FACTORS AFFECTING CITIZENS’ ADOPTION
OF E-GOVERNMENT SERVICES IN LIBYA

Abdulghani Abdulsalam Abied

This thesis is presented for the degree of Doctor of Philosophy of Murdoch University, 2017
I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary education institution.

..........................................................

**Abdulghani A. Abied**
ABSTRACT

In the 21st century, many countries are providing services to their citizens using the Internet. In countries such as Libya, where the population is spread over a large geographical area, the need to deploy services via the Internet is very evident. This research employs the Technology Acceptance Model integrated with the Diffusion of Innovations Theory to identify and assess factors that could influence Libyan citizens to adopt e-government services in Libya. The main benefit of this research is that it is the first study to tackle this issue in Libya. A quantitative research methodology via a paper-based self-administered questionnaire was used to collect data. All the variables considered in this research were statistically significant except in the case of Trust of the Internet on Perceived Ease Of Use. Perceived Ease Of Use and Perceived Usefulness are significant antecedents of Intention To Use. Computer Self-Efficacy and Facilitating Conditions have a significant relationship with Perceived Ease Of Use. Moreover, Subjective Norms, Image, Beliefs, and Perceived Ease Of Use were empirically observed to influence Perceived Usefulness. Second, the moderating role of citizen characteristics which include gender, age, education, and Internet experience was supported by the data. Analysis of the empirical data indicates the following actions from Libyan government will have implications for successful adoption of e-government services in Libya: launched its services in ease to use manner, provide services that are centred around the need for the users, identify to its citizens the advantages of using e-government services as an alternative to other means of interacting with its government agencies, launch efforts to increase Information Technology literacy, provide people with required resources to use e-government, and
give special concerns to aspects that can have relation to prevalent beliefs in the Libyan society.
ACKNOWLEDGEMENTS

Thank is due Almighty God for his grace and kindness and for his great favours and blessings that I could have reached not this state without.

A sincere gratitude and acknowledgement to my supervisors, Dr Mohd Fairuz Shiratuddin and Associate Professor Dr Kevin Wong, for the continuous help, care and support during my journey to the PhD degree and throughout the research phases. Their assistance and guidance have indeed helped me at all times of the research.

I would like also express my deep gratitude to my parents, wife and my children, for their endless support and encouragement.

Finally, I would like to thank my government for sponsoring my PhD scholarship.
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<td>Computer Self-Efficacy</td>
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<td>DOI</td>
<td>Diffusion Of Innovation Theory</td>
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<td>FCs</td>
<td>Facilitating Conditions</td>
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<td>G2B</td>
<td>Government to Business</td>
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<td>Information and Communication Technology</td>
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<td>TOI</td>
<td>Trust Of the Internet</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>TPB</td>
<td>Theory of Planned Behaviour</td>
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<tr>
<td>TRA</td>
<td>Theory of Reasoned Action</td>
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<tr>
<td>UTAUT</td>
<td>Unified Theory of Acceptance and Use of Technology</td>
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LIST OF PUBLICATIONS AND CONTRIBUTIONS OF THE THESIS


## Summary of the Contributions of the Thesis

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<td>Chapter 6: Discussion &amp; Conclusions</td>
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<td>- Literature searches on technology adoption models that could explain the factors that influence citizens’ adoption of e-government services.</td>
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<td>- The formulation of an e-government adoption framework based on the important influencing factors in the Libyan context that can facilitate better decision-making in the country’s future e-government endeavours.</td>
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<td>- This study extends the body of knowledge in there of citizen adoption of e-government applications and services, as it integrated and tested Technology Acceptance Model and Diffusion of Innovation theory in Libyan context.</td>
<td>Journal Paper 1</td>
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<td>- Identification of relative importance of each of the factors in the adoption model to highlight areas and factors that can have a higher impact. This would facilitate better prioritisation of initiatives and strategies. This would ensure</td>
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- Higher productivity of current and future initiatives.
- Identification of the barriers that restrict successful implementation of e-government services in Libya.
- Findings from this research can be used for future research to explore the implementation opportunities of the research model by testing their reliability and validity, particularly in the context of developing countries such as Libya. Similarly, future research on technology adoption in Libya in the later stages of implementation can also benefit from this research.
Chapter 1 INTRODUCTION

1.1 Introduction

The main purpose of this chapter is to present an overview of this thesis in terms of its scope, significance and background. Moreover, the aims, the research questions and the significance of the research are identified. Other chapters in this thesis further elaborate key topics such as literature review, research methodology, data collection and analysis. The researcher of this research has also included chapters’ summaries to present an overview of the complete thesis.

