethics Committee. Participants are recruited voluntarily with informed consent. Participants have the right to withdraw from participation at any stage.

The research does not use any form of deception to recruit participants. The questionnaire includes a cover page explaining the aim of the survey, the nature of participation and the way findings will be reported. All participants are assured that they can withdraw from the research at any point for any or no reason. The research does not include vulnerable groups such as children or patients. No incentives are offered to recruit participants. Finally, participants' anonymity will be protected. For this reason, aliases are used where appropriate to ensure that no participants can be identified.

4.7. Research Process

The research roadmap of this project explains the activities and processes conducted in this project. The activities and processes performed to achieve this project involve the Five key stages where each stage involves different steps, see Figure 4.1:

1. Conduct an Exploratory Investigation
2. Develop a Proposed Model
3. Manage Data Resources
4. Conduct Model Assessment
5. Report Results and Findings

Figure 4.1: Research Process

4.8. Summary

This chapter provided a comprehensive description on the research methodology of this research project. The chapter at the beginning revisited the Research Framework, the MGAM Model, with the research questions and hypotheses. It was important to identify the independent and dependant variables, and the relationships among them in the MGAM Model. In this chapter, the study population and sample selection process was described. Other key components of this chapter include the data collection procedure and instrument and data analysis methods; the chapter explained the development of a new instrument based on the literature analysis and earlier studies to collect data about the MGAM Model variables. Prior to the actual collection of data, this research project provided comprehensive details on the validity and reliability of the data collection instrument, i.e., the survey. The Statistical Data analysis tools were described in this chapter, and ethical issues have been discussed in this chapter. The chapter finally presents a flowchart illustrating the research process and activities conducted to achieve the objectives on this work.

Chapter 5

Data Analysis Results and Discussion

This Chapter presents the descriptive data analysis and the research results of this study, and then discusses those results. The first section presents the characteristics of 450 respondents; these include the knowledge and the use of different technologies for Mobile Government applications. The demographic characteristics of our sample are also provided, and the descriptive statistics of our main nine components (i.e., research model constructs) along with their items are described. The chapter also provides discussions on the research results. As this chapter presents the descriptive data analysis results and research findings, the next chapter will provide data analysis results on the Mobile Government Adoption Model (MGAM) for further model assessment and discussions with their scientific implications.

The descriptive analysis findings and results in this chapter revealed that the responses and perceptions of our participants towards the MGAM model were between slightly and highly positive. The results also show that most of the users or research participants have good levels of knowledge of using technologies and M-Government applications, and have frequently used the services offered by this technology in Oman. After presenting the descriptive analysis results on the use of technologies, demographic attributes of the participants and the use of M-Government in Oman, this chapter will present the descriptive results on the factors introduced in the TAM Model, and other

novel factors including Perception of Risk, Culture and Personality Traits. The chapter then discusses the implications of those results and compares them with some findings of similar studies reported in the literature. To assess the responses, the following values have been used as thresholds in this project:

- From 1 to 1.79: Strongly Disagree
- From 1.8 to 2.59: Disagree
- From 2.6 to 3.39: Neither Disagree nor Agree
- From 3.4 to 4.19: Agree
- From 4.2 to 5: Strongly Agree

5.1. The Use of New Technologies Characteristics

Respondents have completed an anonymous confidential questionnaire designed to study the user-centric factors affecting the adoption of Mobile Government (known as M-Government in this study) in Oman. The questionnaire includes key questions to collect data about respondent's use of new technologies such as mobile government applications, frequency and the level of knowledge of using smart devices and Internet, availability of Internet and computer at home, number of M-Government applications used and the method used to conduct a service with the new technologies. Such data will provide insights on the deployment and trend of using Mobile Government and technologies in Oman.

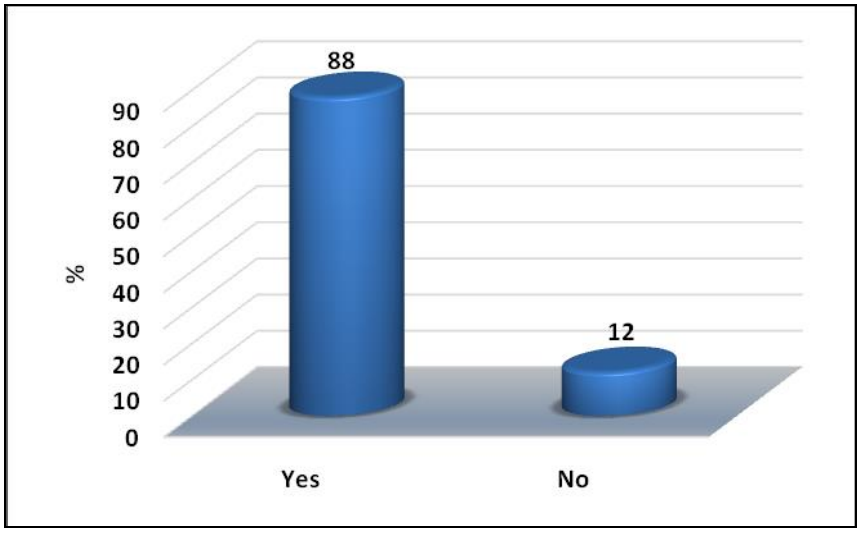
5.1.1. Using any Mobile Government Applications

The participants were asked about whether they have ever used any of the Mobile Government Applications or not. As illustrated in Table 5.1 and Figure 5.1, out of 450 participants, 396 (88%) answered with "Yes" and only 54 (12%) with "No".

Table 5.1: Distribution of Participants' Used M-Government Applications at any Time for any Purpose

Frequency	Count	Percentage (%)
Yes	396	88.0
No	54	12.0
Total	450	100

Figure 5.1: Distribution of Participants' Used M-Government Applications at any Time for any Purpose



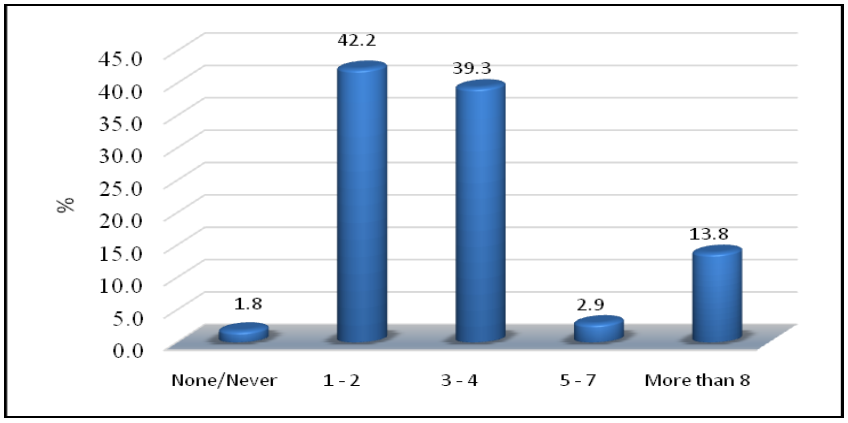
5.1.2. Frequency of Using Mobile Government Applications

Respondents were also asked about the frequency of using Mobile Government Applications during the last year since conducting this study late 2017. As illustrated in Table 5.2 and Figure 5.2, most of the participants have used mobile government applications (last year)"1-2" times with 42.2% followed by "3-4" times with 39.3%, which makes more than 80% of our participants who have used M-Government applications at least once. Only 1.8% of the participants have never used the applications of M-Government, and16.7% of the participants have used M-Government applications more than 5 times during the last year.

Table 5.2: Distribution of Participants' Frequency of Using M-Government Applications

Frequency	Count	Percentage (%)
None/Never	8	1.78
1 – 2 times	190	42.22
3 – 4	177	39.33
5 – 7	13	2.89
More than 8	62	13.78
Total	**450**	**100**

Figure 5.2: Distribution of Participants' Frequency of Using M-Government Applications



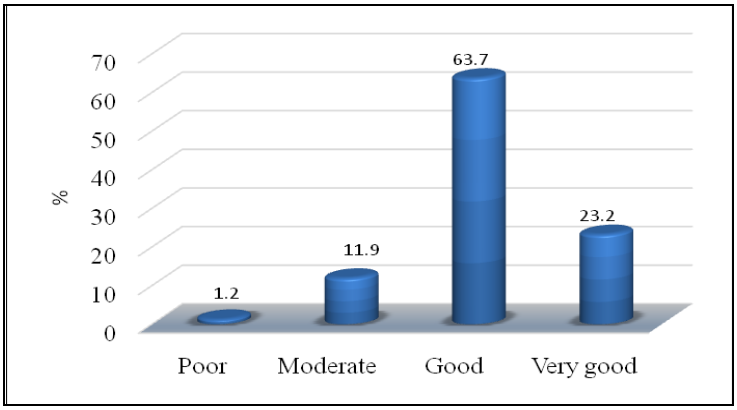
5.1.3. Knowledge Level of Using a Computer

Participants were asked about their level of knowledge in using computers on a scale from very poor to very good (1 to 5). Table 5.3 and Figure 5.3 show the range of knowledge and distribution of participants. Almost 87% of participant knowledge of computer is good or very good; while only 1.2% of them consider themselves poor in the knowledge of computers.

Table 5.3: Distribution of Participants' Level of Knowledge in Using Computer

Level of knowledge	Count	Percentage (%)
Very Poor	0	0
Poor	11	1.2
Moderate	71	11.9
Good	285	63.7
Very good	83	23.2
Total	**450**	**100**

Figure 5.3: Percentage of Participants' Level of Knowledge of Using Computer



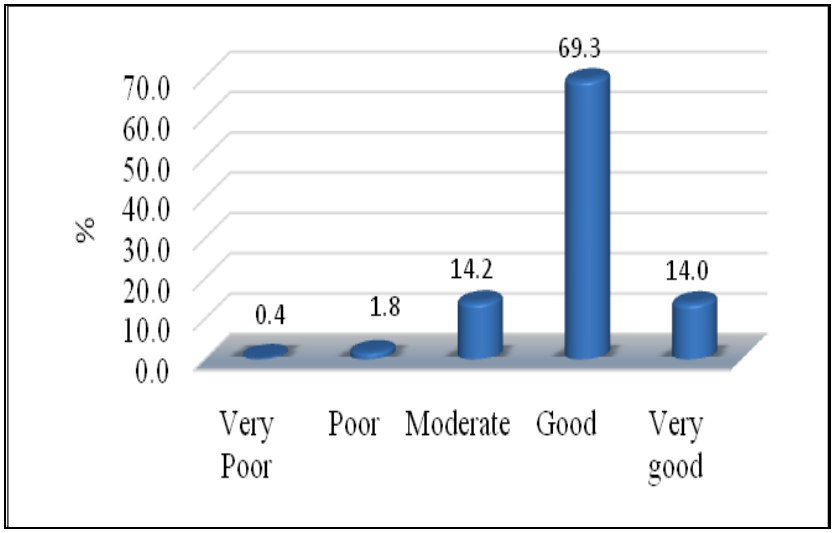
5.1.4. Knowledge Level of Using Internet

In the same way, participants were asked about their level of knowledge in using Internet on the same scale from very poor to very good. Results are illustrated in Table 5.4 and Figure 5.4. The results show that almost 83% of the participants are good or very good, while only 2.2% consider themselves poor or very poor in using the Internet, while the remaining 14.2% were of a moderate level of knowledge of using the Internet.

Table 5.4: Distribution of Participants' Level of Knowledge of Using Internet

Level of knowledge	Count	Percentage (%)
Very Poor	2	0.4
Poor	8	1.8
Moderate	64	14.2
Good	312	69.3
Very good	63	14.0
Total	**450**	**100**

Figure 5.4: Percentage of Participants' Level of Knowledge of Using Internet



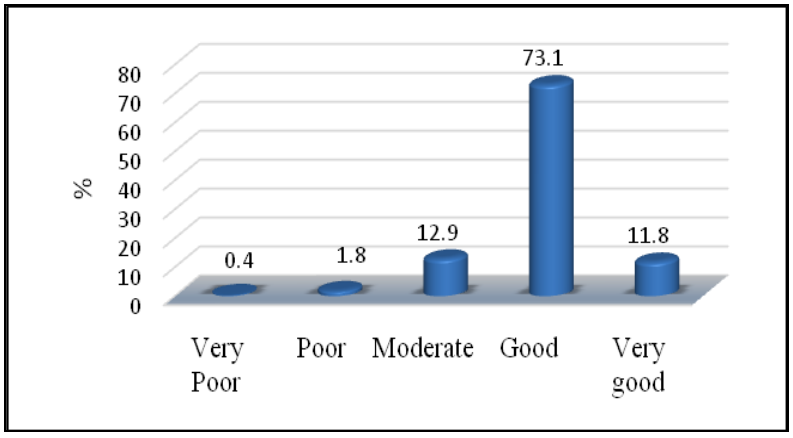
5.1.5. Knowledge Level of Smartphone or Other Similar Devices

Results in Table 5.5 and Figure 5.5 show that participants have a good knowledge of using smart devices, as more than 84% of them consider themselves good or very good at dealing with smart devices.

Table 5.5: Distribution of Participants' Knowledge Level of Smartphones or Other Similar Devices

Level of knowledge	Count	Percentage (%)
Very Poor	2	0.4
Poor	8	1.8
Moderate	58	12.9
Good	329	73.1
Very good	53	11.8
Total	**450**	**100**

Figure 5.5: Percentage of Participants' Knowledge Level of Smartphones or Other Similar Devices



5.1.6. Having a Computer and Internet at Home or Smart Devices

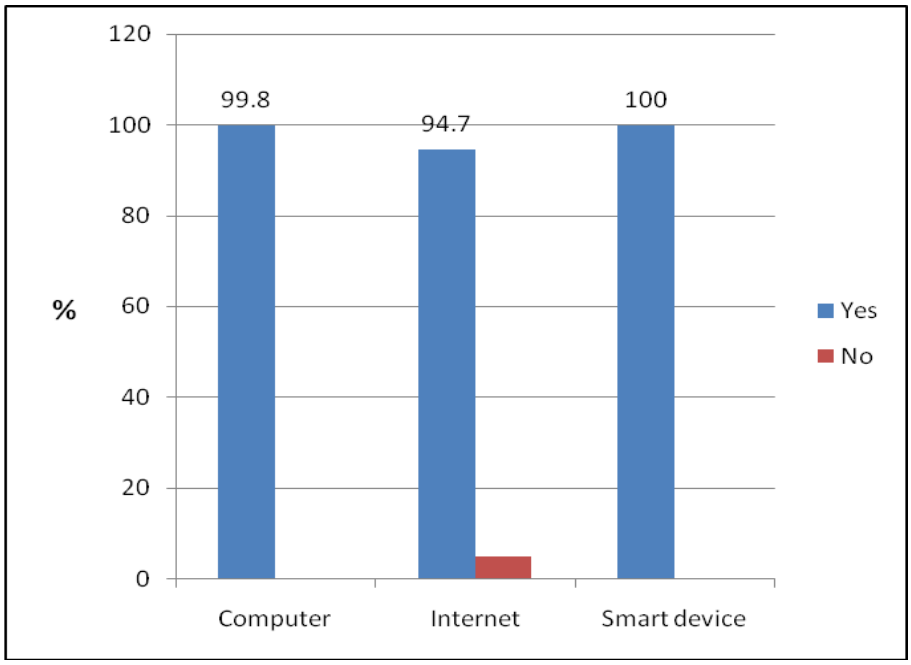
Participants responded to whether or not they have a computer and Internet at home or have Smartphone, tablets or any other similar devices. Responses are illustrated in Table 5.6 and Figure 5.6. Results show that almost all participants have a computer and 94.7% of them have Internet at home. All participants have one or more of the Smartphone, tablets or any other similar devices.

Table 5.6: Distribution of Participants Having a Computer and Internet at Home or Smart Devices

	Response	Count	Percentage (%)
Computer	Yes	449	99.8
	No	1	0.2
Internet	Yes	426	94.7
	No	23	5.1

Smart device	Yes	450	1.0
	No	0	0.0

Figure 5.6: Distribution of Participants Having a Computer and Internet at Home or Smart Devices



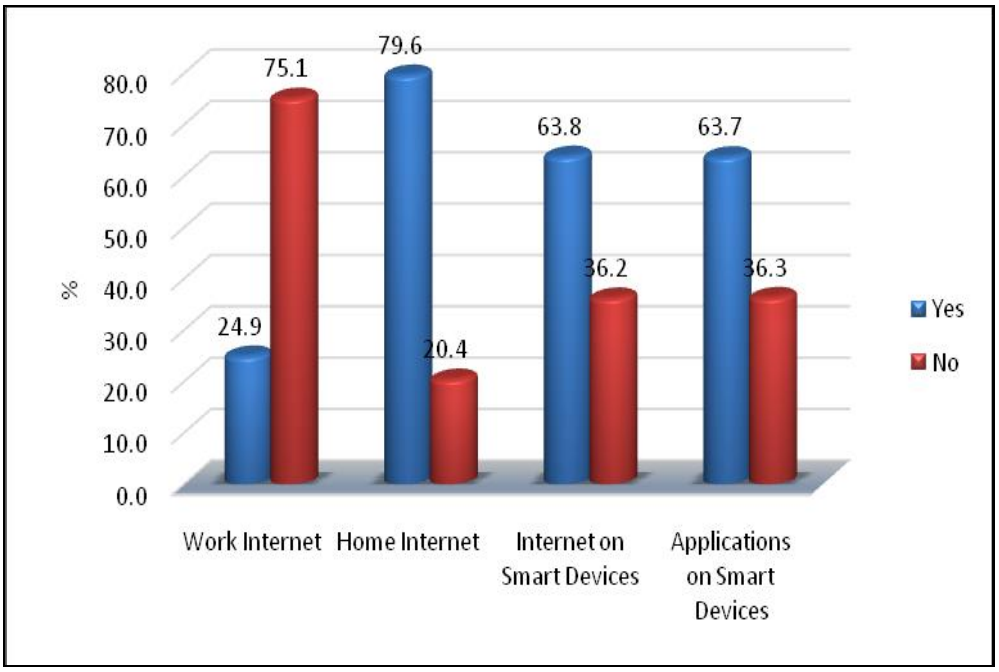
5.1.7. Technologies Used to Conduct Services

Participants were asked about the method they use to conduct services, they have been given the option to choose more than one. Results show that participants mostly use Internet at home versus only 24.9% who use Internet at work. The percentage of participants using Internet using smartphones, tablets or similar devices (63.8%) is very similar to the percentage of participants using Mobile phone applications, tablets or similar devices as illustrated by Table 5.7 and Figure 5.7. note that, these percentages in the table are not to sum of 100 percentage as they represent different items, and therefore, a diagram is also provided.

Table 5.7: Distribution of Participants Methods to Conduct Services

Method	Count	Percentage (%)	
		Yes	No
Work Internet	112	24.9	75.1
Home Internet	358	79.6	21.4
Internet using Smartphone, Tablets or similar Devices	287	63.8	36.2
Mobile Phone Applications, Tablets or similar Devices	288	63.7	66.3

Figure 5.7: Distribution of Participants Methods to Conduct Services



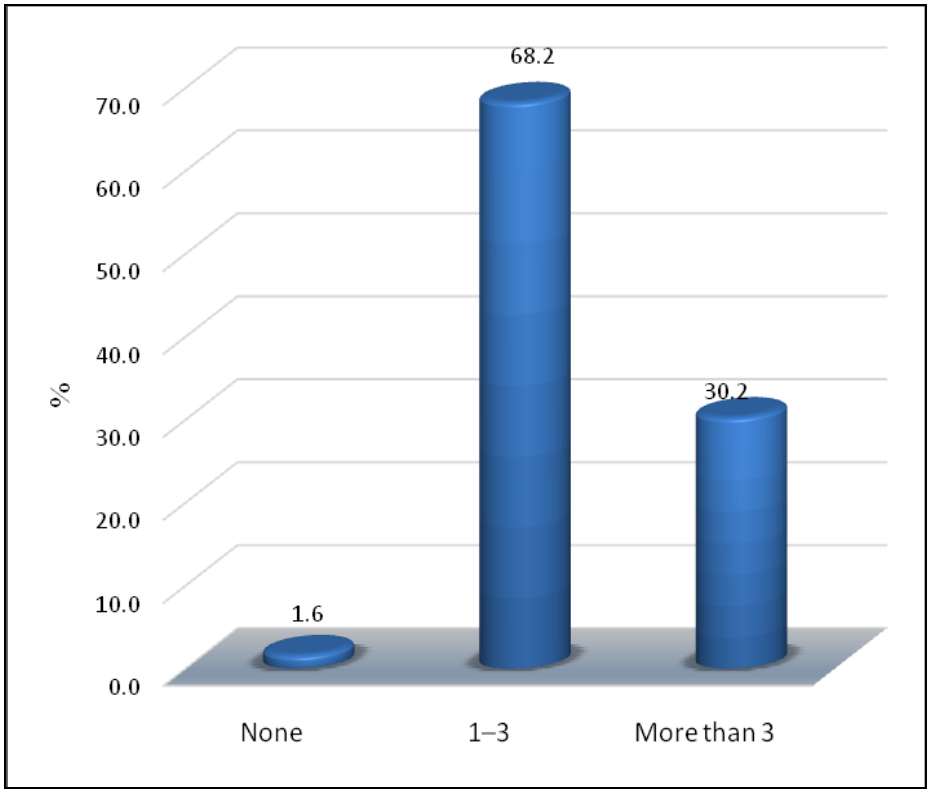
5.1.8. Number of Mobile Government Applications Used in Oman

Participants were also asked about the number of M-Government applications used in Oman. Results (in Table 5.8 and Figure 5.8) show that almost all participants (98.4%) have used the M-Government application at least once. Most of the participant (68.2%) used M-Government applications for 1-3 times and 30.2% used it for more than 3 times, while only 1.6% never used M-Government applications in Oman.