1.2 Research Background

Information and Communication Technology (ICT) is playing an increasingly prominent role in our lives. Most of the innovations are based on Information and Communication Technology (ICT) developments and change our lives in some way. If we look back at how systems and organisations were managed three or four decades ago, we see massive differences made by ICT with its growing capability. Though this capability of ICT was first tapped into by private organisations for purposes generally referred to as e-commerce; individual users, researchers and governments are now increasingly making an effort to use ICT systems which are gradually revolutionising the way governments, citizens and organisations act with each other (Alshehri & Drew, 2010). There can be various forms in which these entities (i.e. governments, citizens, and organisations) interact, including obtaining information, filings, making
payments, and a host of other activities via the World Wide Web (Palvia & Sharma, 2007).

The advantages of e-government are unquestionable. Compared to the traditional face-to-face services, online services are faster, cheaper and more readily available 24/7. Alshehri and Drew (2010) explain that “More and more governments around the world are introducing e-government as a means of reducing costs, improving services for citizens and increasing effectiveness and efficiency at national, regional and local levels of the public sector”.

Some researchers also link e-government services to citizen empowerment through access to relevant information and more efficient government management resulting in benefits such as less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions (Ahmad, Jouni, & Markku, 2012; Palvia & Sharma, 2007; Rokhman, 2011). Accordingly, e-government has become one of the most important priorities in most developed and developing countries over the world (Chen, Chen, Huang, & Ching, 2006).

Ahmed, Mehdi, Moreton, and Elmaghraby (2013) point out that implementation of e-government in developing countries faces many challenges due to technical, infrastructure, cultural and social issues. Al-Naimat, Abdullah, Osman, and Ahmad (2012) explain that 85% of the e-government projects in developing countries fail to achieve their objectives due to challenges and problems that exist in term of the implementation of e-government. Some of these issues include:
- Technical challenges such as unavailability or inadequacy of ICT infrastructure, and issues related to privacy and security over the Internet (Alshehri & Drew, 2010; Gant, 2008; Nkohkwo & Islam, 2013)
- Organizational/Management issues such as lack of qualified personnel to roll-out and support e-government services, resistance to change, lack of collaboration, etc. (Alshehri & Drew, 2010; Nkohkwo & Islam, 2013)
- Political issues such as lack of stability required for implementing e-government services. Political interests also impact the implementation and adoption of e-government services in developing countries (Nkohkwo & Islam, 2013; Al-Naimat et al., 2012; Gant, 2008).
- Social issues such as difference in level of digital literacy, economic classes within the society and cultural factors (Al-Naimat et al., 2012; Alshehri & Drew, 2010; Gant, 2008)
- Financial issues including high cost of implementation (Alshehri & Drew, 2010; Gant, 2008; Nkohkwo & Islam, 2013)
- Inappropriate implementation methodology e.g. copying or re-implementing the e-government services as they were done in developed countries irrespective of the differences between developed and developing countries (Al-Naimat et al., 2012; Nkohkwo & Islam, 2013). Another major issue commonly faced by developing countries is the lack of harmony between design and implementation strategies.

In terms of e-government adoption, the literature addresses two streams: one dealing with the supply side and the other dealing with the demand side of e-government. The first stream addresses factors that affect government institutions to deliver e-
government services, including IT infrastructure, financial resources, human resources, and change management. The second stream – the demand side - addresses factors that affect the beneficiaries of public services, whether citizens, businesses or government employees who utilise information and e-government services, with research highlighting issues of trust, culture, perceptions, beliefs and experience. The largest proportion of studies focuses on the supply side of e-government adoption, with relatively few studies focusing on the demand side of e-government adoption.

Some of the literature suggests that there is a low level of citizen adoption of e-government services in developing countries; however, other researchers suggest that it is a common problem in both developed and developing countries (Al Hujran & Shahateet, 2010; Alsaif, 2014; Meftah, Gharleghi, & Samadi, 2015; Thi, Lim, & Al-Zoubi, 2014). According to a search conducted in Russia, e-government in Russia suffers from low acceptance among citizens, only 9% of the population are registered members of the e-government website (Srednik & Cha, 2016).

Most of the existing research on the analysis of factors influencing citizens’ adoption of e-government services have been conducted in developed countries. There are considerably fewer studies that have been conducted in developing countries, such as Libya. Irani (2015) has identified the top 20 countries which have generated research on e-government (see Table 1-1). Interestingly, there no middle-eastern countries are featured in this list, which suggests therefore that there is limited research on e-government in Arab countries. It’s obvious that the majority of previous studies have focused on developed countries, and hence, due to the large cultural differences between Arab countries such as Libya and those previously studies, the results from these studies may not be relevant in an Arabian context. Moreover, to date, there has
been no research that develops the technology use model in the context of e-government in Libya.