Table 5.8: Number of Mobile Government Applications Distribution Used in Oman

NO of Applications	Count	Percentage (%)
None	7	1.6
1– 3	307	68.2
More than 3	136	30.2
Total	**450**	**100**

Figure 5.8: Number of Mobile Government Applications Distribution Used in Oman



5.2. Demographic Characteristics of the Participants

The questionnaire consisted of four demographic variables, age, gender, education level and income. Table 5.9 summarises the distribution and details of the participant subjects to the four demographic variables.

Table 5.9: Demographic Characteristics of the Sample (n=450)

Characteristic	Group	No.(%)
Gender	Male	302 (67.1%)
	Female	148 (32.9%)
Age	Less than 25	248 (55.1%)
	25 – 34	119 (26.4%)
	35 – 45	61 (13.6)
	45 – 54	20 (4.4%)
	55 – 65	2 (0.4%)
Academic degree	High School or Less	1 (0.2%)
	Diploma	189 (42.0%)
	Bachelor	208 (46.2%)
	Masters	52 (11.6%)

Income	Less than 200,000 OR*	421 (93.6%)
	200K – 400K OR	15 (3.3%)
	400K – 600K OR	11 (2.4%)
	More than 600K OR	1 (0.2%)
Nationality	Omani	369 (82%)
	Non-Omani	81 (18%)

***OR: Omani Riyals**

Most of our participants are Males with 67.1%, as illustrated in Figure 5.9. Most participants are young, 55.1% less than 25 years old and 26.4% age between 25 – 34 years old. These two (Young) groups make 81.5% of participants. Figure 5.10 also illustrates the distribution of participants' age. All the participants had gained an educational level of at least Diploma (42%), or Bachelor (46.2%) or Master (11.6%) degree, see Figure 5.11. the vast majority of the participants' annual income is less than 200,000 Omani Riyal with 93.6%, as illustrated in Figure 5.12. The vast majority of our participants are Omani with 82%, and the rest of the participants are non-Omanis, as illustrated in Figure 5.13.

Figure 5.9: Participants Distribution by Gender

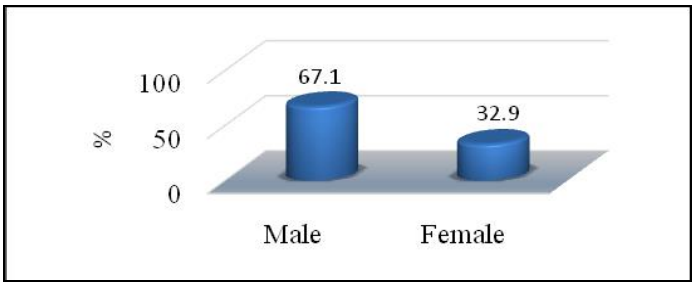


Figure 5.10: Participants Age Distribution

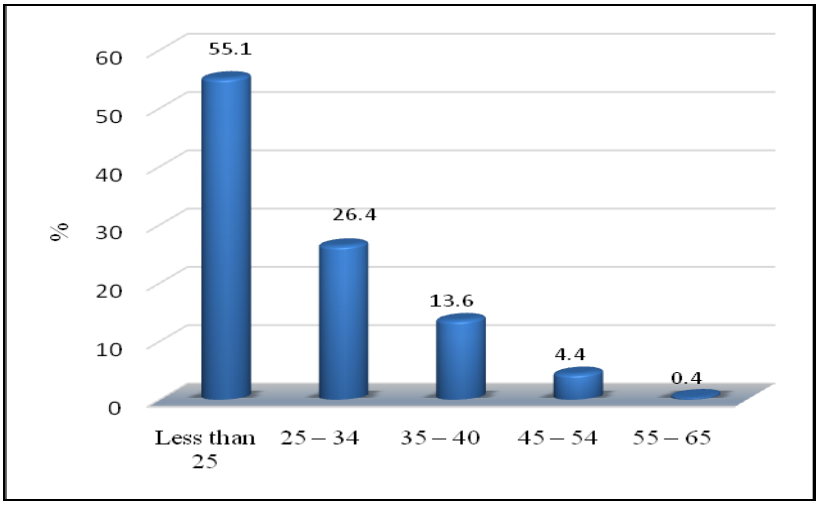


Figure 5.11: Participants Education Level Distribution

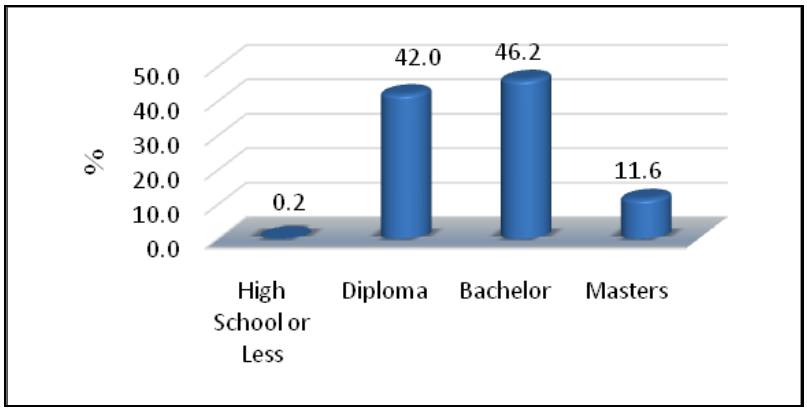


Figure 5.12: Participants Distribution by Income

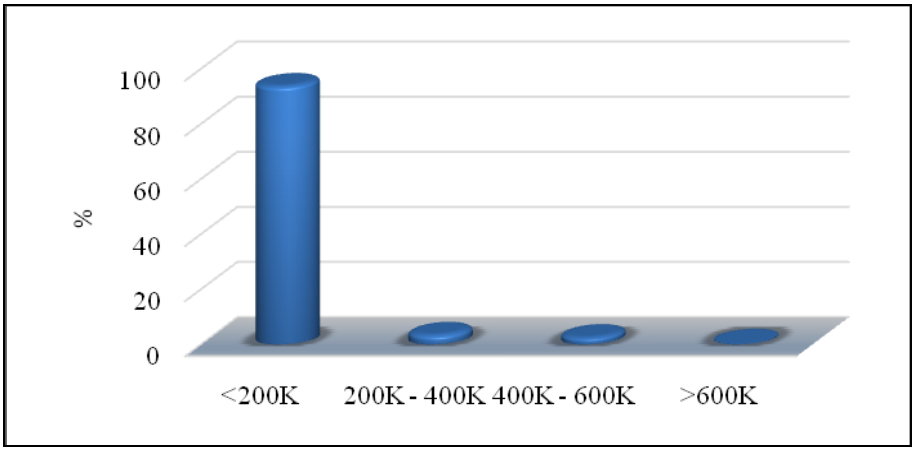
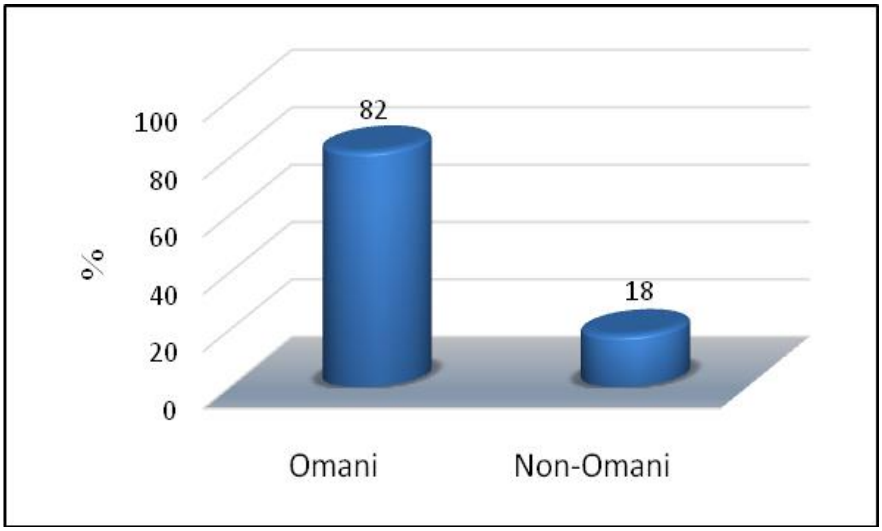


Figure 5.13: Participants Distribution by Nationality



5.3. Descriptive Statistics – Adoption Model Factors

Descriptive statistics using Means, Standard Deviations, Frequency and Relative Frequency are reported for each variable (constructs or collection of statements, i.e., items, i.e.) used in the research model. All items were rated on a five point Likert Scale with a score of 5 indicating Strong Agreement and a score of 1 indicating Strong Disagreement. The scores for the statements were then averaged to provide one numerical score (average). A higher average (more than 3, the average of the Likert scale 1 – 5) indicates greater agreement with the statements relating to that variable. Low average (bellow 3) indicates that respondents disagree with the statements of the related variable. The descriptive statistics of measurement items for each variable (construct) and its items are discussed in details next.

5.3.1. Perceived Ease of Use

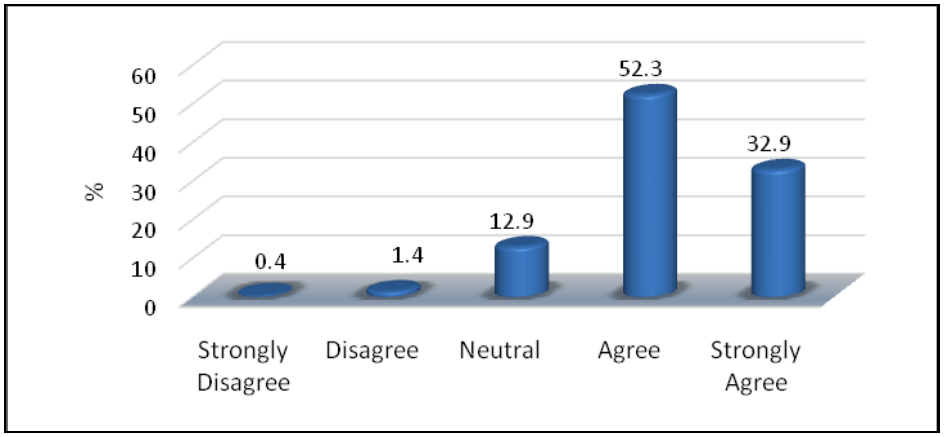
With respect to the third and fourth research questions, Five variables measured this factor along with direct items asking about PEU (5 items). These variables relate to the ease of use of Mobile Government Applications including the ease of obtaining services, making payments, user friendly and understandable, ease of download and use, and availability of details and information. Each variable is measured using five items (questions) related to the ease of use. Items with their means and standard deviations for each variable are illustrated in Table 5.10.

In general, the results demonstrate that respondents were very positive about the perceived ease of using Mobile Government Applications with an aggregated average of 4.16 and standard deviation (Stdev) of 0.62. The same results can be concluded from Figure 5.14, which shows the percentages of aggregated participants' responses to PEU statements. As illustrated by Figure 5.14, 85.2% responded with Agree and Strongly Agree to PEU statements compared to only 1.8% with Disagree and Strongly Disagree.
Items averages are almost the same as they vary between 4.09 and 4.22. Participants were more positive to the ease of obtaining governmental services and to user friendliness of mobile government application items (with averages of 4.22 and 4.19, respectively). The lowest average (4.09) was to the statement "It is easier to make payments using the Mobile Government Applications ".

Table 5.10: Descriptive Statistics for PEU and its Statements

Item	Statements	Average	Stdev
PEU11	It is easier to obtain governmental services using Mobile Government Applications.	4.22	0.62
PEU12	It is easier to make payments using the Mobile Government Applications.	4.09	0.80
PEU13	The Mobile Government Applications are user friendly and understandable.	4.19	0.65
PEU14	I find the Mobile Government Applications are easy to download and use.	4.14	0.74
PEU15	It is easier to obtain governmental services using Mobile Government Applications.	4.14	0.80
Aggregate Average		**4.16**	**0.63**

Figure 5.14: Participants' Aggregated Responses to the PEU Questions



5.3.2. Perceived Usefulness

With respect to the fourth and fifth research questions, Perceived Usefulness (PU) was measured by direct items (5 questions). These items measure Usefulness of Mobile Government Application which includes the efficiency, obtaining services approval and confirmation, provide full details of services and policies, and provide easy services-related information prior to requests. Questions (items), with their averages and standard deviations, are illustrated in Table 5.11. Aggregated participant responses are also summarized in Figure 5.15.

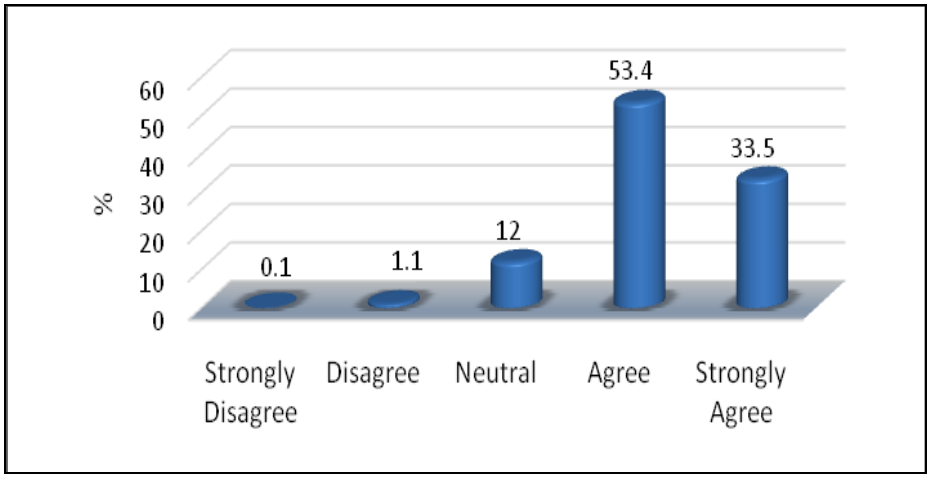
In general, results show that respondents were very positive about PU with an aggregated percentage of responses, "Agree and "Strongly Agree", of 86.9% compared to only 1.2% who answered "Disagree" and "Strongly Disagree". This high percentage

of responses is reflected in the aggregated average of all statements with an average 4.19 and a standard deviation of 0.59. The lowest average (4.13) was for the efficiency of using mobile government applications and the highest average (4.28) was for enhancing effectiveness and saving time in preparing participants' requests.

Table 5.11: Descriptive Statistics for PU and its Items

Item	Statements	Average	Stdev
PU21	It is more efficient to use Mobile Government Applications when I am doing more than one service.	4.13	0.73
PU22	Using the Mobile Government Applications makes it easier and simplifies for me to obtain services approval and confirmation.	4.16	0.70
PU23	Using the Mobile Government Applications enhance my effectiveness by saving time in preparing my requests.	4.28	0.67
PU24	I find the Mobile Government Applications useful in preparing my services and provide me with full details of the services and policies.	4.17	0.66
PU25	Using the Mobile Government Applications provide easy services-related information prior to requests.	4.22	0.65
Aggregated Average		**4.19**	0.59

Figure 5.15: Participants' Aggregated Responses on the PU Statements



5.3.3. Attitude to Use

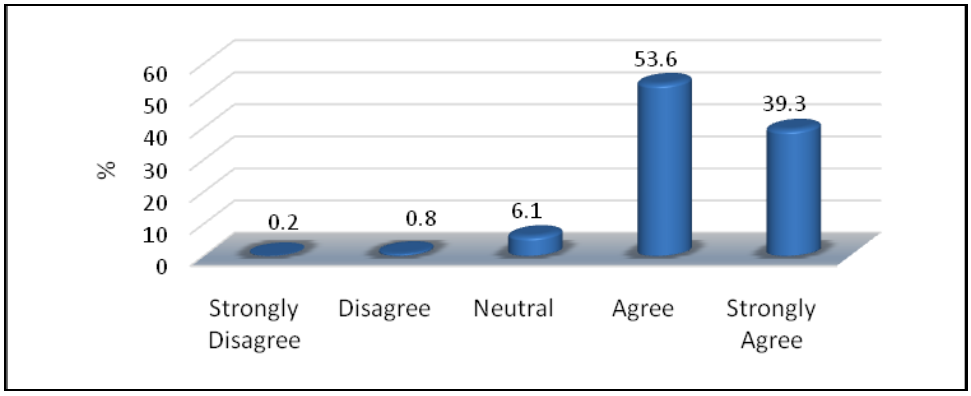
With respect to the second, fourth and fifth research questions, Five items (questions) as listed in Table 5.12 measure the participants' attitude (AT) towards using Government Mobile Applications. Results show that respondents' attitude was very positive with an aggregated percentage of responses, "Agree" and "Strongly Agree", of 92.9% compared to only 1.0% who answered "Disagree" and "Strongly Disagree", as shown in Figure 5.16. The high percentage of participants who "Strongly Agree, i.e., coded as 5" and "Agree, i.e., coded as 4" resulting a high aggregated average of these statements with an

average of 4.31 (more than 3 and close to 5) and 0.58 of standard deviation. Averages varies within a very small range, between 4.28 (good and pleasure experience) and 4.35 (likeness of the idea of using Mobile Government Applications).

Table 5.12: Descriptive Statistics for AT and its items

Item	Statements	Average	Stdev
AT31	I like the idea of using Mobile Government Applications for requesting governmental services.	4.35	0.63
AT32	Using the Mobile Government Applications is useful and beneficial for me.	4.32	0.68
AT33	Using the Mobile Government Applications is a good and pleasant experience.	4.28	0.64
AT34	I feel positive towards using the Mobile Government Applications to obtain services and information.	4.30	0.61
AT35	The features of the Mobile Government Applications help me to obtain more services effectively.	4.31	0.62
Aggregated Average		**4.31**	**0.58**

Figure 5.16: Participants' Aggregated Responses on the AT Statements



5.3.4. Behavioral Intention

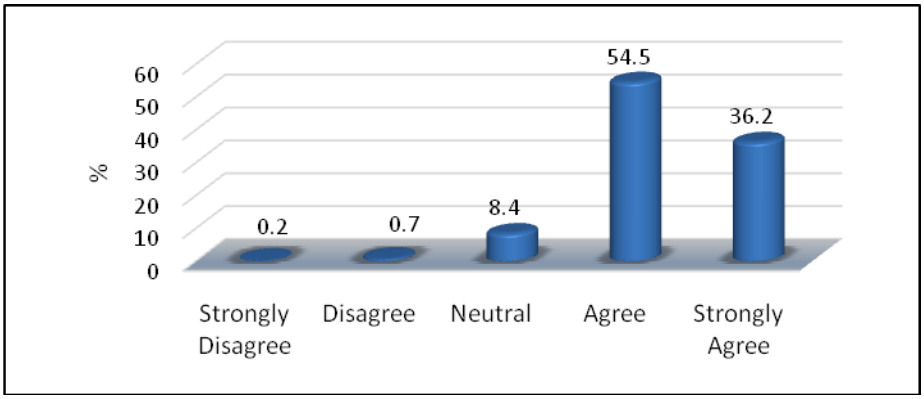
With respect to the fifth, sixth and seventh research questions, Behavioural Intention (BI) measured using five items (questions) as listed in Table 5.13. Results show that participants BT was very positive with an aggregated percentage of responses answered with "Agree and "Strongly "Agree" of 90.7% comparing to only 0.9% answered with "Disagree" and "Strongly Disagree", as shown in Figure 5.17. Due to this, the aggregated average was also high (above 3) with an average of 4.26 and 0.59 standard deviation. The least average was for considering M-Government application as strategic

investment with average of 4.20 (Stdev = 0.64). The highest average (4.30) was for two statements: participant expectation of using M-Government while engaging with other entertainments and enjoyments and with the statement of loyalty of commitment in re-using M-Government application in the future.

Table 5.13: Descriptive Statistics for BI and its items

Item	Statements	Average	Stdev
BI41	It is likely that I will use the Mobile Government Applications again for other services.	4.23	0.65
BI42	I expect that the Mobile Government Applications will make governmental services even easier in the future.	4.26	0.61
BI43	I expect using Mobile Government Applications while engaging in other entertainments and enjoyments.	4.30	0.62
BI44	I expect that the Mobile Government Applications should be considered a major and strategic investment.	4.20	0.64
BI45	I expect that my loyalty is strong with a commitment to re-use Mobile Government Applications in future.	4.30	0.61
Aggregated Average		**4.26**	0.59

Figure 5.17: Participants' Aggregated Responses on the BI Statements



5.3.5. Perception of Risk

With respect to the second and third research questions, Perception of Risk (PoR) was measured using five items (questions) as listed in Table 5.14. Results show that the PoR of participants was slightly negative with an aggregated percentage of responses, with "Disagree, 2" and "Strongly Disagree, 1", of 31.7% compared to 25.5% answered with "Agree, 4" and "Strongly Agree, 5", as shown in Figure 5.18. This result is also reflected on the average of PoR statements producing an aggregated average less than 3

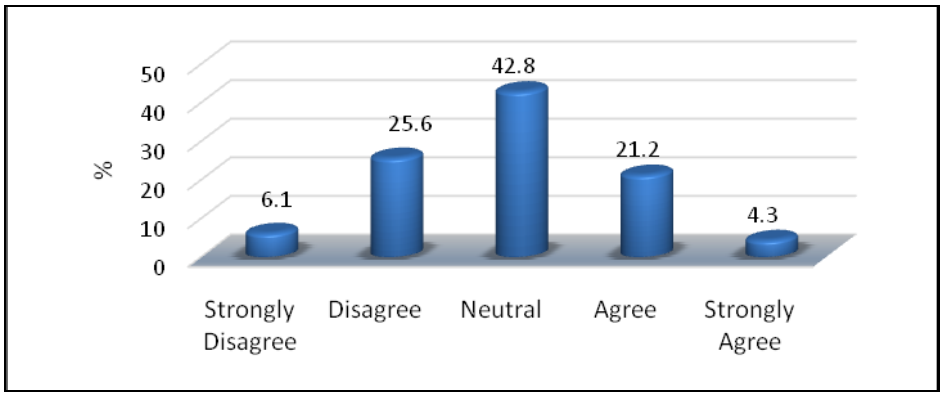
(i.e., the average of Likert Scale, less than 3) of 2.92 and standard deviation of 0.85. This means that the participants have concerns less than the average (3) of using the M-Government application.

The highest concern (i.e., the average = 3.05, above 3) with M-Government application was not completing their transactions due to some technical problem. The least concern (average=2.85) with using M-Government application was with not being able to protect my personal details, and that someone may access to my account without my permission or illegitimately.

Table 5.14: Descriptive Statistics for PoR and its items

Item	Statements	Average	Stdev
POR51	I am concerned that the Mobile Government Applications may not deliver the expected standard of service, or it may be denied access to my account due to some unknown faults.	2.97	0.92
POR52	I am concerned that the Mobile Government Applications may not be able to complete my transaction due to some problem.	3.05	0.88
POR53	I am concerned that the Mobile Government Applications may not be able to protect my personal details, and that someone may access my account without my permission.	2.85	0.97
POR54	I am concerned that the Mobile Government Applications may not be reliable or secure enough to conduct services and finish transactions.	2.87	0.94
POR55	I am concerned that the Mobile Government Applications may cause financial or data loss when I make payment to the government.	2.86	0.96
Aggregated Average		**2.92**	0.85

Figure 5.18: Participants' Aggregated Responses on the PoR Statements



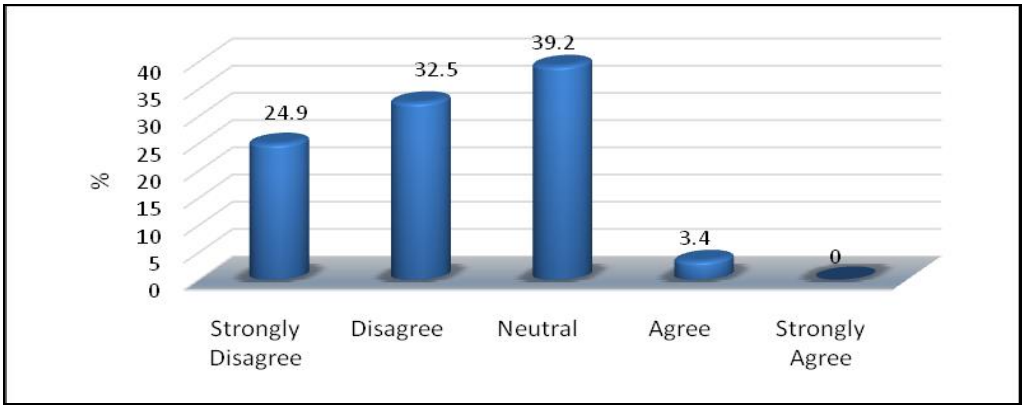
5.3.6. Culture

With respect to the first research question, Omani Culture (CT) factor was measured using five items (questions) as listed in Table 5.15. Results show that participants CT was positive towards using M-Government with an aggregated percentage of responses, with "Disagree" and "Strongly Disagree", of 57.4% compared to only 3.4% who answered" Agree, 4" and "Strongly Agree, 5", as shown in Figure 5.19. This resulted with aggregated average, for all CT statements, less than 3 (2.21) with a standard deviation of 0.95, (since statements were negative and the aggregated average less than 3). The highest concern (average=2.33) was with the benefits of M-Government applications and their services. The least concern (average=2.07) was with using M-Government application may not allow participants to control the governmental services as in the case of conventional government offices.

Table 5.15: Descriptive Statistics for CT and its items

Item	Statements	Average	Stdev
CT61	I am not completely sure or aware about the benefits of Mobile Government Applications and their services	2.33	0.82
CT62	I prefer seeing things like government services happening with my own eyes rather than using Mobile Government Applications	2.20	0.82
CT63	I am concerned that Mobile Government Applications do not allow me to control my governmental services as in like the government offices do	2.07	0.87
CT64	I am not comfortable using Mobile Government Applications over governmental offices.	2.27	0.89
CT65	I am concerned that Mobile Government Applications is not according to my religious beliefs and my culture	2.19	0.86
Aggregated Average		**2.21**	**0.74**

Figure 5.19: Participants' Aggregated Responses to the CTS statements



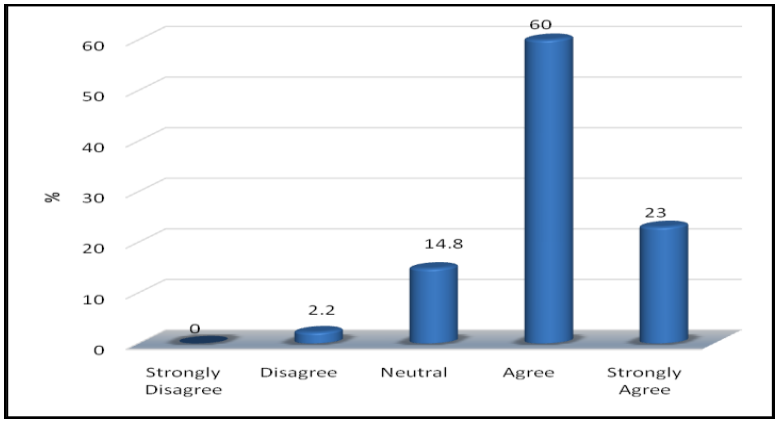
5.3.7. Personality Trait – Agreeableness

With respect to the seventh research question, Agreeableness (AGR) factor was measured using five items (questions) as listed in Table 5.16. Results show that the participants' agreeableness was very positive with an aggregated percentage of responses, with "Agree" and "Strongly Agree", of 83% compared to only 2.2% who answered with "Disagree", as shown in Figure 5.20. The High percentage (83%) of "Agree, 4" and "Strongly Agree, 5" on these statements reflected on the aggregated average of these statements with an average of 4.04 (above 3 and close to 5) and a standard deviation of 0.63. This means that participants are positive towards new technology adoption. The highest agreement average (4.11) was with polite and likes to cooperate with others. The lowest average (3.96) was with the statement "easily tends and accepts to go along with others".

Table 5.16: Descriptive Statistics for AGR and its items

Item	Statements	Average	Stdev
AGR71	I see myself as someone who easily tends and accepts to go along with others.	3.96	0.68
AGR72	I see myself as someone who is loyal and unselfish with others.	4.02	0.70
AGR73	I see myself as someone who is polite and likes to cooperate with others.	4.11	0.69
AGR74	I see myself as someone who is cold, calm and is generally trusting	4.02	0.64
AGR75	I see myself as someone who is helpful and kind to almost everyone.	4.09	0.69
Aggregated Average		**4.04**	0.63

Figure 5.20: Participants' Aggregated Responses to the AGR Statements



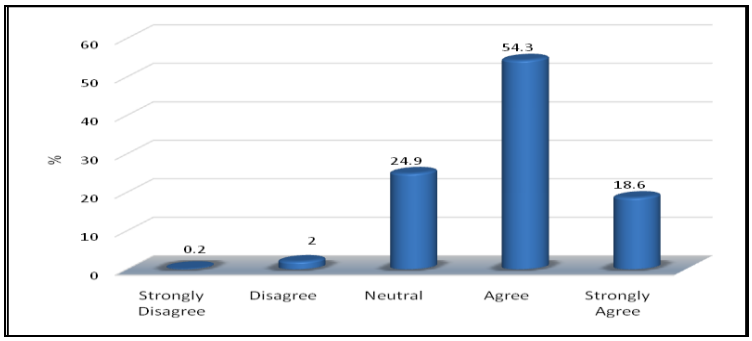
5.3.8. Personality Trait – Conscientiousness

With respect to the seventh research question, Conscientiousness (CON) factor was measured using five items (questions) as listed in Table 5.17. Results show that participants were very positive to CON factor with an aggregated percentage of responses, with "Agree and "Strongly Agree", of 72.9% compared to only 2.2% who answered with "Disagree" and "Strongly Disagree", as shown in Figure 5.21. The high percentage "Agree, 4" and "Strongly Agree, 5" (72.9%) of responses on CON statements is also reflected on the aggregated average of these statements with an average (higher than 3) of4.03 and a standard deviation of 0.65. The highest conscientiousness average (3.94) was with being a reliable worker and tends to be well-organized. The lowest average (3.84) was with two statements: "being someone who is with patience and keeps trying until the task is finished and I see myself who tends to be hard working and do my work on time".

Table 5.17: Descriptive Statistics for CON and its items

Item	Statements	Average	Stdev
CON81	I see myself as someone who makes plans and follows through with them.	3.90	0.74
CON82	I see myself as someone who can be somewhat capable and does things efficiently.	3.92	0.74
CON83	I see myself as someone who is a reliable worker and tends to be well-organized.	3.94	0.70
CON84	I see myself as someone who tends to be hard working and do my work on time.	3.84	0.69
CON85	I see myself as someone who with patience and keeps trying until the task is finished.	3.84	0.74
Aggregated Average		**3.96**	**0.59**

Figure 5.21: Participants' Aggregated Responses to the CON Statements



5.3.9. Actual Use of Mobile Government Applications

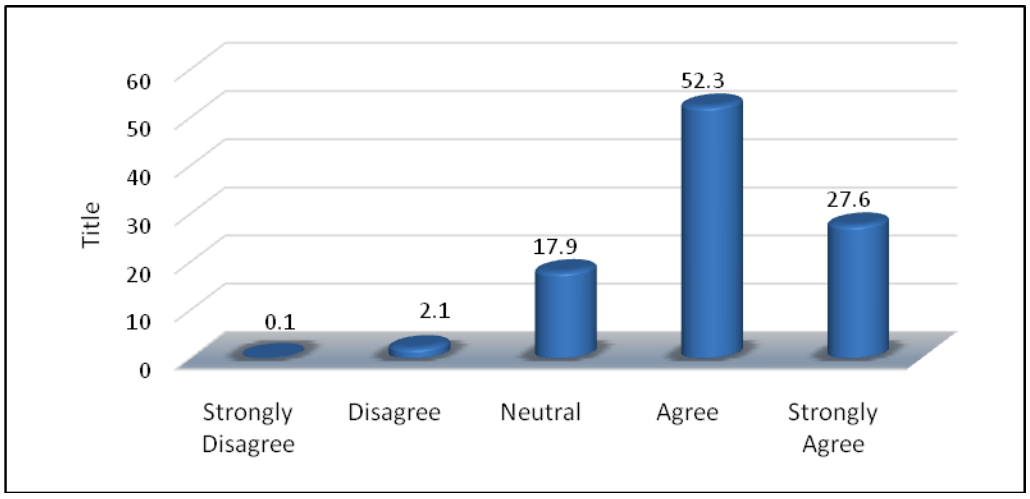
With respect to the sixth and seventh research questions, Actual Use of Mobile Government Applications (AU) factor was measured using five items (questions) as listed in Table 5.18. Results show that participants were very positive about the AU factor with an aggregated percentage of responses, with “Agree" and “Strongly Agree”, of 79.9% compared to only 2.2% who answered with “Disagree” and “Strongly Disagree”, as shown in Figure 5.22.

The high percentage of “Agree, 4" and “Strongly Agree, 5" (79.9%) has affected the aggregated average of 4.05 (more than 3) and a standard deviation of 0.59. The highest AU statement average (4.09) was with “conducting requests using M-Government applications is clear and considered highly by operators”. The lowest average (3.96) was with the statement “Some members of my family have conducted and requested for several time services using the Mobile Government Applications”.

Table 5.18: Descriptive Statistics for AU and its items

Item	Statements	Average	Stdev
APR91	The services I conduct and request using the Mobile Government Applications is clear and can be considered high or very high.	4.09	0.50
APR92	Many of my friends have conducted and requested services using the Mobile Government Applications for several times.	4.08	0.64
APR93	The services I conduct and request using the Mobile Government Applications vary and for many governmental services.	4.04	0.77
APR94	Some members of my family have conducted and requested for several time services using the Mobile Government Applications.	3.96	0.78
APR95	The general volume of using and requesting services through the Mobile Government Applications is high or very high.	4.07	0.74
Aggregated Average		**4.05**	0.53

Figure 5.22: Participants' Aggregated Responses to the AUS statements



5.4. Discussions on the Descriptive Results

This provides discussions on the results and findings of the descriptive data analysis. This will involve discussions on the use of new technologies in Oman such as Smartphones and the Internet, the users using the M-Government in Oman, and the factors affecting the adoption of M-Government in Oman.

5.4.1. The Use of New Technologies in Oman

There were ten items in the data collection instrument asking for data about the use of new technologies in Oman. These covered the following: the use of M-Government applications and services in Oman, the frequency of use, the knowledge level of using the computers, Internet and the Smartphone technologies, and about the ownership of computers, the Internet connection and Smartphone technologies.

Based on the responses provided by our participants on the use of new technologies, the results indicate an active new trend in terms of new technologies used in Oman. More than 88% used Mobile government applications and more than 55% of them used it more than twice up to eight or more times during the year before conducting this study, see Table 5.1 and Figure 5.1. This indicates a great opportunity for the government in Oman to more invest in this area for providing more services through the mobile channels. The findings also showed that about 83% of our participants consider their level of knowledge of using computer, Internet and Smart-devices good or very good, see Table 5.3, 5.4, and 5.5 and Figure 5.3, 5.4 and 5.5. This also indicates that the

adoption of such technologies may not need further development in the area of users' awareness and knowledge about the tools and infrastructure needed for M-Government innovations and initiatives. Furthermore, more than 94% of our participants have Computers, Internet and Smart Devices, Tablets or any other similar devices, see Table 5.6 and Figure 5.6; this showed an evidence that the M-Government services can be reachable by all users in Oman and there will be a great level of coverage of the beneficiaries.

As this study is concerned with investigating all factors that may have an implication on using Mobile government applications, such readings indicate that Omanis are very well aware of technologies and their benefits, and this may lead to a smoother adoption and actual use of new technologies. Earlier studies also showed the same results in regard to the importance of users awareness and knowledge of those technologies as pre adoption requirement (e.g., (Alhujran, 2009; AlSoufi and Ali, 2014)). In regard to the findings about the technologies used to acquire governmental services, the results showed a very noticeable evidence on adopting the use of Smartphone Applications and the use of Internet via those devices to acquire the services. Such findings implies that the skills and knowledge needed to adopt the M-Government services in Oman may not be a challenge or a reason to affect the actual use of those technologies. Yet, the findings showed an evidence on moderate of the number of M-Government applications distribution used in Oman over the last year since conducting this study. The results here imply that there is more work and efforts need to be achieved to influence and facilitate the use of M-Government applications, and there is a remaining need to develop further applications that can offer different services.

5.4.2. The Users of M-Government in Oman

There were five items in the data collection instrument asking for data about the demographic profiles and characteristics of the 450 participants. These included: age, gender, educational level, yearly income and nationality or citizenship. With regard to the participants' age, the results showed that around half of the respondents were aged between 25 and 65 years, see Table 5.9, i.e. around half of the participants are mature enough to report realistic and concrete opinions. This also implies that not only the older participants were likely to be exposed to the M-Government services, but also the young one too, i.e., M-Government services and applications are reaching all categories of age. In regard to the gender, the findings showed that there was a very noticeable

difference in the ratio of responses received from men and women, more than two thirds were men. These ratios suggest that the women in Oman do not use the M-Government services and applications as much as men, and this most possibly indicates that women in Oman are most likely obtaining their services by men and not directly. Therefore, a further investigation could be needed to explore this issue, otherwise, the findings imply that further developments in the area of M-Government services and applications in Oman need to consider particular services for women.

With reference to the academic or educational level of the participants, the results showed that more than 98 percent of the participants had gained an educational level of at least Diploma. This implies that the users of M-Government applications and mobile related technologies in Oman are well educated and this can be a facilitator for the government in Oman to succeed in such initiatives. Thus, the government in Oman may not need to offer awareness programs and training for the users. The data collected in regard to the estimated annual income were improper as the choices in the question involved very high amounts; more than 93% reported income less than 200k Omani Riyal a year, i.e. around less than 50k US Dollar. This was due to incorrect choices in the question and the findings here may not add any value to this research.

With reference to the nationality, the findings showed that more than 80 percent of the participants are Omani, and this indicates that there is a reasonable portion of the M-Government users are none Omanis. This finding implies that the government Oman still needs to consider developing M-Government applications and services for the none Omani residents in Oman.

5.4.3. Perceived Ease of Use and M-Government in Oman

Several scholars have investigated the impact of perceived ease of use on the Behaviour of customers using online services, and assessed the relationship between perceived ease of use and perceived usefulness within different domains of services available online (e.g. (Mahadeo, 2009; Oliver, 1997This study in particular focused on this impact within the context of using and adoption of M-Government services in Oman. The findings indicated with respect to the third and fourth research questions that the perceived ease of use of M-Government services among the research participants was very positive, and this is expected to influence the Behavioural intent of the participants towards using and adopting such technology, see Table 5.10 and Figure 5.14. The

findings also indicated that this positive perceived easy of use may influence developing a positive perception towards the usefulness of M-Government applications in Oman. This implies that the available M-Government applications and services in Oman are easy to use for obtaining governmental services such as making payments, and can also be considered user friendly and understandable.