Table 1-1 Countries Generating the Most e-government Publications (Top 20)
Irani (2015)

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<td>20</td>
<td>Ireland</td>
<td>29</td>
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</table>

(Key: SL = Services List; IS = Information Systems; EG = e-government; and AIS = Applied Information Systems.)

Citizens’ intentions to adopt e-government services, though very important, is sometimes afforded little consideration in many implementations due to a tech-centric focus, often resulting in the failure of implementation efforts (Saadi & Almahjoub, 2012).
The implementation of e-government services in Libya is also facing similar challenges and, therefore, it is important to identify the impact of key determinants of citizen adoption from the Libyan perspective to inform stakeholders who can take the results into consideration in designing, implementing, and launching and marketing e-government systems.

1.3 The problem statement

After the ‘Libyan Revolution’ in 2011, the Ministry of Communication and Informatics recommended several initiatives. The aim of these initiatives was to utilise ICT in assisting government functionality and extend facilitation and service-provision to Libyan citizens in a more efficient manner. The e-government project, which came out as a result of these initiatives, had the objective to offer all government services electronically to everyone wherever they are, and for the services to function on modern communication networks and information systems (Radwan, 2013).

The influence of new technology, such as e-government, on economic growth and effective service provision, can only be achieved if and when the new technology is commonly adopted and utilised by stakeholders (Khanh, 2014); in this case, Libyan citizens.

Technology utilisation and diffusion are linked to an array of individual decisions and the choice to begin using the new technology, which is termed its ‘adoption’. Hall and Khan (2003) disagree with this definition of adoption, and argue that decisions on whether or not to use new technology are often based on a comparison of the uncertain benefits of the new invention with the uncertain costs of adopting it.
The problem addressed in the present research was a lack of information on the adoption behaviour of Libyan citizens relating to the acceptance of e-government services in Libya.

An understanding of the factors affecting e-government acceptance is essential for government stakeholders to make an assessment of efficient service provision and administration, for economists studying the determinants of growth and for the creators and producers of such technologies to be user-friendly and to understand barriers to usage. The present research will accordingly assist such audiences in the Libyan context.

The purpose of this research is, therefore, to identify and assess the factors and their relationships that influence citizens to adopt e-government services in Libya.

1.4 Scope of the research

Following is the scope of this research:

1) This research focuses on the adoption of e-government services in terms of ‘intention to use’ in Libya. Libya is chosen, as the researcher is a Libyan student sponsored by the Libyan government to do this research.

2) This research explores the demand side of e-government (i.e. the citizen’s perspective) factors, commonly referred to as Government to Citizens (G2C), and not the supply side or government related issues such as strategies and policies in Libya. The target population of this research is ‘Libyan Citizens’ as this research aims to identify e-government services
adoption among this population for current and future e-government services provided by the Libyan government.

3) This research considers only the adult Libyan population (with no upper age limit) as e-government adoption is not related in Libya to non-adults (less than 18 years old).

4) It should be noted here that the current situation in Libya is not stable. The country remains trapped in a spiral of deteriorating security, economic crises, and political deadlock since mid-2014 after the outbreak of a civil war between groups of political parties. This situation has a negative impact on many developments of projects (Murry, 2015). Among these projects that are impacted by the civil war is e-government project. Many of e-government services that were operating before the war are now no longer available. Moreover, many of services that were planned to be implemented are postponed. This fact restricted the research to a limited number of e-government services that are currently available. This factor also hindered data-collection process to some extent (the data was collected only from two of Libyan cities which were considered safe).

The outcomes of this research could be useful when stability returns to the country, as it was when this research started.

1.5 Research Objectives and Questions

The main objective of this research is to identify and assess the factors that influence Libyan citizens to adopt e-government services in Libya. The research objective was addressed through answering two high level research questions. These questions are as follows:
• What are the factors that can facilitate or hinder the adoption of e-government services by the Libyan citizens?
• What is required, from policy makers and e-government implementers, to enhance e-government acceptance in the Libyan context?

1.7 Significance of the Research

The following points highlight the significance of this research:

1) There has been no research done to-date that has specifically tackled the issue regarding e-government systems’ adoption by citizens in Libya. The present research could serve to inform future development.

2) The success of e-government is always impacted by two groups of stakeholders; those who will fund, design, implement and maintain the system (supply side), and those who will consume the services of the system (demand side). According to Alhujran (2009), most of the existing research focus has been on the supply side of e-government system, and little has been explored about demand side in terms of how, when and what influences adoption by citizens. Accordingly, this thesis explores the demand side, or Government to Citizen (G2C) side, of e-government adoption. Furthermore, Irani (2015) has analysed 910 research papers related to e-government from a number of journals and sources and further highlights the gap in the analysis of factors from the citizens’ perspective.

3) Alshawi and Alalwany (2009) argued that research into effective utilisation of e-government services from the citizen's point of view needs to be urgently addressed in regard to developing countries. Al-Naimat et al. (2012) explored the citizen’s point of view and recommended that studies
in developing countries give consideration to factors specific to the location where the study is conducted and its specific culture. They have also explained the shortcomings of using ‘imported methodologies’. They have pointed out that what works in one country and culture may not work in another in the same way. According to Bagchi, Hart, and Peterson (2004), IT adoption is affected by the culture in every society. Accordingly, factors that need to be included in the study have to take into account local customs, cultures, values and traditions. Filling in this gap in the existing research is one of the motivations for conducting this research in a developing country such as Libya that has different cultures and values as compared to the majority of existing technology adoption studies.

4) A low level of citizen adoption of e-government services in developing countries has been identified, and some research suggests it is a common problem in both developed and developing countries (Al Hujran & Shahateet, 2010; Srednik & Cha, 2016). This low rate of e-government adoption, however, is particularly noticeable in Libya. Therefore, the present research is significant because it will identify and evaluate the factors that may affect citizen's adoption of e-government services in Libya in the coming years and well into the future. Determining these factors could help to increase the adoption rate of these services because, by deepening the knowledge of the factors that facilitate or hinder the adoption process, developers, government officials and other relevant stakeholders can fine-tune their efforts accordingly, which in turn could enhance the adoption rate through appropriate roll-out methodologies and launches.
5) This research contributes to the body of knowledge on technology adoption literature as it integrated and tested Technology Acceptance Model (TAM) and Diffusion of Innovation theory (DOI) in Libyan context.

6) Future research on technology adoption in Libya in the later stages of implementation can benefit from the present research findings, for example, by repeating the approach to measuring adoption of e-government services at particular later stages of their development, and at future stages of social and economic development in the country.

The Libyan government is increasingly engaging in offering e-government solutions. As it is still in its initial stages at the moment (Radwan, 2013) like any other developing countries (Al-Naimat et al., 2012), this research is expected to provide an opportunity to focus further and direct toward these efforts in line with the citizens’ preferences in regards to e-government services’ adoption.

1.8 Research Outcomes:

The research outcomes are as follow:

- The formulation of an e-government adoption framework based on the important influencing factors in the Libyan context which might facilitate decision-making in the country’s future e-government endeavours.

- The identification of the relative importance of each of the factors in the adoption model to highlight areas and factors that can have a higher impact. This would facilitate better prioritisation of initiatives and strategies. This would ensure higher productivity of current and future initiatives.
- The identification of the barriers that restrict successful implementation of e-government services in Libya.
- The identification of the demographic factors that contribute to the adoption rate of various sections of society of e-government in Libya.
- Utilisation of lessons learnt from previous implementation efforts in identifying the relevant recommendations for the e-government roll-out in Libyan context.

1.9 Thesis Outline

This thesis is organised into six chapters. Figure 1-1 depicts the thesis outline. This chapter provides a background of the research followed by the scope of the research. It also includes the research aims and research questions. In addition, it presents the significance of the research and research outcomes.
Figure 1-1 Organisation of the thesis
1.9.1 Chapter 2 description:

This chapter presents an analysis of the literature on e-governments to describe the research work already undertaken, gaps in existing research and future research opportunities in this field. This chapter also includes various e-government models and their benefits including Government to citizens (G2C). An overview of the various technology acceptance/adoption models and a discussion of their applicability and verification through previous studies are then presented. Following this, an analysis of the Libyan situation from economic, political, demographic and infrastructural points of view are presented.

1.9.2 Chapter 3 description:

This chapter introduces the research model. It describes the proposed constructs, model, and research hypotheses.

1.9.3 Chapter 4 description:

This chapter explains the research design and data collection methodology, starting with an explanation of the research paradigm used in this research and then describing the study’s quantitative research methods. Sampling methodology is also described in detail in line with the special geo-demographic situation in Libya and its impact on the sample population in this study. In addition, the questionnaire is described regarding instrument design, the various questionnaire sections and the constructs being measured, the data collection processes, and ethical considerations.
1.9.4 Chapter 5 description:

Chapter 5 describes the analytical methods used with the collected data. It also examines the reliability and validly of the instrument; and the response rates. In terms of the preparation of the data for use, this chapter explains the data cleaning aspects regarding missing data, outliers and normal distribution. This chapter also presents an analysis of the demographic characteristics of the participants, followed by a description of Structural Equation Modelling (SEM). Then, the results of the measurement model and structural model analyses are presented.

1.9.5 Chapter 6 description:

Chapter 6 discusses the results of the data analysis and compares the findings with previous research in terms of each hypothesised relationship. The study’s conclusions are presented. This chapter also discusses the limitations of this research and recommendations for future research.