The findings also indicate and imply that the M-Government Applications in Oman are easy to download and use, and provide full details and complete information as needed by the users. Therefore, the Omani government need to keep taking into account the easy of use issue as this may influence the adoption of M-Government services. these findings are consistent with the findings of some earlier studies which highlight the fact that complex electronic applications and services may face slower rates of adoption than those systems that require less human effort to use and operate. Another study also supported the same findings and found that perceived ease of use positively influences the attitudes of users towards using the technology-enabled services (Bisdee, 2007). Therefore, making the M-Government applications and services easy to use and more friendly helps increasing the satisfaction of the Omani users and may enhance the levels of their loyalty (Childers et al., 2001).

5.4.4. Perceived Usefulness and M-Government in Oman

Several earlier studies have investigated the impact of perceived usefulness on the Behaviour of individuals using the online services (e.g. (Mahadeo, 2009; Gummerus et al., 2004)). This study in particular investigated those issues within the context of using M-Government services in Oman. The findings indicated with respect to the fourth and fifth research questions that the perceived usefulness of M-Government services among the research participants was very positive, and this is expected to influence the Behavioural intent of the participants towards using and adopting such services and technologies, see Table 5.11 and Figure 5.15. This implies that the available M-Government applications and services in Oman are efficient and informative, and provide easy services-related information prior to making service requests. For example, the research participants reported that the available M-Government applications and services in Oman are efficient to conduct more than a service at once, simplified enough to obtain services approval and confirmation, and useful in acquiring services as they provide full details of services and policies. The findings are in parallel with findings reported by other studies (McCloskey, 2004), and implies that the government in Oman

needs to continue making and developing M-Government applications that are useful and efficient for the users to use.

5.4.5. Attitude to Use and M-Government in Oman

Several earlier studies have investigated the impact of attitude on the Behaviour of users considering the online services (e.g. (Mahadeo, 2009; Barkhi et al., 2008). This study in particular investigated the influence of customer attitude towards Behavioural intention to use the M-Government applications and services in Oman, see Table 5.12 and Figure 5.16. The study found with respect to the second, fourth and fifth research questions that the there is a very positive attitude towards using those initiatives with positive association between the user attitude and the Behavioural intention to use them. This seems to be due to that the users in Oman prefer the idea of using M-Government applications for requesting governmental services, believe those services as useful and beneficial, and consider using the M-Government Applications is a pleasant experience.

The users of M-Government applications and services in Oman also reported that they believed in the features of such utility for their productivity and effectiveness; such feelings can result in the development of a positive attitude towards it. Through data analysis, the study found that such positive attitude makes the users have a strong Behavioural intention to use the M-Government applications and service. These results are similar and come in parallel with those results as reported by other researchers (e.g. (Ahn et al., 2004; Barkhi et al., 2008)).

5.4.6. Behavioral Intention and M-Government in Oman

Several earlier studies have investigated the Behavioural intention of the users towards using online technologies and the impact of this Behavioural intention on the actual use of such technologies (e.g., (Davis, Bagozzi, and Warshaw, 1992; Oliver, 1997)). This study in particular investigated the influence of Behavioural intention towards the actual use and adoption of the M-Government applications and services in Oman. The study found with respect to the second, fourth and fifth research questions that the there is a very positive intention towards using the M-Government in Oman with positive association between with the actual use of such initiatives, see Table 5.13 and Figure 5.17. This seems to be due to the believe of the research participants in that the M-Government can be used for other services, to make governmental services even easier

in the future, and their expectation in that they may use such services while engaging in other entertainments and enjoyments. The Behavioural intention was also positive due to considering that M-Government initiative as a major and strategic national investment, and this technology will enhance the loyalty and commitment levels in the future.

The M-Government users in Oman seem to believe that developing a strong Behavioural intention toward using this technology is very important to persuade them reuse the service acquisition and make payments again, and consequently, to acquire strong loyalty with commitment towards the initiative in Oman. These results are similar to those reported in the literature; for example, feeling that the electronic services will be easier to use in the future and engaging the users in further entertainments and enjoyments have been found to affect the adoption of graphics applications and programmes (Davis, Bagozzi and Warshaw, 1989).

5.4.7. Perception of Risk and M-Government in Oman

Several earlier studies have investigated the impact of risks and the perception of different types of risks towards using the new technologies, and the impact of this perception on the adoption of and on the perceived ease of using such technologies (e.g., (Vijayasarathy, 2004; Alsomali, 2015)). This study in particular investigated the impact of perception of risk and its impact on the perceived ease of using MM-Government applications and services in Oman. The study found with respect to the second and third research questions that the there is a slightly positive perception of risk when using M-Government services and applications developed by the users, see Table 5.14 and Figure 5.18. This indicates that the users in Oman have minimal concerns about risks when using the M-Government application, and about that those M-Government applications may not deliver the expected standard of service, or it may be denied access to their accounts due to some unknown faults.

The M-Government users in Oman seem to believe that this technology will be able to complete their transactions and services with no interruption, and to secure their data and information from hackers and adversaries. The users reported that the M-Government is reliable or secure enough to conduct services and finish transactions, and may not cause any financial or data loss when making payments to the government in Oman. Yet, those findings are in opposition with other findings reported by other

studies that consider the perception of all types of risk have a significant impact on the adoption of new technologies and thus are important components of the adoption model (e.g., (Lee et al., 2013; Farzianpour et al., 2014; Alsomali, 2015). The results here could be due to a limited awareness of the users in Oman about the information security threats and risks, or due to other factors such as social; this issue may require further investigation to consider the socio-cultural factors affect.

5.4.8. Culture and M-Government in Oman

Several scholars have investigated the impact of culture on Behaviour and perception towards different aspects of technology; they reported that different cultures have different perceptions towards usefulness of multilingual websites (Hiller, 2003), perceived usability of websites is influenced by the culture and language and that the cultural factors can influence using the Internet banking (Alsomali, 2015). This study in particular investigated the impact of culture on the perceived attitude of the M-Government users and on their perception of risk towards using this technology in Oman. The study found with respect to the first research question that culture is a positive aspect influencing the perception of risk when using the M-Government applications and services in Oman and influencing the development of positive attitude towards using this technology, see Table 5.15 and Figure 5.19. This finding is in parallel with the findings of other studies that reported the adoption of technology may be significantly influenced by the socio-cultural belief, values and experiences of the users (Narteh, 2012), and by different cultural factors such as the language, uncertainty and avoidance aspects, as well as the usability of new technologies (Alsomali, 2015).

This is an obvious reading from the responses of the research participants. For example, the M-Government users in Oman seem to be completely aware and sure of the benefits of M-Government applications and their services, and prefer to experience and seethe government services happening through using M-Government Applications. The users in Oman also seem to perform their governmental services as they do in the governmental offices, and to feel more comfortable when using M-Government applications than doing this in actual governmental offices. The M-Government applications and services also seem to be implemented according to the religious beliefs and culture norms of the users in Oman. Such findings are consistent with the findings reported by other studies where the compatibility of the technology with the culture and norms of the users is a key factor for the adoption of such technology (Alsomali, 2015).

This implies that the government in Oman will need to consider the cultural issues in Oman when implementing new services or M-Government applications.

5.4.9. Personality Trait and M-Government in Oman

Several studies investigated the personality impact on the the relationship between the Behavioural intentions and the actual Behaviour (e.g., (Ajzen 2005; Gountas and Gountas, 2007). The personality trait is an indication of theoretical support for a connection between personality traits and beliefs, and this variable should be considered a moderating variable between the Behavioural intentions and the actual (e.g., (Baron and Kenny, 1986; Shropshire, 2015)). This study in particular investigated the impact of personality trait as a moderating factor on the Behavioural intentions of using M-Government in Oman and the actual use of such technology. The study considered two personality traits only as explained in Chapter 4: Agreeableness and Conscientiousness. The study found with respect to the seventh research question that the there is a positive and very positive impact of both personality trait, Agreeableness and Conscientiousness, respectively, as moderating factors on the relationship between the Behavioural intentions of using M-Government in Oman and the actual use, see Tables 5.16 and 5.17 and Figures 5.20 and 5.21.

With reference to the agreeableness trait, the M-Government users tend to easily go along with others, to be loyal and unselfish with others, and act politely with cooperation with others. The users of M-Government in Oman also seem to be cold, calm, trusting, helpful and kind to almost everyone, and consequently, those personality characteristics impacted positively on the Behavioural intention and actual use of the technology. These findings are consistent with the findings of other studies that reported the agreeableness trait as a factor associated with technological knowhow ideologies and acceptance (Devaraj et al., 2008). With reference to the conscientiousness trait, the study found that the M-Government users tend to make plans and follow those plans to achieve tasks, to be fairly capable, reliable, efficient and well organized when doing things or conducting services. The users of M-Government in Oman also seem to be hard working and perform their work on time with patience, and keep trying until their tasks and duties are finished. Those attributes are the key issues made both, the agreeableness and conscientiousness, traits as a moderating factor with positive and strongly positive impact, respectively (Salgado, 1997). Those findings are consistent with the results of other studies focusing on the technology adoption; it has been

reported that such characteristics are important for technology adoption as the new technological applications are based on enhancing performance, hardworking and real achievements (Gountas and Gountas, 2007).

5.5. Summary

This study investigated the use of new technologies and the demographic characteristics of individuals using the M-Government applications and services in Oman. The study also investigated the key factors comprising a novel model for the adoption of new paradigm for offering governmental services, i.e., M-Government infrastructure. The findings indicated that the users in Oman as well educated and the M-Government services are used by users with different ranges of age and nationalities. The findings also indicated that the use of new technologies is mature in Oman, and different types of means are in use such as Smartphones, Tablets, Internet and Computers. Those outcomes implies the readiness of the society in Oman to use the M-Government applications and services.

The findings also indicated that the factors comprising the M-Government Adoption Model (MGAM) include those factors introduced in the Technology Acceptance Model (TAM), and other novel factors including perception of risk, culture and personality traits. This can be considered as an extension of the TAM model within the context of emerging technology, i.e., M-Government in Oman. The study here reports that the whole set of factors suggested by the new MGAM have an influence and impact on the adoption of M-Government applications and services. yet, how those factors are interrelated to each other and how they interact for a final development of the MGAM model will be discussed in the Chapter 6, with further discussions.

Chapter 6

Mobile Government Adoption Model Assessment and Discussion

This Chapter presents the data analysis and the research results on the development of Mobile Government Adoption Model (MGAM). The Chapter provides the results of Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) and the results of Structural Equation Modelling (SEM) for the evaluation of the research hypotheses. Investigating the moderating variable impact and multi-group analysis will also be provided in this chapter. The Chapter will then assess the relationship and interactions among the factors comprising the MGAM model, and the development of MGAM model, and provide discussions about the scientific implications of the model.

In brief, the MGAM Model assessment in this chapter revealed that the participants have positive perception on the dynamics and links among the variables presented in the model. According to the statistical tests used to assess the hypotheses in this chapter, the findings revealed that there are significant relationships among the MGAM Model variables or factors; i.e., accepting all hypotheses introduced in this study. This explained the importance of those factors for developing M-Government applications that can be easily adopted by the Omani users. In addition, the SEM Modelling

technique showed the strength of the links among the factors of the MGAM Model and that this model is fit with significant coefficients. Further details on the hypotheses testing and discussions on the MGMA Model assessment and Goodness-of-Fit will be provided in this chapter.

6.1. Confirmatory Factor Analysis and Model Evaluation

As recommended by Jöreskog (1993) and Castaneda (1993), a two-step Structural Equation Modelling (SEM) procedure was employed in this study for estimating parameters: A measurement model followed by a structural model. The measurement model is a Confirmatory Factor Analysis (CFA). The purpose of the measurement model is to specify the relationships between the observed variables. Furthermore, the structural model specifies the relationships among the latent variables. It specifies which latent variables directly or indirectly influence changes in the values of other latent variables in the model (Schumacker and Lomax, 2010). The CFA using the AMOS program focused on the nine latent variables (PU, PEoU, PoR, AT, CT, BI, PT_AGR, PT_CON, AU) and 45 observed variables (as listed in Table 4.1 in Chapter 4). The CFA provides an assessment of the reliability and validity of the observed variables for each latent variable (Jöreskog and Sörbom, 1989). Reliability of the observed variable refers to the degree of variance explained by the construct rather than by error. It is measured by squared factor loadings. Observed variables are considered to have high reliability when the squared factor loading for each one is more than 0.50, moderate if between 0.30 and 0.50 and poor if below 0.30 (Holmes-Smith, 2001). Therefore, in this study, any observed variables where their squared factor loadings are less than 0.20, should be deleted from the model.

The Maximum Likelihood Estimation (MLE) method was also used for estimating the parameters. Two procedures were used to test the fit of the measurement model: The fit of individual parameters and the fit of the entire model. To test the fit of the individual parameters, two steps were used. The first step was to determine the feasibility of their estimated values. The assessment focused on whether their estimated values are in the admissible range or not. These include negative variance, correlation exceeding one, and non-positive definite correlation matrix (Byrne, 2001). None of these problems was found when performing CFA for each variable.

The second step in assessing the fit of individual parameters was to test their statistical significances. Parameters are considered statistically significant when their t-values ≥ 1.96 at a level of α= 0.05. Non-significant parameters should be deleted from the model (Holmes-Smith, 2001). The second step in evaluating the fit of the measurement model was to assess the fit of the entire model. The AMOS program provides a number of fit indices. However, this study used the following major indices as recommended by Byrne (1998). These were the Chi-square (χ^2) test, the Normed chi-square (χ^2/df), Goodness-of-Fit index (GFI), Adjusted Goodness of-Fit Index (AGFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA). These indices are explained below:

1. The traditional fit index is the chi-square χ^2 test and it is the only statistical test of significance in SEM. A non-significant chi-square value indicates that the hypothesised model fits the sample data well. However, χ^2 is affected by sample size and normality of the data (Kline, 1998; Tabanchnick and Fidell, 2001; Schumacker and Lomax, 2010). Therefore, the χ^2 test should be used in combination with other indices. The Normed chi-square is the ratio of the χ^2 divided by the degree of freedom and a value less than 3.0 indicates acceptable fit (Hu and Bentler, 1999).

2. The GFI and AGFI are similar to squared multiple correlations in that they indicate the relative amount of sample variance and covariance explained by the MGAM model. The AGFI differs from the GFI in that it adjusts the number of degrees of freedom in the specified model. Both indices range from zero to one, with values exceeding 0.90 indicating a good fit model (Byrne, 2001).

3. The CFI compares the fit of the hypothesized model to an independent model or null model. Its value ranges from zero to one, with values above 0.90 indicating a good fit (Hu and Bentler, 1999).

4. The RMSEA represents the discrepancy per degree of freedom between the population data and the hypothesized model. According to Browne and Cudeck (1993), RMSEA values of less than or equal to 0.05 can be considered a good fit, values between 0.05 and 0.08 an adequate fit, and values between 0.08 and 0.10 a mediocre fit, whereas values more than 0.10 are not acceptable.

6.2. Model Assessment

Our proposed research model is illustrated (in Figure 3.12) through employing Structural Equation Modelling (SEM) to our proposed MGAM model, which involves solving the following hypothetical set of simultaneous regression equations that represents our main research hypotheses; each one of these is extracted from the original theories used in this research, and express a regression equation and represents a single hypothesis as will be described and discussed later in this Chapter:

$$PoR = \beta_{12}CT + \varepsilon_1 \quad (1.1)$$

$$PEoU = \beta_{13}PoR + \varepsilon_2 \quad (1.2)$$

$$PU = \beta_{14}PEoU{+}{+}\varepsilon_3 \quad (1.3)$$

$$ATT = \beta_{15}PEoU{+}\beta_{25}PU + \beta_{25}CT + \varepsilon_4 \quad (1.4)$$

$$BT = \beta_{16}BI + \varepsilon_5 \quad (1.5)$$

$$AU = \beta_{17}BI + {+}\varepsilon_6 \quad (1.6)$$

$$AU = \beta_{18}BI + \beta_{28}PT + \beta_{38}BI \times PT + \varepsilon_7 \quad (1.7)$$

Such that,

- Error terms $\boldsymbol{\varepsilon} = \varepsilon_1, \varepsilon_2, \dots, \varepsilon_7$ are independent and normally distributed random variables with zero mean, where $\theta_\varepsilon = E(\boldsymbol{\varepsilon}\boldsymbol{\varepsilon}')$, the covariance matrix of structural disturbance**.**
- The coefficients β_{ij} are the regression coefficients among latent variables.
- Regression model Hypotheses (Null and Alternative Hypothesis):
    - Equation 1.1: $H_0: \beta_{12} = 0$ vs $H_1: \beta_{12} \neq 0$

      This hypothesis describes the regression relationship between Culture Impact (CT) and Perception of Risk (PoR). If $\beta_{12} = 0$, then there is no relationship between CT and PoR.

    - Equation 1.2: $H_0: \beta_{13} = 0$ vs $H_1: \beta_{13} \neq 0$

      This hypothesis describes the regression relationship between PoR and PEoU. In the same way, if we cannot reject the Null Hypothesis ($H_0: \beta_{13} = 0$), then there is no direct relationship between PoR and PEoU.

- Equation 1.3: $H_0: \beta_{14} = 0$ versus $H_1: \beta_{14} \neq 0$.

This hypothesis tests the relationship between PU and PEoU.

- Equation 1.4: $H_0: \beta_{15} = \beta_{25} = \beta_{35} = 0$ vs H_1: at least one $\beta_{i5} \neq 0$

This hypothesis tests if PEoU, PU and CT have a direct impact on ATT.

- Equation 1.5: $H_0: \beta_{16} = 0$ versus $H_1: \beta_{16} \neq 0$.

This hypothesis tests if there is a relationship between BI and BT.

- Equation 1.6: $H_0: \beta_{17} = 0$ versus $H_1: \beta_{17} \neq 0$.

This hypothesis tests if there is a relationship between BI and AU.

- Equation 1.7: $H_0: \beta_{18} = \beta_{28} = \beta_{38} = 0$ versus H_1: at least one $\beta_{i8} \neq 0$.

This equation represents the moderation hypothesis testing for PT effect and its interaction with AU. If the interaction term is significant ($\beta_{38} \neq 0$) then there is a moderation effect.

All equations above represent the relationships between the research variables or factors as illustrated in the proposed research model (Figure 3.12); the direction of impact flow among the factors is also illustrated in the figure. The results of the initial measurement model fit the data well (Model1) (See Table 6.1). The chi-square of 148.37 with 20 degrees of freedom indicating a good fit. A significant chi-square at $p=0.000<0.05$ suggests that the model fitting is only acceptable. According to Byrne (2001) and Hu and Bentler (1999), the values of $\chi^2/df = 7.42$ and RMSEA= 0.12 indicate acceptable fit; yet, other fit statistics indicate that the model is not acceptable (e.g., the values of GFI=0.938; AGFI= 0.860; CFI= 0.903).

As CFA and SEM show that all variables are significant, so no substantial modification is needed except with modification indices options between terms. The modification allows the model to correlate errors (Model2). Byrne (2001) suggests that correlated error terms between item pairs are often an indication of a high degree of overlap in item content. The modification allows the model to correlate the modification index. The highest correlation was between (PoR, PU), (BI, PoR), and (CT, PEoU), etc. The

results of refitted model (Model 2) yielded an excellent fit for the model (Figure 3.12 and Figure 6.1) as illustrated in Table 6.1.

Table 6.1: Goodness-of-Fit Indices for Structural Model

Fit Indices	Benchmark	Value
CMIN (χ2)/DF	< 3	2.15
GFI (Goodness of Fit Index)	> 0.9	0.993
RMSEA (Root Mean Square Error of Approximation)	<0.08	0.051
Incremental fit measures		
AGFI (Adjusted Goodness of Fit Index)	> 0.90	0.962
NFI (Normed Fit Index)	> 0.90	0.989
CFI (Comparative Fit Index)	> 0.90	0.994
IFI (Incremental Fit Index)	> 0.90	0.994
RFI (Relative Fit Index)	> 0.90	0.955

Figure 6.1: Structural Equation Model for Mobile Government Adoption Model (The Default MGAM Model)

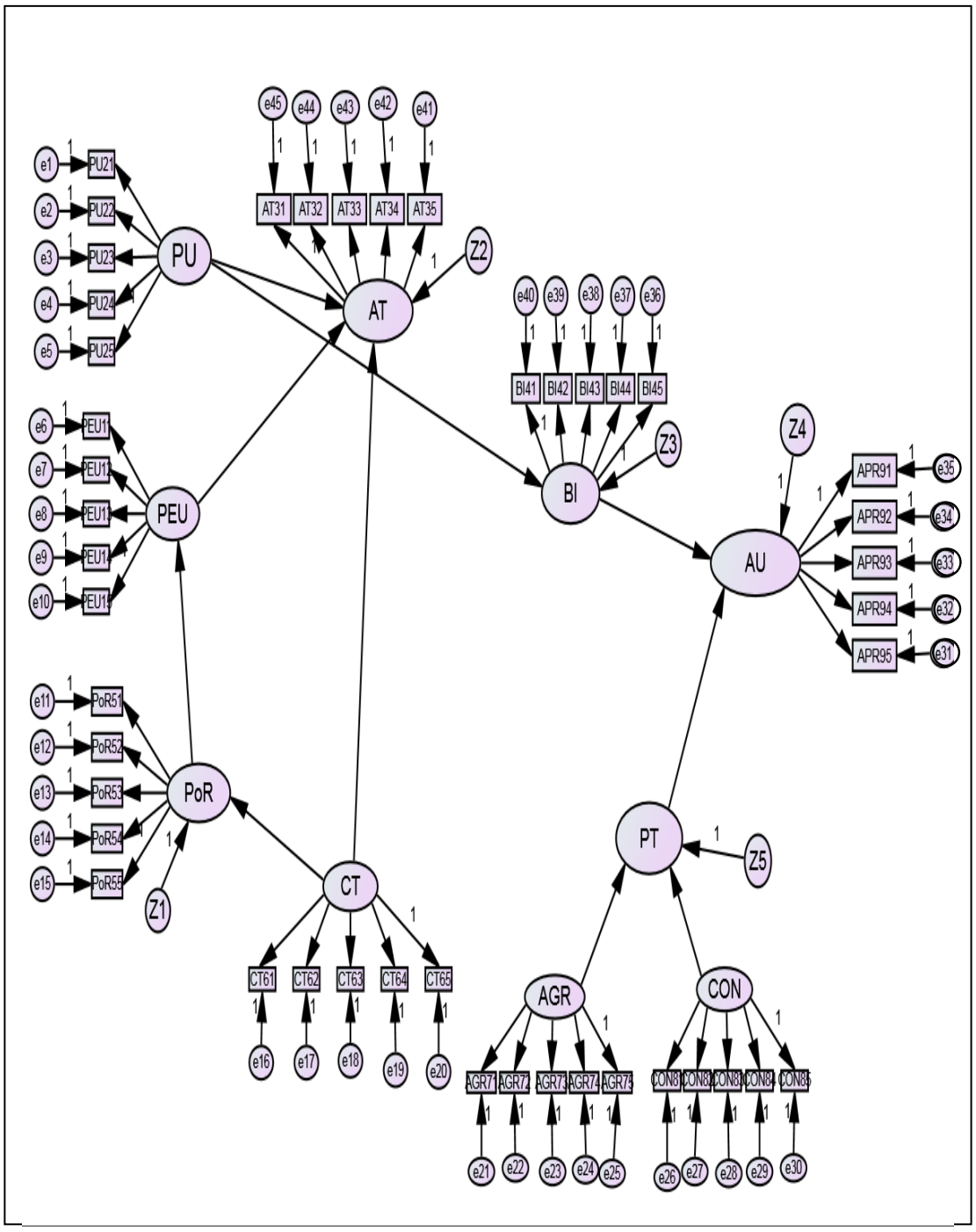


Figure 6.1 illustrates the MGAM Model development and building where each construct is based on the five statements or questions as explained earlier in Chapter 4, Table 4.2. For example, the assessment of Perception of Risk (PoR) was based on the five statements PoR51, PoR52, PoR53, PoR54 and PoR55, and the assessment of the Agreeableness of Personality Trait was based on the five statements AGR71, AGR72, AGR73, AGR74 and AGR75.

As illustrated in Figure 6.1, the use of SEM Modelling reveals the default direct or indirect relationships among the MGAM Model constructs and variables prior to testing the hypotheses. The SEM illustration identified the existence of those relationships and dynamics among the MGAM Model constructs and takes into account any possible mistakes or errors in the measurements of the variables. As shown in the figure, each construct of the MGAM Model constructs is linked to the observed variables or questions provided in the survey to the participants; making the observed variables or questions and the MGAM Model constructs connected to each other is a reflective way (i.e., the responses on the observed variables or questions reflect on and explain the status of the MGAM Model constructs).

6.3. Structural Model and Testing Main Hypotheses

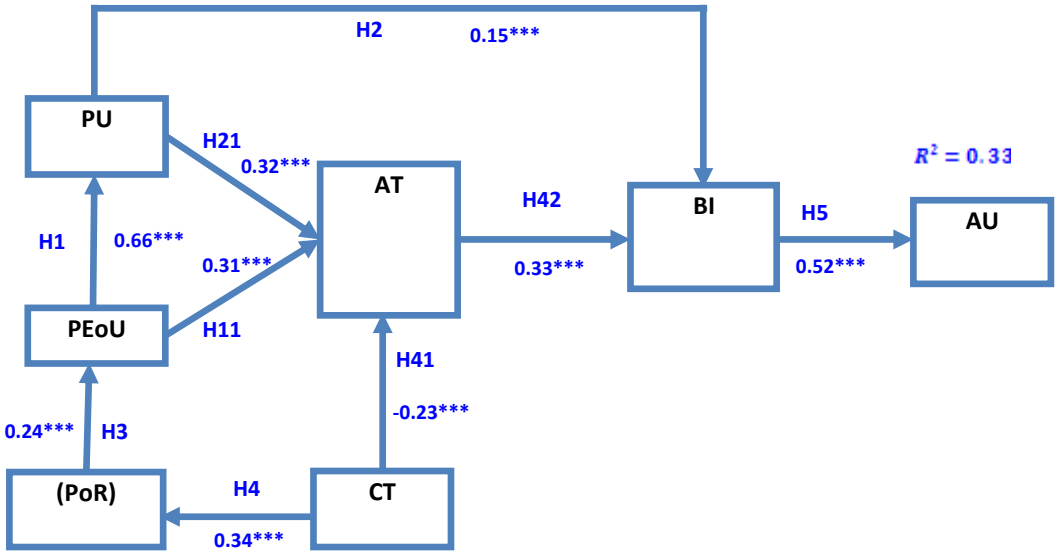
6.3.1. Structural Equation Modelling and Hypotheses Testing

After establishing and confirming the measurement model using Goodness of fit statistics, the next step was to evaluate our model and test our research hypotheses using structural model. With respect to the first research question, the structural model defines the relationships between the latent variables or the constructs. It specifies which latent variables directly or indirectly influence changes in the values of other latent variables in the model (Byrne, 2001). The analysis of the hypothesised structural model was conducted by testing the hypothesised model, which specified the nine casual relationships in Table 6.2 and in the path diagram presented in Figure 6.1. The standardized path coefficients for the theoretical structural model are presented in Figure 6.2. As the hypothesised paths illustrated in this Figure, all of those paths were significant at $p<0.01$, and as summarised below in the Table 6.2 to test the main hypothesis.

The figure shows the R-squared (i.e., R^2) values as a statistical measure indicating how close the data are to the fitted regression line between factors; i.e., how well the linear model fits a set of observations. This is known as the coefficient of determination to identify the proportion of the variance in the dependent variable (for example, BI) that is predictable from the independent variable (i.e., AT). The values explain and analyse how differences in one variable (i.e., dependent variable) can be explained by a difference in a second variable (i.e., independent variable). The values of R- squared in

this project were obtained through the use of standard linear regression analysis between any two given variables using SPSS Software Statistical Application.

Figure 6.2: Structural Equation Modelling Results and Hypothesized Paths



Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

In the context of using M-Government applications and services in Oman, the data analysis conducted here was to validate the hypotheses as described in the MGAM Model. The key findings provide answer on the first research question and found the following validations and formulas:

1. The Perceived Ease of Use explained the Perceived Usefulness of the technology (where PU =0.66PEoU with the R-squared around 0.46%).
2. The Perception of Risk explained the Perceived Ease of Use of the technology (where PEoU =0.24PoR with the R-squared around 0.31%).
3. The Culture explained the Perception of Risk of the technology (where PoR =0.34PoR with R-squared around 0.57%).
4. The Perceived Ease of Use, Perceived Usefulness and Culture explained the Attitude towards using the technology (where AT =0.32PU + 0.66PEoU – 0.23CT with the R-squared around 0.43%).
5. The Perceived Usefulness and Attitude of the users explained the Behavioural Intention of the technology (where BI =0.15PU + 0.33 AT with the R-squared around 0.29%).

6. While the Behavioural Intention of the users using M-Government Applications and service in Oman explained of the Actual Use of the technology (where AU =0.52BI with R-squared around 0.33%), the Personality Trait strengthened this positive relationship between BI and AU with (where AU =0.33BI + 0.275PT + 0.29BI*PT with R-squared around 0.53%).

Table 6.2: Hypothesis Testing for our Main Hypotheses

Hypotheses		**Result**
H1: Perceived ease of use (PEoU) is positively associated with perceived usefulness (PU)	PEoU→PU	Accepted
H11: Perceived ease of use is positively associated with attitude (AT).	PEoU→AT	Accepted
H2: Perceived usefulness (PU) is positively associated with Behavioural intention (BI).	PU→BI	Accepted
H21: Perceived usefulness (PU) is positively associated with Attitude (AT).	PU→AT	Accepted
H3: The perception of risk (PoR) is positively associated with perceived ease of use (PEoU)	PoR→PEoU	Accepted
H4: The Omani Culture (CT) is positively associated with the perception of risk (PoR)	CT→PoR	Accepted
H41: The Omani Culture (CT) is positively associated with attitude (AT)	CT→ AT	Accepted
H42: Attitude (AT) is positively associated with Behavioural Intension (BI)	AT→ BI	Accepted
H5: The Behavioural Intension (BI) is positively associated with AU	BI → AU	Accepted

The above results (in regard to testing the hypotheses) reveal that all hypotheses are accepted, thereby confirming the existence of significant relationship between the factors in our theoretical model. This is aligned with what was proposed earlier using the SEM Modelling equations proposed (above) in equations (1.1 to 1.7) and testing for the significance of the coefficients. These coefficients are as illustrated in the earlier Figure 6.2 along with the level of significance for each coefficient.

6.3.2. Testing Moderating PT Effects on the Structural Model

Testing personality trait of the end-users of M-Government will be a moderating factor with a positive impact on the relationship between the Behavioural intention (BI) and

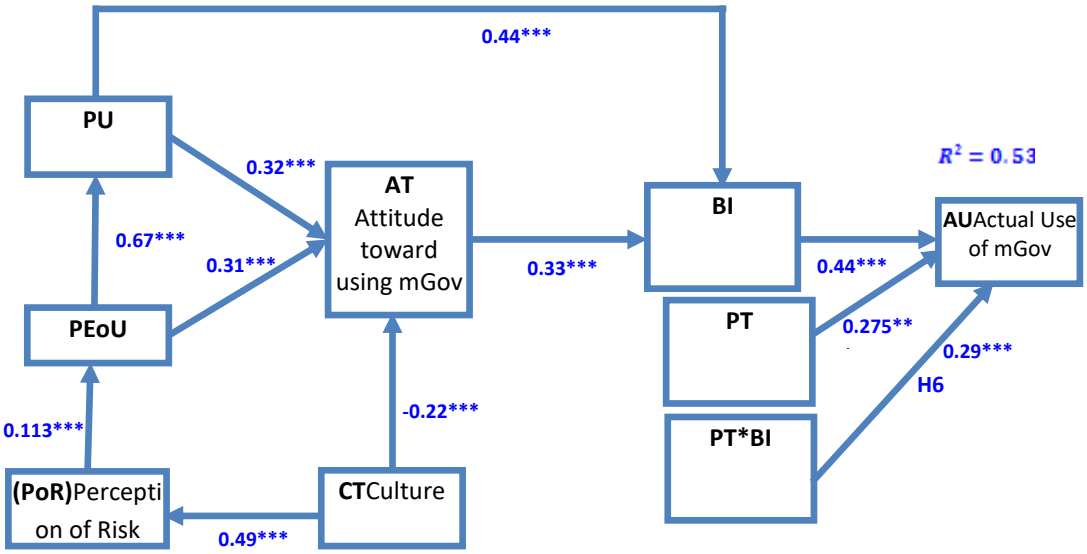
their actual use (AU) of M-Government in Oman, i.e., the sixth hypothesis and seventh research question. SEM analysis using AMOS was conducted by using the standardized values of Behavioural Intension (BI), Personnel traits (PT) and their interaction effect, as suggested by Hair et al. (2010). Therefore, the descriptive statistics in the SPSS software was used to standardize the moderating variables (BI, and PT and their interaction BI×PT).Moderation effects are discussed as an interaction between BI and PT, where the effects of one variable depend on levels of the other variable in analysis. If the interaction effect is significant (coefficient different from zero), then there is a significant moderation in the relationship between BI and AU.

Plotting interaction effects aids in the interpretation of moderation to show how the slope of AU on BI is dependent on the value of the moderator variable. Path Coefficients that correspond to the prediction of AU from BI at a single value of PT are termed simple slopes. The results show that the theoretical model was adequate for participants' data according to the goodness of fit criteria. They were within the acceptable values except for GFI, AGFI and CFI, which were more than the commonly acceptable values of 0.90 as shown in Table 6.3. Not only were the goodness of fit indicators improved but the value of R-squared also increased from 0.33to 0.53 after entering the PT and the interaction of PT and BI into the model. In terms of our previous hypotheses (H1 – H5), as illustrated in Figure 6.4, all of them hold and are accepted. Interaction, as shown from the results, is significant and positive, which means that PT strengthens the positive relationship between BI and AU, (see interaction plot in Figure 6.4). AU increases significantly, as it is shown in Figure 6.4, along with BI when PT increases.

Table 6.3: Goodness-of-fit Indices for Structural Model (Moderating Effect)

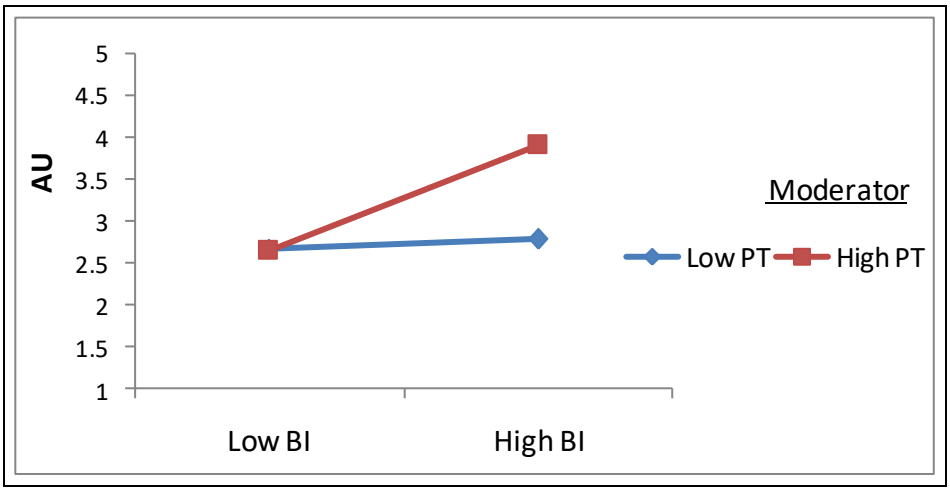
Fit Indices	Benchmark	Value
CMIN (χ2)/DF	< 3	1.77
GFI (Goodness of Fit Index)	> 0.9	0.991
RMSEA (Root Mean Square Error of Approximation)	<0.08	0.041
Incremental fit measures		
AGFI (Adjusted Goodness of Fit Index)	> 0.90	0.961
NFI (Normed Fit Index)	> 0.90	0.985
CFI (Comparative Fit Index)	> 0.90	0.993
IFI (Incremental Fit Index)	> 0.90	0.993
RFI (Relative Fit Index)	> 0.90	0.952

Figure 6.3: Structural Equation Modelling and Hypothesized Paths for Moderating Factor



Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Figure 6.4: Moderation effect Graph (Interaction Effect plot)



In comparing Figure 6.2 (Structural Equation Modelling Results and Hypothesized Paths) with Figure 6.4 (Structural Equation Modelling results and Hypothesized Paths for Moderating Factor), the following remarkable findings can be concluded:

- PU→BI (0.15 with no Moderator) versus PU→BI (0.44 with Moderator)
- BI→AU (0.52 with no Moderator) versus BI→AU (0.44 with Moderator)
- R^2 = 0.33 with no Moderator versus R^2 = 0.53 with Moderator

6.4. Multi-group Analysis and Testing Main Hypotheses

6.4.1. Testing moderating variable effects on the Structural Model

Multi-group structural equation within AMOS was used to test the differences in strengths of the structural relationship (Arbuckle and Wothke, 1999; Byrne, 2001). In other words, it is used to assess the moderating variable effects on the structural model (Byrne, 2001). In comparison to other methods, multiple group analysis is considered to be a good technique to test for interaction effects (Dabholkar and Bagozzi, 2002). Three demographic variables (Gender, Age and Education) are considered as some moderator variables to test their impact on our structural model and on the actual use of M-Government Mobile Application (AU) and for our seven variables (PU, PEoU, PoR, CT, AT, BI, PT).

The respondents were mutually exclusive for our three demographic variables i.e. no case could be a member of both groups. With respect to the eighth research question, the groups were identified in the data set using nominal variable (1, 2) as per Table 5.9 (Demographic Characteristics of the Sample) and illustrated in the following (Table 6.4).Before starting the multi-group analysis, there is a need to make sure that there are enough cases in each group, or we merge groups with small frequency. For example, age variable has been classified into 2 groups less than 25 years old and more than 25. Moreover, Income and Nationality variables will be excluded from this analysis as they do not have enough cases of respondents to be tested on using Structural Equations Modelling.

Table 6.4: Demographic variables distribution (Revisited)

Characteristic	Group	No.(%)
Gender	Male	302 (67.1%)
	Female	148 (32.9%)
Age	Less than 25	248 (55.1%)
	25 – 34	119 (26.4%)
	35 – 45	61 (13.6)
	45 – 54	20 (4.4%)
	55 – 65	2 (0.4%)
Academic degree	High School or Less	1 (0.2)
	Diploma	189 (42.0%)
	Bachelor	208 (46.2%)

	Masters	52 (11.6%)
Income	Less than 2000 OR*	421 (93.6%)
	2000 – 4000 OR	15 (3.3%)
	4000 – 6000 OR	11 (2.4%)
	More than 6000 OR	1(0.2%)
Nationality	Omani	369 (82%)
	Non-Omani	81 (18%)

***OR: Omani Riyals**

For each of the variables of interest, the objective was to determine if they moderated the strength of the relationships in the model, or changed the relationships in the model, which would have theoretical and practical implications. The null hypotheses (for our demographics) is that there is no difference among groups with respect to our hypothetical model, whilst the alternative is that there is a statistical difference among the group of the respondents according to our measurement weights and structural weights with more interest to focus our main hypotheses. Through the imposition of cross-group equality constraints, the significance of group differences on a model parameter or set of parameters can be tested. Before the structural weights can be compared to test for invariance, metric equivalence (invariance) must be established (Hair et al., 2010).

6.4.2. Multi-Group Analysis of Structural Evaluation Model and Path Testing Subject to Gender

The results show that the theoretical model was adequate for our data by gender according to the goodness of fit criteria. They were within the acceptable values except for RFI, which was very close to the commonly acceptable values of 0.90as shown in Table 6.5. This section tests the theoretical model for male and female respondents separately trying to highlight any similarities and differences between the male and female groups.