1.10 Summary

In this chapter, the scope, objectives, aims and significance of this research have been discussed. Organization of this thesis has been presented by briefly describing the content of each thesis chapter.
Chapter 2 LITERATURE REVIEW

2.1 Introduction

The aim of this chapter is to review the existing literature about e-government to develop a clear understanding of this technology and to identify key determinants that may influence e-government adoption by citizens in Libya.

This chapter starts by presenting a number of e-government definitions. Then, it identifies the categories of e-government applications that have been determined by scholars. Next, the anticipated benefits that will be derived from the use of e-government services on individuals and society are listed. Then, the theories and models that have been used to explain the information technology adoption process are described. This chapter continues with a review of previous research studies that have examined the factors that influence citizen adoption of e-government services.

2.2 An overview of e-government:

The following sections comprise a literature overview on the various aspects related to e-government in the context of this research.

2.2.1 Definitions of E-government:

This literature review highlights that there are numerous definitions of e-government systems which reflect the various approaches, interests and paradigms adopted by researchers in this field.

Before the adoption of any particular definition, it is important to note that:
e-government is quite difficult to define due to the many different definitions in the public domain. Defining e-government too narrowly as electronic service delivery only (as is the case with the current EU e-government benchmarking exercise) can result in exercises that are overly complex and costly. Such a definition can also miss the transformative potential of e-government to speed-up decision-making, streamline or reduce processes, or reduce costs of engagement. However, it is important to have a common “working definition” to guide public bodies in developing focus and priorities. It is expected that any “working definition” will change over time as opportunities and priorities develop (Department of Finance, 2009).

Following is an overview of some of the relevant common definitions:

- Fang (2002) defines the e-government concept as:

  a way for governments to use the most innovative Information and Communication Technologies (ICTs), particularly web-based Internet applications, to provide citizens and businesses with more convenient access to government information and services, to improve the quality of the services and, to provide greater opportunities to participate in democratic institutions and processes.

- Fernández-i-Marín (2011) defines e-government as “the delivery of public services (services) using the Internet (channel) between public administrations and citizens (impact) for personal purposes (use)”. In this definition, the e-government concept is confined to the Internet channel.

- According to The World Bank Group (2012), e-government is:
The use by government agencies of ICT - such as Wide Area Networks (WANs), the Internet, and mobile computing, that have the ability to transform relations with citizens, businesses, and other arms of the government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management.

This definition focuses on the benefits to be derived from the e-government as well as the tools used in this technique.

- Moon and Norris (2005) provide a simpler definition, pointing out that e-government is “a means of delivering government information and services”.

From the above definitions, it can be seen that most researchers define e-government services as depending upon ICT.

Some researchers disagree with the idea that e-government is the mere provision of services over the Internet. Based on this premise, Dawes (2002) explains two aspects where this definition is too limited.

Firstly, defining e-government only in terms of the Internet is considered too narrow due to the lack of consideration of an array of government services that are not direct. Also, it does not consider the use of any other technologies apart from the Internet.

Secondly, this type of definition of e-government is considered to give the impression that all e-government systems lie within some websites, thereby ignoring other relevant aspects such as infrastructure, training, policies and processes.
Satyanarayana (2004) identified some non-Internet forms of e-government services, including the use of technologies such as: Telephonic services, fax-based services, Personal Digital Assistant (PDA), mobile text messaging, multimedia messaging using mobile networks, wireless networks and services, Bluetooth, CCTV, tracking systems, radio-based services, biometric identification, traffic management systems, self-service booths / stations, identity cards recognition systems, smart cards and other Near Field Communication (NFC) applications; election/ polling technologies, television, security systems, luggage scanning systems, weighing systems, and so forth.

As the present research is conducted in Libya, where e-government is still in an early stage, e-government in this research is defined as the provision of government information and services to the public or to other civil and public service bodies by means of the Internet and other electronic means such as mobile phone text short message services (SMS).

**2.2.2 Categories of e-government**

The stakeholders of e-government initiatives can be numerous and may include:

- citizens,
- employees,
- businesses,
- Non-governmental organisations (NGOs),
- government agencies, and
- other governments.

From the list above, e-government key stakeholder relationships can be categorised into four main groups (Kanaan, 2009; Ndou, 2004), as follows:
1. Government to Government (G2G)

Examples from the Libyan Context: Intelligence sharing systems; and inter-government military cooperation and training systems.

2. Government to Business (G2B)

Examples from the Libyan Context: Company registrations, and complaints registrations.

3. Government to Citizen (G2C)

Examples of services being offered in Libya: Social Assistance Scheme, Displaced and war-afflicted citizens’ assistance, student registration for studying abroad, Passport/ ID applications, e-voting, Hajj applications, complaints registration, and distance education.

4. Government to Employees (G2E)

Examples of G2E services offered in Libya: Job recruitment services; and payment systems for employees.

It is notable that in the literature, other sub-classes and sub-categories have been identified, as follows:

- Belanger and Hiller (2006) classify e-government into six categories:
  - Government Delivering Services to Individuals (G2IS),
  - Government to Individuals as a Part of the Political Process (G2IP),
  - Government to Business as a Citizen (G2Bc),
  - Government to Business in the Marketplace (G2BMKT),
  - Government to Employees (G2E), and
  - Government to Government (G2G).
- Fang (2002) categorised e-government into eight different potential categories:
  
  o Government-to-Citizen (G2C),
  o Citizen-to-Government (C2G),
  o Government-to-Business (G2B),
  o Business-to-Government (B2G),
  o Government-to-Government (G2G),
  o Government-to-Nonprofit (G2N),
  o Nonprofit-to-Government (N2G), and
  o Government-to-Employee (G2E).

In the following sub-section, an overview of the four main categories of e-government is presented.

2.2.2.1 Government to Government (G2G)

G2G involves data exchange, sharing and electronic transactions between government agencies, government departments, or government organisations. According to W. Huang, Siau, and Wei (2005), the aims of G2G are to enhance inter-government processes by streamlining collaboration and coordination between the involved parties. In some instances, national and international levels of interaction and cooperation between administrations are crucial for the success of e-government projects (Realini & Riedl, 2004).

The Northeast Gang Information System (NEGIS), used in the United States, is an example of a successful G2G project in which local governments within the US collaborated with each other and shared important crime related data such as ‘leads’, lists of the skills of ‘investigators’, information sources (including news, media
reports, etc.) and other useful resources (Pitts, 1999). The system is used to exchange information and intelligence between government parties about street gangs and their activities. State police departments of the participating states are connected through this system and engage in transmission of collected information to other law enforcement and public service agencies.

It can also be seen that collaboration and data exchange systems are increasingly used within certain geographical zones such as among different countries in the Gulf Cooperation Council and in the European Union. For example, in an initiative by the Gulf Cooperation Council regarding common identity system, large-scale pilot projects were developed and run; and in the European Union under the ICT Policy Support Programme in five main areas: eID, eProcurement, eBusiness, eHealth and eJustice (Al-Khour, 2011).

2.2.2.2 Government to Business (G2B)

G2B is considered as the second most-used application of e-government after G2C (AlShihi, 2006). G2B comprise all transactions between government and business organisations. Businesses and government agencies can utilise central websites to exchange information and be more efficient in their mutual businesses as compared to their performance using other means. For example, businesses can learn about a current or upcoming government project which may provide an opportunity for them to participate by giving quotations, proposals, reports, tenders or engaging in other activities using an e-government portal or website.

According to Fang (2002), electronic procurement (also known as e-procurement) is the chief application of G2B e-government that can reduce costs and allow all companies to interact with the government. Electronic trading saves time compared to
humans doing business. For example, there is no need for driving to government buildings and no waiting time. If the transaction is not completed, personnel can use a mouse click from any location to return to the task rather than drive to the office. As more and more companies are conducting government business online, their transaction costs for this will be reduced. Using more technology usually means that fewer workers are needed, which in turn can reduce business costs.

As well as G2B e-government offering benefits to businesses, there are a number of benefits for governments. One advantage is the G2B e-government can make available a greater amount of useful information for business and can present it clearly with easy accessibility by businesses. In some respects, the success of businesses depends on the ability to plan for the future using relevant information from relevant sources. Governments collect a lot of data from economic, demographic, social, competition, environmental and other points of view. In sharing this data openly and transparently with businesses, governments give them a better chance to succeed. The benefits to businesses is that they can review relevant regulations, do their transactions in a smarter way in less time and reap other relevant benefits (Alshehri & Drew, 2010).

In terms of e-procurement, businesses learn about the purchasing needs of agencies; and agencies request proposal responses. Examples of G2B applications are company registration, taxation services, license renewal, project registrations, tender processing, etc.. A very good example of G2B application is Australia’s web portal (business.gov.au) which is an online government resource for the Australian businesses. Its scope includes a wide range of services for businesses including taxation, business registration, establishing new businesses, reviewing already existing businesses, acquiring ABNs, licensing, and reviewing legislation.
2.2.2.3 Government to Citizen (G2C)

Most countries around the world seek to facilitate communication between government and citizens. For this purpose, a lot of investment has been allocated for the establishment of e-government services applications.