Table 6.5: Goodness-of-fit Indices for Structural Model – By Gender

Fit Indices	Benchmark	Value
CMIN (χ2)/DF	< 3 or 5	4.17
GFI (Goodness of Fit Index)	> 0.9	0.975
RMSEA (Root Mean Square Error of Approximation)	<0.08	0.084

Incremental fit measures		
AGFI (Adjusted Goodness of Fit Index)	> 0.90	0.862
NFI (Normed Fit Index)	> 0.90	0.961
CFI (Comparative Fit Index)	> 0.90	0.970
IFI (Incremental Fit Index)	> 0.90	0.970
RFI (Relative Fit Index)	> 0.90	0.838

Multi-group analysis results indicate that there are two measurements significantly different to the model. In other words, these two measurements (variables) are significant for Male users, but not for females. This difference is represented in the paths (association) between (PU →ATT) and between (PU → BI), as illustrated in Table 6.6. The results also show that four measurements (bold) were significantly different in their importance (more or less significant) between Male and Female participants of the study. Note that the main purpose of Table 6.6 is not to test the main hypothesis, as done earlier in Tables 6.2 and Table 6.3; the purpose here is to show if there are differences between the two groups of Males and Females, and this tabulated presentation is easier to illustrate those results.

Table 6.6: Testing Measurement Weights between Male and Female Respondents

			Male		**Female**		
			Estimate	P	Estimate	P	z-score
PoR	<---	CT	0.420	0.000	0.353	0.000	-0.613
PEoU	<---	PoR	0.159	0.000	0.118	0.022	-0.637
PU	**<---**	**PEoU**	**0.530**	**0.000**	**0.776**	**0.000**	**3.574*** **
ATT	**<---**	**PEoU**	**0.212**	**0.000**	**0.474**	**0.000**	**2.426****
ATT	<---	PU	0.383	0.000	0.135	0.144	-2.296**
ATT	<---	CT	-0.137	0.000	-0.226	0.000	-1.514
BI	<---	PU	0.302	0.001	0.147	0.386	-0.795
BI	**<---**	**ATT**	**0.694**	**0.000**	**0.336**	**0.069**	**-1.716***
AU	**<---**	**BI**	**0.404**	**0.000**	**0.594**	**0.000**	**2.109****
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

Two of these relationships (paths) are related to perceived ease of use with perceived usefulness (PEoU→PU) and Attitude (PEoU→ATT). These relationships with these two paths are significantly stronger and have more weights (0.776, 0.474, respectively) for females than males (0.53, 0.212). However, Males have significantly stronger relationship (paths) and weights between (ATT → BI) and (BI→ AU), (0.694, 0.404,

respectively) than females (0.336, 0.594). In summary, the female respondents do not support two of our main hypotheses as summarised in Table 6.7 (H2 and H21).

Table 6.7: Hypothesis Testing for our Main Hypotheses by Gender

Hypotheses		**Result**		
		Both	**Males**	**Females**
H1: Perceived ease of use (PEoU) is positively associated with perceived usefulness (PU)	PEoU→PU	Accepted	Accepted	Accepted
H11: Perceived ease of use is positively associated with attitude (AT).	PEoU→AT	Accepted	Accepted	Accepted
H2: Perceived usefulness (PU) is positively associated with Behavioral intention (BI).	PU→BI	**Accepted**	**Accepted**	**Rejected**
H21: Perceived usefulness (PU) is positively associated with Attitude (AT).	PU→AT	**Accepted**	**Accepted**	**Rejected**
H3: The perception of risk (PoR) is positively associated with perceived ease of use (PEoU)	PoR→PEoU	Accepted	Accepted	Accepted
H4: The Omani Culture (CT) is positively associated with the perception of risk (PoR)	CT→PoR	Accepted	Accepted	Accepted
H41: The Omani Culture (CT) is positively associated with attitude (AT)	CT→ AT	Accepted	Accepted	Accepted
H42: Attitude (AT) is positively associated with Behavioral Intension (BI)	AT→ BI	Accepted	Accepted	Accepted
H5: The Behavioral Intension (BI) is positively associated with AU	BI → AU	Accepted	Accepted	Accepted

6.4.3. Multi-group Analysis Structural Model Evaluation and Path testing subject to Age Groups

The results show that the theoretical model was adequate for our data subject to age group less than 25 and more than 25 years old according to the goodness of fit criteria. They were within the acceptable values except for AGFI and RFI which was very close to the commonly acceptable values of 0.90 as shown in Table 6.8.

Table 6.8: Goodness-of-fit Indices for Structural Model – By Age Group

Fit Indices	**Benchmark**	**Value**
CMIN (χ2)/DF	< 3 or 5	3.67
GFI (Goodness of Fit Index)	> 0.9	0.982
RMSEA (Root Mean Square Error of	<0.08	0.077

Approximation)		
Incremental fit measures		
AGFI (Adjusted Goodness of Fit Index)	> 0.90	0.876
NFI (Normed Fit Index)	> 0.90	0.972
CFI (Comparative Fit Index)	> 0.90	0.979
IFI (Incremental Fit Index)	> 0.90	0.970
RFI (Relative Fit Index)	> 0.90	0.838

Multi-group analysis results indicate that there is only one measurement significantly different to the model. In other words, this measurement (variable) is significant for age group less than 25 participants, but not for participants of >=25 years of age. This difference is represented in the paths (association) between (PU → BI), as illustrated in Table 6.9. As it can be seen, the association (path) between PU and BI is significant and positive for older group and not significant for younger group participants. The results also show that four measurements (bold in Table 6.9) were significantly different in their importance (more or less significant) between young (<25) and older group (>=25) participants.

Table 6.9: Testing measurement weights between Less than 25 years old group and >=25 years

			<25		**>=25**		
			Estimate	P	Estimate	P	z-score
PoR	<---	CT	0.395	0.000	0.411	0.000	0.147
PEoU	<---	PoR	0.195	0.000	0.147	0.003	-0.668
PU	**<---**	**PEoU**	**0.523**	**0.000**	**0.809**	**0.000**	**4.302*****
ATT	**<---**	**PEoU**	**0.223**	**0.000**	**0.433**	**0.000**	**2.257****
ATT	<---	PU	0.280	0.000	0.271	0.000	-0.088
ATT	<---	CT	**-0.135**	**0.000**	**-0.258**	**0.000**	**-2.185****
BI	<---	PU	-0.035	0.757	0.608	0.000	3.751***
BI	<---	ATT	0.483	0.000	0.574	0.000	0.524
AU	<---	BI	0.522	0.000	0.596	0.000	0.938
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

Results also show that two of these relationships (paths) are related to perceived ease of use with perceived usefulness (PEoU→PU) and Attitude (PEoU→ATT). These relationships with these two paths are significantly stronger and have more weights (0.809, 0.433, respectively) for older group than younger group (0.523, 0.223,

respectively). In summary, younger group respondents do not support one of our main hypotheses as summarised in the following Table 6.10 (H2).

Table 6.10: Hypotheses Testing of our main Hypotheses by Gender

Hypotheses		**Result**		
		Both	**Young**	**Old**
H1: Perceived ease of use (PEoU) is positively associated with perceived usefulness (PU)	PEoU→PU	Accepted	Accepted	Accepted
H11: Perceived ease of use is positively associated with attitude (AT).	PEoU→AT	Accepted	Accepted	Accepted
H2: Perceived usefulness (PU) is positively associated with Behavioural intention (BI).	PU→BI	Accepted	**Rejected**	Accepted
H21: Perceived usefulness (PU) is positively associated with Attitude (AT).	PU→AT	Accepted	Accepted	Accepted
H3: The perception of risk (PoR) is positively associated with perceived ease of use (PEoU)	PoR→PEoU	Accepted	Accepted	Accepted
H4: The Omani Culture (CT) is positively associated with the perception of risk (PoR)	CT→PoR	Accepted	Accepted	Accepted
H41: The Omani Culture (CT) is positively associated with attitude (AT)	CT→ AT	Accepted	Accepted	Accepted
H42: Attitude (AT) is positively associated with Behavioural Intension (BI)	AT→ BI	Accepted	Accepted	Accepted
H5: The Behavioural Intension (BI) is positively associated with AU	BI → AU	Accepted	Accepted	Accepted

6.4.4. Multi-group Analysis Structural Model Evaluation and Path Testing Subject to Education

The results show that the goodness of fit indictors for theoretical model was adequate subject to the level of education, i.e. Bachelor and Master Degree (University Degree). They were within the acceptable values except for AGFI and RFI which was very close to the commonly acceptable values of 0.90 as shown in Table 6.11.

Table 6.11: Goodness-of-fit Indices for Structural Model – By Age group

Fit Indices	**Benchmark**	**Value**
CMIN (χ2)/DF	< 3 or 5	3.099
GFI (Goodness of Fit Index)	> 0.9	0.981
RMSEA (Root Mean Square Error of Approximation)	<0.08	0.068

Incremental fit measures		
AGFI (Adjusted Goodness of Fit Index)	> 0.90	0.895
NFI (Normed Fit Index)	> 0.90	0.972
CFI (Comparative Fit Index)	> 0.90	0.980
IFI (Incremental Fit Index)	> 0.90	0.981
RFI (Relative Fit Index)	> 0.90	0.881

Multi-group analysis results indicate that there is only one measurement significantly different to the model. In other words, this measurement (variable) is significant for University degree participants, but not for participants of diploma degree group. This difference represented in the paths (association) between (PU →BI), as illustrated in Table 6.12. As it can be seen, the association (path) between PU and BI is significant and positive for Bachelor degree holders group and not significant for Diploma degree group participants. The results also show that four measurements (bold) were significantly different in their importance (more or less significant) between Diploma degree holders and Bachelor degree holders.

Table 6.12: Testing Measurement Weights between Diploma and Bachelor Degrees Holders

			Diploma		**Uni-Degree**		
			Estimate	P	Estimate	P	z-score
PoR	←	CT	0.443	0.000	0.387	0.000	-0.550
PEoU	←	PoR	0.173	0.003	0.174	0.000	0.018
PU	←	**PEoU**	**0.420**	**0.000**	**0.772**	**0.000**	**5.273*** **
ATT	←	PEoU	0.201	0.001	0.395	0.000	2.198**
ATT	←	PU	0.159	0.039	0.330	0.000	1.74*
ATT	←	**CT**	**-0.096**	**0.033**	**-0.246**	**0.000**	**-2.658*** **
BI	←	PU	-0.021	0.866	0.402	0.002	2.395**
BI	←	ATT	0.412	0.000	0.651	0.000	1.341
AU	←	BI	0.488	0.000	0.492	0.000	0.049
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

Results also show that two of these relationships (paths) are related to perceived ease of use with perceived usefulness (PEoU→PU) and Perceived Usefulness with Behavioural Intension (PU→BI). These relationships with these two paths are significantly stronger and have more weights (0.772, -0.246, respectively) for University degree holder than Diploma degree holders group (0.420, -0.096, respectively). In summary, Diploma

holders do not support one of our main hypotheses as summarised in the following Table 6.13 (H2)

Table 6.13: Hypothesis Testing for our Main Hypotheses by Education Level

Hypotheses		**Result**		
		Both	**Diploma**	**Bachelor**
H1: Perceived ease of use (PEoU) is positively associated with perceived usefulness (PU)	PEoU→PU	Accepted	Accepted	Accepted
H11: Perceived ease of use is positively associated with attitude (AT).	PEoU→AT	Accepted	Accepted	Accepted
H2: Perceived usefulness (PU) is positively associated with Behavioural intention (BI).	PU→BI	Accepted	**Rejected**	Accepted
H21: Perceived usefulness (PU) is positively associated with Attitude (AT).	PU→AT	Accepted	Accepted	**Rejected**
H3: The perception of risk (PoR) is positively associated with perceived ease of use (PEoU)	PoR→PEoU	Accepted	Accepted	Accepted
H4: The Omani Culture (CT) is positively associated with the perception of risk (PoR)	CT→PoR	Accepted	Accepted	Accepted
H41: The Omani Culture (CT) is positively associated with attitude (AT)	CT→ AT	Accepted	Accepted	Accepted
H42: Attitude (AT) is positively associated with Behavioural Intension (BI)	AT→ BI	Accepted	Accepted	Accepted
H5: The Behavioural Intension (BI) is positively associated with AU	BI → AU	Accepted	Accepted	Accepted

Multi-group analysis for Nationality and Income is not meaningful as for the Income variable we have dominant group, i.e., 94% of participants having an income less than 200K. This is also applied for the nationality variable where the group of non Omani is too small (18%) to be tested in SEM, and thus making a valid comparison based on a small number of cases is not statistically doable.

6.5. Mobile Government Adoption Model Discussions

This section will discuss the relationships among the MGAM model variables. The relational influence and direction of each variable on the other variable(s) in the model will be discussed in this section. These relationships and the dynamics among the MGAM model variables will be in particular discussed within the context of M-Government adoption in Oman.

6.5.1. The Influence of Perceived Ease of Use on Perceived Usefulness

This study investigated the impact of Perceived Ease of Use on Perceived Usefulness according to the users of M-Government applications and services in Oman. The findings show that the perceived ease of use factor strongly influences the perceived usefulness factor, i.e., accepting the hypothesis. As illustrated in Figure 6.3, the Perceived Ease of Use explained the Perceived Usefulness of using M-Government technology with the value of R-squared around 0.46% and equation linking the constructs was PU =0.66PEoU. This implies that the users in Oman using the M-Government applications and services perceive more benefits and usefulness of this emerging technology when they believe that this technology is easy to use. Other studies in similar technological domains also confirmed that there is a positive relationship between the perceived ease of use and perceived usefulness factors (e.g., (Gumussoy and Calisir, 2009)).

As also reported by the research participants, when the M-Government applications and services are user friendly, understandable, easy to download and install, and provide full details and complete information when needed, the users then will be able to conduct more than one transaction or service in each visit and to obtain more simplified services approval and confirmations.

6.5.2. The Influence of Perceived Ease of Use on Attitude

This study investigated the impact of Perceived Ease of Use on the attitude of the users using the M-Government applications and services in Oman. The findings showed that the perceived ease of use factor strongly influences the attitude factor, i.e., accepting the hypothesis. Figure 6.3 also illustrates the influential relationship between the Perceived Ease of Use and the Attitude towards using the services and applications offered by the M-Government technology; for this relation, the value of R-squared was around 0.43% and the equation linking the two constructs was AT =0.66PEoU. Yet, as to be discussed shortly, the figure also illustrated the influential relationships between the Perceived Usefulness and Culture, and the Attitude of the participants, therefore, the equation linking the four constructs was AT = =0.32PU + 0.66PEoU – 0.23CT.

It can be seen that the users in Oman using the M-Government applications and services will develop a positive attitude towards the M-Government in Oman when they perceive and believe that this technology is easy to use. This positive relationship between perceived ease of use and attitude factors had also been previously validated by other studies (e.g., (Davis, 1989)). As also found in the responses of the participants, when the M-Government Applications and services are user friendly, understandable and provide full details of transactions, the users will experience a good and pleasant service, and will be able to effectively obtain more services more frequently.

6.5.3. The Influence of Perceived Usefulness on Behavioural Intention

This study investigated the impact of Perceived Usefulness in the Behavioural Intention of the users using the M-Government applications and services in Oman. The findings showed that the perceived usefulness factor strongly influences the development of positive Behavioural intention towards this emerging technology, i.e., accepting the hypothesis. This implies that the users in Oman using the M-Government applications and services will behave positively and intentionally towards this emerging technology when they perceive and believe that this technology is easy to use. Other studies in similar technology domains also confirmed that there is a positive relationship between perceived usefulness and Behavioural intention factors (e.g., Chen, et al., 2002)).

The findings here imply that when the use of M-Government applications is more efficient, enabling doing more than one transaction in each visit, providing simplified services approval and confirmation, the users will expect that this technology will make governmental services even easier in the future, and will expect that they will experience higher and stronger levels of loyalty with a commitment to re-use the technology in the future. In addition, the findings imply that using M-Government applications enhances the effectiveness of users through saving time in making requests, providing useful details of the services and policies, and providing easy service-related information prior to requests; the users then may expect using this technology while they can engage in other entertainments and enjoyments, and may expect that this emerging technology should be considered as a major and strategic investment by the government and society.

6.5.4. The Influence of Perceived Usefulness on Attitude

This study investigated the impact of Perceived Usefulness on the attitude of the users using the M-Government applications and services in Oman. The findings showed that the perceived usefulness factor strongly influences the attitude factor, i.e., accepting the hypothesis. This implies that the users in Oman using the M-Government applications and services will develop a positive attitude towards the M-Government in Oman when they perceive more benefits and usefulness of this emerging technology. This positive relationship between perceived usefulness and attitude factors had also been previously validated by other studies (e.g., (Hwang, 2005)).

These findings imply that the use of M-Government applications should be efficient, enable doing more than one transaction in each visit, and provide simplified services approval and confirmation. This will enhance the idea of using the M-Government applications for requesting governmental services and will encourage positive feelings about the usefulness and benefits of this technology. In addition, the findings indicate that the use of M-Government applications should increase the effectiveness of the users by saving time in making requests, providing useful and full details of the services and policies, and by providing easy service-related information prior to requests. This consequently develops a good and pleasant experience by the users, and enables obtaining more services effectively.

6.5.5. The Influence of Perception of Risk on Perceived Ease of Use

This study investigated the impact of Perception of Risk on the Perceived Ease of Use according to the users of M-Government applications and services in Oman. The findings showed that the perception of risk factor influences the perceived ease of use factor, i.e., accepting the hypothesis. This implies that the users in Oman perceive and believe that this technology is easy to use when they develop a positive perception of risk associated with this technology. This result is in alignment with other studies that confirmed a positive relationship between perception of risk and perceived ease of use factors (e.g., (Farzianpour et al. 2014; Lee et al. 2013)).

The findings here imply that M-Government applications should deliver the expected standard of service, protect the access to the accounts and personal details with no

faults, and be able to complete any transaction with no security problems. This makes the users feel easier to obtain governmental services and business or personal transactions such as making payments. In addition, the results confirm that the M-Government applications should be reliable or secure enough to conduct services and finish transactions, and cause no financial or data loss when making payment to the government or other parties. This will make the users experience more user friendly, understandable, easy to download and install applications, that also can provide full details and complete information when needed.

6.5.6. The Influence of Culture on Perception of Risk

This study investigated the impact of Culture in Oman on the Perception of Risk according to the users of M-Government applications and services. The findings showed that the culture factor strongly influences the perception of risk factor, i.e., accepting the hypothesis. This implies that the users in Oman using the M-Government applications and services believe that this technology is more risk-free easy to use when the technology meets their culture and social norms. This positive relationship between culture and perception of risk factor had also been previously validated by other studies (e.g., (Eid, 2011; Wu et al. 2007; Peikari, 2010)).

The results here imply that the users need to feel that they conduct and control their governmental services through M-Government applications as they do it in the actual governmental offices. This will make the user believe and ratify that the M-Government applications can deliver the expected standard of service, protect the access to the accounts and personal details with no faults, and complete any transaction with no problems. In addition, the results confirm that the users need to feel comfortable when using M-Government applications over the actual governmental offices, and believe that this technology is according to the religious beliefs and cultural norms in Oman. This will guarantee that the M-Government applications are reliable and secure enough to conduct services and finish transactions, and will cause no data loss.

6.5.7. The Influence of Culture on Attitude

This study investigated the impact of Culture in Oman on the attitude of the users of M-Government applications and services. The findings showed that the culture factor influences the development of positive attitude factor, i.e., accepting the hypothesis.

This implies that the users in Oman using the M-Government applications and services will develop a positive attitude towards this technology as long as this technology meets their culture and norms. Other studies in similar technology domains also confirmed that there is a positive relationship between culture and attitude factors (e.g., (Peikari, 2010)).

These findings imply that the users need to be completely sure and aware of the benefits of M-Government applications and their services, and then they can control and manage their services and transactions easily. Consequently, the users will accept the idea of requesting governmental services with feeling positive impressions. In addition, the results here confirm that the users should believe that this technology is meeting and fit with their social and cultural norms and standards in Oman. This will then result in making the users feel more comfortable and pleasant with the use of this emerging technology in Oman.

6.5.8. The Influence of Attitude on Behavioural Intension

This study investigated the impact of Attitude of the users of M-Government applications and services in Oman on the Behavioural Intention of those users. The findings showed that the attitude factor strongly influences the development of positive Behavioural intention towards this emerging technology, i.e., accepting the hypothesis. This implies that the users in Oman using the M-Government applications and services will behave positively and intentionally towards this emerging technology when they develop a positive attitude towards using this technology. Other studies in similar technology domains also confirmed that there is a positive relationship between attitude and Behavioural intention factors (e.g., (Gumussoy and Calisir, 2009)).