According to DeBenedictis, Howell, Figueroa, and Boggs (2002), G2C e-government refers to all dealings between citizens and the government using the online medium. It is perceived that serving citizens is the primary goal of e-government (Seifert, 2003). The aim of this application is to offer proper, adequate support for citizens anywhere and anytime by enabling them to perform online activities such as searching for contact details of public departments, applying for jobs, obtaining birth, death, and marriage certificates, pay parking tickets, and obtain building permits.

2.2.2.4 Government to Employees (G2E)

Tang, Zhang, Song, and Yan (2011) describe G2E as:

the online interactions through instantaneous communication tools between government units and their employees with the purpose to offer employees the possibility of accessing information in regard to compensation and benefits policies, training and learning opportunities and civil rights. It also gives an effective way to provide e-learning to the employees, bring them together and to promote knowledge sharing among them.

Government-to-Employee e-government is focussed on relationships between government employees (public roles) and government bodies with an aim to effectively coordinate internal processes and operations focussing on the improvement of the efficiency of processes. G2E services can be related directly or indirectly to
employees. Examples of direct impact include the provision of human resource management, remuneration, and training and development. Indirect services and facilitates include internal communication, advice on policies, etc. This accordingly improves the bureaucracy in its day-to-day functioning and dealings.

2.2.3 e-government benefits

E-government is one of the most important developments in ICT and other related fields. It provides a variety of benefits for the community at large. The Libyan government can accordingly yield these benefits as well by furthering their e-government initiatives. One recent success story from the Libyan context is the implementation of the mobile voting system (this system is further explained in section 2.6.4).

Among the benefits are economic benefits, social benefits and political benefits. The most significant benefits of e-government that can be gained from implementation of e-government, according to the literature, are:

- Cost savings: Phone calling and paperwork will be reduced when governments go online. E-government services are found to have financial benefits for customers as it reduces the financial burden to them, being more convenient, efficient, easy and accessible. These factors, in many cases, directly reduce cost-to-customer (Seifert, 2003). An example of how government can achieve cost savings that can be passed on to customers is where the procedures for receiving vehicle registration fees when deposited online cost the government less than when receiving a direct deposit by customers visiting the service centre or sending payment by mail. The cost savings of receiving payments are
made by computer-based or electronic systems performing many functions of e-government systems in comparatively less resource intensive ways than the alternatives, and accordingly costing the government less. A study in Virginia USA of Motor Vehicle licencing services found that the initial cost of setting up the website was recouped after sufficient usage by customers because online payments cost only $2.50 to process compared to other types of payments that cost $5.00 to process.

- Stability: e-government can play its role in furthering the stability of the country in various forms, such as the provision of news through technology platforms, providing opportunities for participation and volunteering to citizens, etc. The 2011 uprising in Libya was heavily influenced by the use of ICT, which demonstrated the opportunity for its uptake on a large-scale. This uptake suggests the probability that well-designed e-government services could also be successful. Accordingly, ‘The Centre for International Governance Innovation’ (CIGI) considers ICT as a useful tool for bringing in stability in the country (Jones, Kennedy, Kerr, Mitchell, & Safayeni, 2012). Arguably, the Libyan government can capitalise on this opportunity and develop relevant services using ICT.

- Time saving: Completing transactions electronically saves a lot of time compared to attending in person and standing in queues or being stuck in traffic. Researchers have found that e-government services have relatively reduced response time and reduced error rates (Al-Kibsi, De Boer, Moursched, & Rea, 2001).

- Efficiency improvement: e-government reduces human related errors due to the fact that it requires lesser manual human interaction. Due to this fact, a
number of benefits are realised including avoidance of information duplication as relevant information is already available within integrated databases which can automatically refer to each other to access relevant information during transactions. It makes it easier for citizens and businesses to find and get services from the government (Layne & Lee, 2001). The provision to business partners, citizens, employees, government and other agencies of faster and cheaper services and the information is often considered as an essential goal of e-government (Layne & Lee, 2001).

- Increased transparency and openness of government’s operations: e-government increases transparency by opening government business processes to the public (tendering, procurement, recruitment, etc.) and by making governments’ budgets and expenditure reports available online to the public. These services provide citizens with a chance to get involved in various sorts of democratic processes (Reddick & Global, 2010). Moreover, openness makes democracy stronger also by encouraging government officials to perform better, for where government is more open, they are more likely to be held accountable for their decisions, both good and bad.

- Increased Citizen Participation: e-government systems increase citizen participation in political processes by inspiring and facilitating online debating, campaigning, voting and the exchange of relevant electoral information. Engaging citizens in policy-making is widely considered as a core element of good governance (OCED, 2001).

- The increase of users’ ICT skills and knowledge (Solinthone & Rumyantseva, 2016).
These services establish and strengthen trust between citizens and their government by improving the government's image (Solinthone & Rumyantseva, 2016).