The findings here confirm that the users need to be positive about the idea of using M-Government applications for requesting governmental services and to feel positive about the usefulness and benefits of the technology. The users as a result will then probably use the M-Government applications again for different services, and experience higher and stronger levels of loyalty with a commitment to re-use the technology in the future. The results also indicate that the use of M-Government applications should enable obtaining different types of services effectively; this may include entertainment and leisure utilities, and then enable more effective engagement.

6.5.9. The Influence of Behavioural Intension on Actual Use

This study investigated the impact of Behavioural Intention of the users towards using the M-Government applications and services in Oman on their Actual Use of this technology. The findings showed that the Behavioural intention factor strongly influences the actual use of this emerging technology, i.e., accepting the hypothesis. This implies that the users in Oman will be adopting the M-Government applications and services when they develop and feel positive about this emerging technology. This result is in alignment with other studies that confirmed a positive relationship between Behavioural intention and actual use (e.g., (Behrenbruch et al. 2015; Parks-Leduc et al. 2015)).

These findings imply that the M-Government applications should enable conducting a wide range of services, then re-use those services easily, and receive the same levels of quality at each time. Having this feature will increase the level of uptake by the users and by their friends and other family members, and will improve the levels of loyalty with real commitment to re-use of the technology in the future. Reaching this level of use will confirm a high level of M-Government adoption.

6.5.10. The Influence of Personality Trait Moderation

This study investigated the moderating impact of Personality Trait of the users on the relationship between the Behavioural Intention of the users using the M-Government applications and services in Oman and their Actual Use. The findings showed that the personality trait, mainly the agreeableness and conscientiousness, moderating factor strongly impact on that relationship, i.e., accepting the hypothesis. Other studies in similar technology domains also confirmed that there is a moderating impact on the relationship between the Behavioural intention of the users and their actual use of specific technology (e.g., (Salgado, 2002; Shropshire et al., 2015)).

These findings imply that the users of M-Government applications need to easily accept to get along with others using this technology, be loyal and unselfish to others, and be polite and like to cooperate with others when needed. The users also need to be helpful, calm, trusting and kind to almost everyone using this technology, and should plan to achieve tasks and services through the M-Government applications. The results here also confirm that the users need to be capable, reliable and do things efficiently, as well

as to be well-organized. It is also a need of the users of M-Government utility, as reported by the research participants, to be hard working, to conduct services on time, do things with patience and keep trying until finalizing the services. Having the users with such nature and characteristics will enhance the Behaviours and increase the intention of those users towards the actual use of M-Government, and consequently more successful adoption of this emerging technology in Oman will be realised.

6.6. Recommendations

Based on the results and findings given in this study, certain user-related strategies and practical recommendations and solutions can be provided for the design, development and implementation of successful and easy to adopt M-Government applications and services in Oman, as well as similar countries. Tacking those recommendations into account is expected to facilitate the transition of the current governmental services in Oman into the new M-Government infrastructure, and then the transformation of Omani environment to be information society and knowledge based economy. There are two folds of recommendations: for governmental managers responsible about then development, implementation and deployment of M-Government applications and services in Oman, and for public users in Oman.

6.6.1. Recommendations for Governmental Managers in Oman

For managers leading the governmental services in Oman, it can be recommended to consider the following within the context of the M-Government initiative:

- Treat the M-Government initiative as a real and strategic shift and paradigm for providing all types of governmental services in Oman.
- Understand and take into account the cultural issues in Oman when designing and implementing M-Government applications and services.
- Understand and take into account the facilities and governmental services that could be needed in particular by women in Oman.
- Identify and define the design preferences of users in Oman prior to the actual implementation and deployment of M-Government applications and services.
- Improve the level of awareness and knowledge of the users in the area of cyber threats and cyber security risks may target the M-Government initiative.

- Improve the capabilities and competencies of the governmental employees in the area of using ICT, Smart technologies and the Internet.
- Facilitate the communication channels for knowledge and information sharing among the users or citizens in Oman.
- Develop the ICT and Internet infrastructure in Oman up to the level for enabling as many as possible of the M-Government applications and services.
- Improve the quality of information on the procedures for downloading, installing and using M-Government applications and services in Oman.
- Provide easy to access and understand information on the governmental services prior to the actual acquisition of those services.
- Develop and implement M-Government applications and services with the manner of enjoyment and entertainment, and with engagement and pleasure.
- Conduct training sessions, meetings and workshops on the advantages, benefits and challenges related to the M-Government initiative in Oman.
- Design the M-Government applications and services in a way for enabling conducting more than a service in one visit by the users.
- Provide secure tools and means for the users to be able accessing their personal data and information with minimal risks.
- Apply the usability and design international standards when developing and implementing the M-Government applications and services in Oman.
- Develop policies, guidelines and regulations related to the use of M-Government applications and services, and then make them available for the users.

6.6.2. Recommendations for the Users in Oman

From the perspective of the users in Oman using the M-Government applications and services, it can also be recommended to consider the following issues.

- Educate yourself and improve the level of knowledge about the M-Government applications and services in Oman.
- Cooperate and communicate with other users in regard to the M-Government applications and services in Oman when needed.
- Be helpful and supportive to everyone may need your experience and knowledge about the use of M-Government in Oman.

- Educate and enhance your knowledge about the cyber risks and dangers threatening the M-Government initiative in Oman.
- Participate in governmental workshops and public meetings when available new about the M-Government applications and services.
- Be updated about the new applications and services offered by the government through M-Government infrastructure.

6.7. Summary and Key Findings

This work has produced crucial results through the use of different statistical techniques with particular focus on the use of M-Government in Oman and the factors affecting the adoption of this new technology. The data analysis conducted in this study was to support the development and validation of a novel technology adoption model in the area of governmental services and public administration, named MGAM Model. The key findings found by this research are as follows:

1. Most of the users in Oman frequently use the M-Government Applications and services; around 88% have used such technologies in Oman during one year prior to this study in 2017, and more than 60% of those users have used the technology for at least 3 times.
2. Most of the users in Oman have a good knowledge of using computers (around 87%), using the Internet (around 85%), and using Smartphones or similar devices (around 85%).
3. Most of the users in Oman conduct services using the Internet at home to conduct and acquire governmental services (around 80%), a large number of them use the Internet through Smartphones or using the Smartphone Applications directly (around 64%) for such services, and few of them use the Internet at work (around 25%) for the same purpose.
4. Almost all the users in Oman have their own computers and Smartphones (around 99%), and Internet connections at home (around 95%).
5. Most of the users in Oman using the M-Government applications and services hold a diploma degree or higher (42% and 98%, respectively).
6. Most of the users in Oman using the M-Government applications and services earn less than OR200 thousand annually.

7. The number of males in Oman using the M-Government applications and services is more than the number of females (67% and 33%, respectively).
8. Most of the users in Oman using M-Government applications and services:

    - Were very positive about the Perceived Ease of Using the technology with an aggregated average of 4.16 and standard deviation of 0.62.
    - Were very positive about Perceived Usefulness of the technology with an aggregated average 4.19 and standard deviation of 0.59.
    - Had very positive Attitude toward using the technology with an aggregated average 4.31 and standard deviation of 0.58.
    - Showed very positive Behavioural Intention about using the technology with an aggregated average 4.26 and standard deviation of 0.59.
    - Showed slightly negative Perception of Risk when using the technology with an aggregated average 2.92 and standard deviation of 0.85.
    - Showed positive impact of Culture when using the technology with an aggregated average 2.21 and standard deviation of 0.74.

9. Most of the users in Oman were very positive to the Personality Trait factors (Agreeableness and Conscientiousness) with impact on using the technology, with aggregated averages of (4.04 and 3.96, respectively) and standard deviation of (0.63 and 0.59, respectively).
10. Most of the users in Oman using M-Government applications and services were very positive toward the actual use of this technology with an aggregated average of 4.09 and standard deviation of 0.53.
11. In the context of using M-Government applications and services in Oman:

    - The Perceived Ease of Use explained the Perceived Usefulness of the technology (where PU =0.66PEoU with the R-squared around 0.46%).
    - The Perception of Risk explained the Perceived Ease of Use of the technology (where PEoU =0.24PoR with the R-squared around 0.31%).
    - The Culture explained the Perception of Risk of the technology (where PoR =0.34PoR with R-squared around 0.57%).
    - The Perceived Ease of Use, Perceived Usefulness and Culture explained the Attitude towards using the technology (where AT =0.32PU + 0.66PEoU – 0.23CT with the R-squared around 0.43%).

- The Perceived Usefulness and Attitude of the users explained the Behavioural Intention of the technology (where BI =0.15PU + 0.33 AT with the R-squared around 0.29%).

12. While the Behavioural Intention of the users using M-Government Applications and service in Oman explained of the Actual Use of the technology (where AU =0.52BI with R-squared around 0.33%), the Personality Trait strengthened this positive relationship between BI and AU with (where AU =0.33BI + 0.275PT + 0.29BI*PT with R-squared around 0.53%).

The above findings and results as described and discussed in Chapter 5 and Chapter 6 on the variables or factors constructing the MGAM model, and on their relationships demonstrate the high validity and reliability of this model adoption model. Most of the hypotheses were confirmed by the data and data analysis obtained from this study, and the MGAM constructs were supported with real data and statistical analysis. The relationships among those variables of MGAM constructs were also explained in full details with evidences obtained using different reliable statistical tests. As discussed above and in line with previous research novel technology adoption, this study confirms the influence of MGAM model constructs, as key factors leading into the successful adoption of M-Government applications and services in Oman.

Chapter 7

Conclusions, Recommendations and Future Works

This main aim of this research project was to develop and validate a novel model with key factors and constructs influencing the adoption of M-Government in Oman. The projects makes this contribution through the development of this model based on extending a well known model in this domain (i.e., TAM Model), and integrating new factors borrowed from other theories (i.e., PPT, CCT and PTT). The efforts here make a significant step towards identifying the key factors with impact on the adoption and success of M-Government infrastructure. For the purpose of this project, a new data collection tool was developed based on the literature analysis to collect data; this tool is another novel contribution made by this project where other researchers may use this tool directly or with slight adjustment. The project identified the key prerequisites for the adoption of M-Government as a new trend in the area of public administration. This contribution can also be significant, and important to understand how the users in Omani decide to adopt the use of M-Government.

This chapter provides a detailed description of the conclusions reached from undertaking this research study. The Chapter finally describes the limitations of the study, future work and then concludes this research project.

7.1. Summary of the Study and Dissertation

The work presented in this dissertation provided comprehensive details on studying the user-centric factors affecting the adoption of mobile government in Oman. The research problem in this study was due to the limited understanding and knowledge about the user-oriented requirements and complexities associated with the adoption of new technology, i.e., M-Government, in Oman. Compared with earlier studies, the current study involved new factors or variables including types of risks, traits of the end-users and the cultural context. Therefore, the aim of the study was to develop and empirically test and validate a novel Mobile Government Adoption Model (MGAM) based on the extension of Technology Acceptance Model (TAM) with the integration of crucial factors particularly related to the end-users or citizens in Oman. The dissertation comprises seven chapters. The first Chapter provided an introduction with quick background on the evolution and use of ICT and Mobile technologies in the area of governmental services mainly the M-Government initiatives, and identified the research problem, questions and hypotheses and the MGAM Model. The anticipated contribution of this research was also provided in the first chapter.

The second Chapter of this dissertation provided comprehensive literature review and analysis with focus on the use of ICT for public administration, mainly e-Government and Smart Government or M-Government, and the transition stage between them. The chapter also discussed the challenges facing the development of M-Government and the benefits and services of this technology. Through the analysis of M-Government initiatives in developed and developing countries, the chapter identified key factors may contribute to a successful adoption of M-Government particularly in Oman. The third Chapter of this dissertation presented the process of MGAM model development with focus on the contributing theories and on the different user-centred models for the adoption and acceptance technologies. The chapter identified the factors affecting the M-Government adoption and introduced the theoretical research model or MGAM Model. The fourth chapter discussed the theoretical and practical research paradigms

and methodology adopted to conduct this study with focus on the research philosophy, strategy, design and approach. The chapter also described the process for designing the data collection instrument, the process for survey validity and research quality, the process for ethical approval and research trustworthiness, and the processes for data collection and analysis.

The fifth chapter five presented the descriptive data analysis with discussions including the descriptive analysis of research participants, the use of M-Government and other smart technologies in Oman, the main components of the MGAM Model constructs. In the sixth chapter, this dissertation presented a comprehensive descriptive analysis of the MGAM model with discussions on the model assessment and validation. The chapter also provided results and discussions on the factors comprising the MGAM model with scientific implications. The seventh chapter summarized the thesis and the research findings, described the research limitations, future works and conclusions.

7.2. Limitations of the Study

The attempt in this study was to make significant contribution towards understanding the key factors affecting the adoption of M-Government in Oman with focus on the end users. Yet, the following limitations and challenges faced this study:

1. The data collection process was done within an unspecified period of time where the users have been sent the link to the online Survey using different social networks. The participants use those networks in different periods of time such as day-time, working-hours or in the evening. Due to this inconsistency in time for filling the Survey, few of the questionnaires were incomplete and some of the participants may not be able to completely answer the questions. Those were excluded from the data analysis process.
2. The study did not specify any of the M-Government application or service to be assessed by the users; however, some of the users may experience different applications or services. Therefore, the findings in this work may not completely be related to the complete set of applications and services but as a package.
3. The expected target audiences were not largely attended due to public holidays in Oman, despite the number of the users included in this work was statistically reasonable to conduct the study.

4. Although the findings in this study may help in the design of guidelines for the development and implementation of M-Government applications and services in Oman and other similar countries, those findings were only validated using questionnaire with no testing in practice or actual experiences.

7.3. Conclusions

Over the last two decades, the use of ICT, Mobile and Internet technologies experienced a high level of interest in the developed and developing countries. The deployment of those technologies provides any-time, any-how and any-where reliable and easy to access services for citizens, organizations and governments. In particular, the evolution in the use of mobile technologies such as Smartphones supported the emergence of digital economies, governments and technology-oriented nations. Many countries have already invested in this area of innovation, and numerous projects have been initiated to particularly utilize the use of Smartphones in providing quality of services such as in the governmental domains or public administration. Oman is one of those countries invested in this area and started the Smart Government or M-Government initiative few years ago to provide easy, reachable, secure, reliable, affordable and timely public services, and to establish transparent and interactive relationships with the citizens, businesses and other governmental agents in Oman. Yet, the adoption and acceptance leading to the success and actual functioning of any novel technologies solutions or Smartphone Applications in any country remain problematic and face financial, cultural, technical, managerial and user-related challenges. Therefore, this study focused on the user-centric challenges facing the adoption of M-Government initiative in Oman.

This study attempted to develop and empirically validate a novel Mobile Government Adoption Model (MGAM) based on the extension of very well known theory, i.e., Technology Acceptance Model (TAM), with the integration of new key factors related to the end-users or citizens in Oman. Those factors involved the Perception of Risk, Cultural context in Oman and the Personality Trait of the end-users. Those factors were reported in many earlier studies investigated the factors may affect or influence the adoption and acceptance of similar technologies in other domains such as the Internet Banking, Online Shopping, and others, to name a few.

The MGAM Model is novel in terms of the integration of crucial variables and can be considered unique as it contributes to the knowledge, theories and practical implications related to the adoption and acceptance of M-Government applications and services in a developing country. Through the design of new data collection instrument for empirical data collection and analysis, several hypotheses were developed and the MGAM model was validated. In addition to the adequacy of MGAM Model for the cultural context of Oman, this model is expected to serve as a general model that fits similar developing countries by identifying the user-related factors associated with the successful design, development and implementation of M-Government applications and services. Thus, the study provided crucial recommendations and practical strategies for the governmental managers dealing with the M-Government initiatives and the users utilizing the services offered through such initiatives.

7.4. Potential Future Works

Despite the aim in this study was to develop and empirically test and validate a Mobile Government Adoption Model (MGAM) based on the extension of Technology Acceptance Model (TAM), other research topics and studies remain of interest in the area of M-Government. In particular, the following studies are recommended to be conducted as research opportunities in the domain:

1. An empirical study to assess the adoption and success of certain applications or services, rather than treating those applications and services as one package.
2. An empirical study to investigate the adoption of M-Government and services using other user-related approaches and theories such as the Theory of Reasoned Action and Theory of Planned Behaviour.
3. A study to investigate the impact of M-Government adoption on issues related to the end user (e.g., trust, security, privacy and productivity), organization (e.g., cost, performance and operations), and government (Quality of Service, efficiency and effectiveness).
4. An empirical study to investigate the factors influencing resistance of employees or users within specific industry (government, health, education or banking) against the adoption of M-Government applications and services offered by the Omani government in that industry.

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Appendices

- **Appendix A: User-Centric Factors affecting the Adoption of Mobile Government (M-Government) in Oman**

- **Appendix B: Arabic Translation of the User-Centric Factors affecting the Adoption of Mobile Government (M-Government) in Oman**

- **Appendix C: Total Variance Explained**

Appendix A

User-Centric Factors affecting the Adoption of Mobile Government (M-Government) in Oman

User-Centric Factors affecting the Adoption of Mobile Government (M-Government) in Oman

++++ Survey ++++

Dear Valued Participants,

This survey is a part of PhD research study that seeks to assess the use and acceptance of Mobile Government Applications in Oman.

The research aim is to gain further understanding of the factors affecting Omanis behaviours and intentions toward the adoption and acceptance of Mobile Government in Oman, and identifying the important areas of culture and risk facing Mobile Government in Oman.

I draw your attention that the valued information you provide will be treated as completely and very confidential with the only use for scientific research. I would like to take this opportunity to give my appreciation for your effort in participating in this study.

If you have any queries please feel free to contact me at this email address:

Sincerely Yours

The Researcher – **Email:** Salim.QatoobAlamri@brunel.ac.uk

Key Concepts and Terminologies

- **Mobile Government (M-Government)**: it is the use of Mobile Phones and Applications to request, conduct and finish any type of governmental services such as paying fines, asking questions, sending feedback, applying for governmental jobs, listening to the Omani Radio, watching the Omani TV, etc.

- Mobile Phone Applications: it is an application that the user can download from different resources such as Government Website, Google Play, etc.

Section A: Demographic Data

Please tick (✓) in the box to record your response to the following questions 1- 15.

Section A1: Questions about the Use of New Technologies

1. Have you ever used any Mobile Government Applications?

a. Yes ☐ b. No ☐

2. How many times have you used any Mobile Government Applications in the last year?

a. none/never ☐ b. 1 to 2 times ☐ c. 3 to 4 times ☐
d. 5 to 7 times ☐ d. more than 8 times ☐

3. How would you describe your knowledge of using a computer?

a. very poor ☐ b. poor ☐ c. Moderate ☐
d. good ☐ e. very good ☐

4. How would you describe your knowledge of using the Internet?

a. very poor ☐ b. poor ☐ c. Moderate ☐
d. good ☐ e. very good ☐

5. Do you have your own computer at home?

a. Yes ☐ b. No ☐

6. Do you have an access to the Internet at home?

a. Yes ☐ b. No ☐

7. Do you have your own Smartphone, Tablets or any other similar device?

a. Yes ☐ b. No ☐

8. How would you describe your knowledge about Smartphone or other similar device?

a. very poor ☐ b. poor ☐ c. Moderate ☐
d. good ☐ e. very good ☐

9. Which of the following you use to conduct services? (you may select more than one)

a. The Internet at work ☐
b. The Internet at home ☐

c. The Internet using Smartphone, Tablets and similar devices ☐
d. The Mobile Phone Applications, Tablets and similar devices ☐

10. How many Mobile Government Applications in Oman you have used?

a. none/ Zero ☐ b. 1 to 3 Apps ☐ c. more than 3 Apps ☐

Section A2: Personality Related Questions

11. **Age group:**

a. Less than 25 ☐ b. 25- 34 ☐ c. 35- 44 ☐

d. 45- 54 ☐ e. 55- 65 ☐ e. more than 65 ☐

12. **Gender group:**

a. Male ☐

b. Female ☐

13. **Educational Level:**

a. High School or Less ☐

b. Diploma ☐

c. Bachelor Degree ☐

d. Master Degree or above ☐

14. **Estimated Yearly Income:**

a. Less than OR2000 ☐

b. Between 2000 to 4000 ☐

c. Between 4000 to 6000 ☐

d. More than 6000 ☐

15. **What is your Nationality or Citizenship?**

a. Omani ☐ b. Non-Omani ☐

Section B: Factors Affecting the Adoption of Mobile Government

For this section as a use of Mobile Government Applications, could you please response to the following statements to which you agree or disagree by ticking number, where:

(Note: 1=strongly disagree, 2=disagree, 3 = neither disagree nor agree, 4= agree and 5 = strongly agree)

	No.	Statements	1	2	3	4	5
Perceived Ease of Use (PEU)	PEU11	It is easier to obtain governmental services using Mobile Government Applications.					
	PEU12	It is easier to make payments using the Mobile Government Applications.					
	PEU13	The Mobile Government Applications are user friendly and understandable.					
	PEU14	I find the Mobile Government Applications are easy to download and use.					
	PEU15	The Mobile Government Applications provide full details and complete information I need.					
Perceived Usefulness (PU)	PU21	It is more efficient to use Mobile Government Applications when I am doing more than one service.					
	PU22	Using the Mobile Government Applications makes it easier and simplifies for me to obtain services approval and confirmation.					
	PU23	Using the Mobile Government Applications enhance my effectiveness by saving time in preparing my requests.					
	PU24	I find the Mobile Government Applications useful in preparing my services and provide me with full details of the services and policies.					
	PU25	Using the Mobile Government Applications provide easy services-related information prior to requests.					
Attitude To Use (AT)	AT31	I like the idea of using Mobile Government Applications for requesting governmental services.					
	AT32	Using the Mobile Government Applications is useful and beneficial for me.					
	AT33	Using the Mobile Government Applications is a good and pleasant experience.					
	AT34	I feel positive towards using the Mobile Government Applications to obtain services and information.					

	AT35	The features of the Mobile Government Applications help me to obtain more services effectively.					
Behavioral Intention (BI)	BI41	It is likely that I will use the Mobile Government Applications again for other services.					
	BI42	I expect that the Mobile Government Applications will make governmental services even easier in the future.					
	BI43	I expect using Mobile Government Applications while engaging in other entertainments and enjoyments.					
	BI44	I expect that the Mobile Government Applications should be considered a major and strategic investment.					
	BI45	I expect that my loyalty is strong with a commitment to re-use Mobile Government Applications in future.					
Perception of Risk (PoR)	PoR51	I am concerned that the Mobile Government Applications may not deliver the expected standard of service, or it may be denied access to my account due to some unknown faults.					
	PoR52	I am concerned that the Mobile Government Applications may not be able to complete my transaction due to some problem.					
	PoR53	I am concerned that the Mobile Government Applications may not be able to protect my personal details, and that someone may access my account without my permission.					
	PoR54	I am concerned that the Mobile Government Applications may not be reliable or secure enough to conduct services and finish transactions					
	PoR55	I am concerned that the Mobile Government Applications may cause financial or data loss when I make payment to the government					
Culture (CT)	CT61	I am not completely sure or aware about the benefits of Mobile Government Applications and their services					
	CT62	I prefer seeing things like government services happening with my own eyes rather than using Mobile Government Applications					
	CT63	I am concerned that Mobile Government Applications do not allow me to control my governmental services as in like the government offices do					
	CT64	I am not comfortable using Mobile Government Applications over governmental offices.					
	CT65	I am concerned that Mobile Government Applications is not according to my religious beliefs and my culture					

PT Agreeableness	AGR71	I see myself as someone who easily tends and accepts to go along with others.					
	AGR72	I see myself as someone who is loyal and unselfish with others.					
	AGR73	I see myself as someone who is polite and likes to cooperate with others.					
	AGR74	I see myself as someone who is cold, calm and is generally trusting					
	AGR75	I see myself as someone who is helpful and kind to almost everyone.					
PT Conscientiousness	CON81	I see myself as someone who makes plans and follows through with them.					
	CON82	I see myself as someone who can be somewhat capable and does things efficiently.					
	CON83	I see myself as someone who is a reliable worker and tends to be well-organized.					
	CON84	I see myself as someone who tends to be hard working and do my work on time.					
	CON85	I see myself as someone who with patience and keeps trying until the task is finished.					
Actual Use	APR91	The services I conduct and request using the Mobile Government Applications is clear and can be considered high or very high.					
	APR92	Many of my friends have conducted and requested services using the Mobile Government Applications for several times.					
	APR93	The services I conduct and request using the Mobile Government Applications vary and for many governmental services.					
	APR94	Some members of my family have conducted and requested for several time services using the Mobile Government Applications.					
	APR95	The general volume of using and requesting services through the Mobile Government Applications is high or very high.					

Appendix B

Arabic Translation of the User-Centric Factors affecting the Adoption of Mobile Government (M-Government) in Oman

++++ إستبيان ++++

أخي المشارك / أختي المشاركة ..... المحترم / المحترمة

السلام عليكم ورحمه الله وبركاته
يعتبر هذا الإستبيان جزءا من نشاطات بحث علمي بهدف الحصول على شهادة الدكتوراة لدى جامعة برونيل البريطانية في مجال إستخدام وقبول تقنيات أو تطبيقات الجوال الذكية لمشروع الحكومة الذكية في سلطنة عُمان. لذا، يسرني دعوتكم للمشاركة معنا في هذا الاستبيان للحصول على فهم أهم العوامل التي تؤثر على الاستخدام الفعلي وتبني تطبيقات الأجهزة الذكية لخدمات الحكومة الذكية.

سأكون شاكراً ومقدراً لكم وقتكم الثمين في اكمال هذا الاستبيان، حيث تستغرق الاجابة على جميع الاسئلة تقريباً من 10 إلى 12 دقيقة. مع العلم انه لا توجد إجابه (صحيحه أو خاطئه)، وان إجاباتكم ستعامل بسرية تامة ودون تسبب أي ضرر بكم، وستستخدم لغرض البحث العلمي فقط.

إن مدى دقة وواقعية إجابتكم ستنعكس إيجاباً على صحه النتائج وتحقيق أهداف الدراسه وفهم أفضل للاستخدام الفعلي لتطبيقات الأجهزة الذكية لتقديم الخدمات الحكومية في عُمان. وإذا كان لديكم أي استفسار فلا تترددوا في التواصل على ايميلي الخاص.

شاكرين لكم حسن تعاونكم معنا، وتقبلوا خالص التحيه والتقدير،،،

الباحث ، إيميل: Salim.QatoobAlamri@brunel.ac.uk

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مصطلحات هامة تخص الدراسة

- **الحكومة الذكية** : هي إستخدام تطبيقات أجهزة الجوال الذكية لتقديم أو الحصول على أو القيام بالخدمات الحكومية مثل إستخدام برامج وتطبيقات الأجهزة الذكية من أجل دفع الغرامات أو الإستفسار عن معلومات أو التقديم للوظائف الحكومية أو السماع للقنوات الحكومية المسموعة أو مشاهدة القنوات التلفزيونية المرئية في عُمان.

تطبيقا الأجهزة الذكية : هي عبارة عن برامج وتطبيقات إلكترونية ممكن تنزيها أو تحميلها من مواقع مختلفة مثل مكتبة قوقل أو من المواقع الإلكترونية للحكومة العمانية أو مواقع معتمدة أخرى.

الجزء الأول : البيانات الديموغرافية

الرجاء وضع علامة (√) في المربع المناسب لإجابتك على ورقة الاستبيان للأسئلة 1 – 15

الجزء الأول / الفقرة أ: الأسئلة المتعلقة بإستخدام التقنيات الحديثة

1. هل سبق لك وإن إستخدمت أي تطبيقات للأجهزة الذكية للخدمات الحومية في سلطنة عُمان؟

نعم ☐ لا ☐

2. كم من المرات قمت بإستخدام أي تطبيقات للأجهزة الذكية للخدمات الحومية في سلطنة عُمان في السنة الماضية؟

أبدا ☐ من 1 – 2 مرة ☐ من 3 –4 مرات☐

من 5 – 7 مرات ☐ أكثر من 7 مرات ☐

3. كيف تصف معرفتك في إستخدام الحاسب الآلي وأنظمة؟

ضعيفة جدا ☐ ضعيفة ☐ متوسطة ☐

متقدمة☐ متقدمة جدا ☐

4. كيف تصف معرفتك في إستخدام الإنترنت ومصادرها ؟

ضعيفة جدا ☐ ضعيفة ☐ متوسطة ☐

متقدمة☐ متقدمة جدا ☐

5. هل تمتلك أو لديك جهاز حاسب آلي في البيت؟

نعم ☐ لا ☐

6. هل تمتلك أو لديك خدمات الإنترنت في البيت؟

نعم ☐ لا ☐

7. هل تمتلك أو لديك جهاز تلفون أو جوال ذكي أو تابليت في البيت؟

نعم ☐ لا ☐

8. كيف تصف معرفتك في إستخدام الأجهزة أو الجوالات الذكية وبرامجها أو تطبيقاتها؟

ضعيفة جدا ☐ ضعيفة ☐ متوسطة ☐

متقدمة☐ متقدمة جدا ☐

9. أي من التالية تستخدم للحصول على الخدمات الحكومية في سلطنة عُمان؟

الإنترنت في العمل ☐ الإنترنت على الأجهزة الذكية من المواقع الإلكترونية ☐

الإنترنت في البيت ☐ برامج وتطبيقات الأجهزة الذكية للحكومة العُمانية ☐

10. كم من التطبيقات أو برامج الأجهزة الذكية قمت بإستخدامها للحصول على الخدمات الحكومية في عُمان؟

ابدا ☐ من 1 – 3 تطبيقات ☐ أكثر من 3 تطبيقات

الجزء الأول / الفقرة ب: الأسئلة المتعلقة بشخصية المشارك / المشاركة

11. أي مجموعة من المجموعات العمرية التالية تناسب عمرك؟

من أقل من 25 سنة☐ من 25 – 34 سنة ☐
من 35 – 44 سنة☐ من 45 – 54 سنة ☐
من55 – 65 سنة ☐ 65 سنة فما فوق ☐

12. إلى أي فئة تنتمي من حيث الجنس؟

ذكر☐ أنثى☐

13. أي مستوى من المستويات التعليمية التالية يتناسب مع مستوى تعليمك؟

الثانوية أو أقل☐ دبلوم أو ما يعادله☐
البكالوريوس☐ دراسات عليا☐

14. تقريبا ، ما هو معدل الدخل السنوي االخاص بك؟

أقل من 2000 ريال عُماني ☐ من 2000 إلى 4000 ريال عُماني ☐
من 4000 ألف إلى 6000 ألف ريال عُماني ☐أكثر من 6000 ألف ريال عُماني ☐

15. ما هي جنسيتك أو إقامتك ؟

عُماني ☐ مقيم وليست عُماني ☐

الجزء الثاني : بيانات عوامل إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية

الرجاء وضع علامة (√) في المربع المناسب لإجابتك على ورقة الاستبيان للفقرات التالية كما في الجدول

ملاحظة : 1 = أوافق بشدة ، **2 =** أوافق ، **3 =** محايد ، **4 =** أعارض ، **5 =** أعارض بشدة

المحور	رمز	الفقرات / العبارات	1	2	3	4	5
سهولة الاستخدام المتوقعة	PEU11	أرى أنه من السهل والواضح الحصول على الخدمات الحكومية في عُمان من خلال إستخدام تطبيقات الأجهزة الذكية					
	PEU12	أرى أنه من السهل والواضح القيام بدفع الفواتير أو المدفوعات في عُمان من خلال إستخدام تطبيقات الأجهزة الذكية					
	PEU13	أرى أنه من السهل والواضح فهم وإستخدام تطبيقات وبرامج الخدمات الحكومية في عُمان من خلال أجهزة الجوال الذكية					
	PEU14	أرى أنه من السهل والواضح تنزيل وتحميل تطبيقات وبرامج الخدمات الحكومية في عُمان من خلال أجهزة الجوال الذكية					
	PEU15	أرى أن تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان تقدم تفاصيل ومعلومات هامة بخصوص الخدمات الحكومية					
الإستفادة المتوقعة	PU21	أرى أنه من السهل والفعال إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان لتنفيذ أكثر من عملية بنفس الوقت					
	PU22	أرى أنه من السهل والفعال إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان لتأكيد وتصديق العمليات المنفذة					
	PU23	أرى أن إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان يساعد على إنجاز المعاملات ويوفر الوقت					
	PU24	أرى أن إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان مفيدا ويقدم المعلومات وتفاصيل القوانين المطلوبة					
	PU25	أرى أن إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان سهلا ويقدم معلومات وتفاصيل العمليات قبل تنفيذها					
الموقف إتجاه الإستخدام	AT31	لقد أحببت فكرة إستخدام تطبيقات أجهزة الجوال الذكية لتنفيذ وطلب المعاملات الحكومية في عُمان					
	AT32	أرى أن إستخدام تطبيقات الأجهزة الذكية للخدمات					

		الحكومية في عُمان مفيدا وسهلا بالنسبة لي وللمجتمع					
	AT33	أرى أن إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان تجربة جديدة ممتازة وممتعة بالنسبة لي وللمجتمع					
	AT34	أشعر بالإيجابية إتجاه إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان للتنفيذ المعاملات الحكومية					
	AT35	أرى أن إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان فعالا ويساعد كثيرا على تنفيذ المعاملات الحكومية					
النيه للاستخدام	BI41	إذا كان لدىصلاحية لإستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان فإنني أنوي استخدامها مرات عدة					
	BI42	أرى أن إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان سيساعد كثيرا على تنفيذ المعاملات بسهولة في المستقبل					
	BI43	أتوقع بأن إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان يؤدي إلى الشعور بنوع جديد من المتعة والرفاهية					
	BI44	أرى بأن إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان خطوة إستراتيجية وإستثمار حقيقي مستقبلي					
	BI45	أرى بأنه سيكون لدي رغبة وإلتزام أكثر في المستقبل إتجاه إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان					
المخاطر المتوقعة	PoR51	لدي بعض القلق من أنتطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان قدلاتوفرمستوىالخدمةالمتوقعة وخاصة بسبب الأعطال وتوقف الخدمات المأمول الدخول لها					
	PoR52	لدي بعض القلق من أنتطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان قدلا تقوم بإنهاء بعض المعاملات خلال القيام بها لأسباب فنية أو غير ذلك					
	PoR53	لدي بعض القلق من أنتطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان قدلا تتمكن من حماية معلوماتي الشخصية بسبب عمليات الدخول غير المشروعة بدون تصريح مني					
	PoR54	لدي بعض القلق من أنتطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان قدلا تكون آمنة بالشكل الكافي أو لا تكون جديرة بالثقة للإنتهاء من تنفيذ المعاملات					
	PoR55	لدي بعض القلق من أنتطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان قدتتسبب ببعض الخسارة المالية وخاصة عندما أقوم بعمعاملات مالية					

		أو دفع فواتير					
العامل الثقافي	CT61	أرى بأنه لا يوجد لدي الدراية والمعرفة الكافية بخصوص فوائد تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان					
	CT62	أرى أنه من الأفضل تنفيذ المعاملات الحكومية يدويا بدلا من تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان					
	CT63	لدي قلق بأنتطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان قدلا تنفذ المعاملات كما لو كانت شخصيا					
	CT64	لا أشعر بالإرتياح عند إستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان كما لو كان شخصيا					
	CT65	لدي قلق بأنتطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان قدلا تتفق مع الأسس الدينية والإجتماعية لدي					

سمة القبولية أو مدى التقبل	AGR71	أرى نفسي بأنني أتعامل مع الآخرين بسهولة وأتمشى وأوافقهم الرأي بكل سهولة وبدون مشاكل					
	AGR72	أرى نفسي بأنني أتعامل مع الآخرين بكرم كبير ودون أنانية مع تقديم الولاء لهم والمساعدة المطلوبة					
	AGR73	أرى نفسي بأنني أتعامل مع الآخرينبأدب وبدون تعدي على حقوقهم وأتقبل التعاون والتعامل معهم بكل سهولة					
	AGR74	أرى نفسي بأنني أتعامل مع الآخرين بثقة وأنني جدير بذلك ولا أغضب بسهولة من أي من المواقف					
	AGR75	أرى نفسي بأنني أتعامل مع الآخرين بكل تعاون وعادة أقدم يد العون والمساعدة للجميع بدون تحفظات أو شروط					
سمة الاجتهاد أو مدى الإجتهادية	CON81	أرى نفسي بأنني دائما أخطط لما أريد القيام به وأقوم بتنفيذ المعاملات والعمليات كما تم التخطيط لها مسبقا					
	CON82	أرى نفسي بأنني في الكثير من الأحيان قادرا وبكفاءة وفاعلية على تنفيذ المعاملات والأشياء المطلوبة					
	CON83	أرى نفسي بأنني في الكثير من الأحيان محط وجديرا بالثقة لتنفيذ المعاملات وبشكل منظم ومرتب					
	CON84	أرى نفسي بأنني في الكثير من الأحيان قادرا على تنفيذ الأشياء ضمن الوقت المطلوب مع بذل الجهد المطلوب لذلك					
	CON85	أرى نفسي بأنني في الكثير من الأحيان أتحلى بالصبر وأقوم بمحاولات متكررة لتنفيذ المعاملات حتى تتم بالشكل المطلوب					
الإستخدام	APR91	لقد قمت سابقا بتنفيذ بعض من المعاملات من خلال					

الفعلي أو الحقيقي		تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان						
	APR92	لقد قام سابقا بعض أصدقائي بتنفيذ الكثير من المعاملات من خلال تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان						
	APR93	لقد قمت سابقا بتنفيذ الكثير من المعاملات المختلفة من خلال تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان						
	APR94	لقد قام سابقا بعض أفراد عائلتي بتنفيذ بعض من المعاملات بإستخدام تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان						
	APR95	أرى أن معدل إستخدامي وتنفيذ المعاملات من خلال تطبيقات الأجهزة الذكية للخدمات الحكومية في عُمان مرتفعا جدا						

Appendix C

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	14.407	30.652	30.652	14.407	30.652	30.652	5.698	12.122	12.122
2	6.296	13.396	44.048	6.296	13.396	44.048	5.307	11.292	23.415
3	4.787	10.185	54.233	4.787	10.185	54.233	4.752	10.111	33.526
4	4.160	8.852	63.085	4.160	8.852	63.085	4.390	9.340	42.866
5	2.879	6.125	69.210	2.879	6.125	69.210	4.252	9.047	51.912
6	2.004	4.264	73.474	2.004	4.264	73.474	4.007	8.525	60.437
7	1.717	3.653	77.126	1.717	3.653	77.126	3.657	7.781	68.218
8	1.328	2.826	79.952	1.328	2.826	79.952	3.477	7.399	75.617
9	1.138	2.422	82.374	1.138	2.422	82.374	3.176	6.757	82.374
10	.928	1.974	84.348						
11	.828	1.762	86.110						
12	.715	1.522	87.632						
13	.612	1.301	88.934						
14	.467	.994	89.927						
15	.435	.924	90.852						
16	.353	.751	91.602						
17	.323	.686	92.289						
18	.307	.652	92.941						
19	.267	.569	93.510						
20	.251	.534	94.043						
21	.216	.459	94.502						
22	.211	.449	94.951						
23	.204	.433	95.384						
24	.186	.395	95.779						
25	.172	.365	96.144						
26	.160	.340	96.484						
27	.152	.322	96.806						
28	.140	.298	97.104						
29	.136	.290	97.394						
30	.123	.262	97.656						
31	.118	.251	97.907						
32	.104	.221	98.128						

33	.096	.205	98.333						
34	.091	.194	98.527						
35	.090	.192	98.719						
36	.082	.174	98.894						
37	.075	.160	99.054						
38	.073	.156	99.210						
39	.070	.148	99.358						
40	.066	.141	99.499						
41	.055	.117	99.616						
42	.053	.112	99.728						
43	.050	.106	99.833						
44	.047	.099	99.932						
45	.032	.068	100.000						
46	5.207E-17	1.108E-16	100.000						
47	-1.848E-16	-3.931E-16	100.000						

Extraction Method: Principal Component Analysis.