Social equity: e-government improves the fairness of treatment of all citizens as the provision of information and services is not biased towards any different groups within the society, thereby ensuring the inclusive treatment of everyone by providing the same services to all members of the community. Governments often strive for inclusion by providing more customer-centred services such as translations, making interpreters available, etc (Sarpoulaki, Eslami, & Saleknia, 2008).

Due to e-government services, businesses can find better opportunities to expand globally and enjoy better economic growth and opportunities.

It breaks down the barriers of geography and demographics (McKeown, Teicher, & Dow, 2004).

Recognising the benefits of e-government, many governments around the world have taken steps to adopt e-government to make the lives of their citizens easier. e-government has been considered as one of the urgent priorities for governments around the world (Chen et al., 2006).

From the above, it is clear that there can be financial, productivity, political, social and economic benefits of e-government systems and services. However, the overall success of such services remains dependent on citizens’ willingness and inclination towards the adoption of e-government.

According to a survey conducted by the UN, all of the 192 surveyed countries have applied some sort of e-government (UN, 2010). However, regardless of the benefits
offered by e-government, its widespread acceptance and adoption still face major challenges. One of the many challenges hindering high levels of citizen uptake is gaps in usage levels between different demographic groups, across and within countries.

2.3 e-government adoption

Adoption is an important aspect for the success of e-government initiatives. Carter and Belanger (2005) conceptualised the issues around adoption and use of e-government services as involving ‘intention’, whereas (Gilbert, Balestrini, & Littleboy, 2004) referred to the uptake issues as involving ‘willingness’. Furthermore, V. Kumar, Mukerji, Butt, and Persaud (2007) declared that e-government adoption is ‘a decision’, specifically, “a simple decision of using, or not using, online services.”

In the present research, the first conceptualisation, ‘intention’, is used. Previous studies have shown that intention to use is a strong predictor of actual use (Ajzen, 1991; Belanger & Carter, 2008; Venkatesh, Morris, Davis, & Davis, 2003). It is notable that the e-government system in Libya is in its initial stages of implementation and adoption. It is expected that a large portion of Libyan citizens investigates the ‘intention’ to adopt e-government services within a given context rather than ‘actual use’.

Despite significant growth in the development and offering of e-government services, it is important to understand the factors that would determine their actual adoption or lack of adoption. The success of e-government services rests on citizens’ adoption or willingness to adopt, according to Carter and Belanger (2005).
E-government, like any other new technology, faces many challenges which may affect adoption levels of e-government services. The challenges may include prior technology experience, the trust of the service, access levels, relevant security issues and perceptions surrounding that, awareness about availability and functionality of services, and overcoming the digital divide (Carter & Weerakkody, 2008); Z. Huang (2007); (Carter & Belanger, 2005).

The literature review of the present research suggests that e-government services are commonly provided via ICT infrastructure; and, accordingly, in order to study intention and willingness to adopt, relevant IT technology adoption models need to be considered (Bwalya, 2009).

2.4 Models Used to Measure Adoption of New Technologies

A range of theories and models has been developed over a period of time under various conditions and situations to explain user acceptance and adoption of technology in the information systems domain. Adoption models seek to explain the individual adoption of new technology. Examples of such theories and models include the Technology Acceptance Model (TAM) developed by Davis (1985), the Theory of Planned Behaviour (TPB) developed by Ajzen (1991), the Diffusion of Innovation (DOI) theory developed by Rogers (1995), and the Unified Theory of Acceptance and Use of Technology (UTAUT) developed by Venkatesh et al. (2003). Researchers often use these models as a base framework or structure and then modify or extend them to be relevant to the specific study being undertaken and the situation at hand.

Adoption models and theories have been utilised to explain citizens’ adoption and acceptance of e-government services in many countries around the world.
Following is a snapshot of the application of adoption studies and their geographical spread:

- Saudi Arabia (M. Alzahrani & Goodwin, 2012)
- Jordan (Al Hujran & Shahateet, 2010),
- Oman (AlShihi, 2006),
- Pakistan (Ahmad et al., 2012),
- Qatar (Al-Shafi & Weerakkody, 2010),
- Malaysia (Hussein, Mohamed, Ahlan, Mahmud, & Aditiawarman, 2010),
- Taiwan (Chang, Li, Hung, & Hwang, 2005),
- Zambia (Bwalya, 2009),
- Gambia (Lin, Fofanah, & Liang, 2011),
- Tanzania (Komba & Ngulube, 2015),
- Netherlands (Horst, Kuttschreuter, & Gutteling, 2007),
- United Kingdom (Choudrie & Dwivedi, 2005),
- Spain (Rufín Moreno, Molina, Figueroa, & Moreno, 2013),
- Greece (Zafiropoulos, Karavasilis, & Vrana, 2012),
- Canada (V. Kumar et al., 2007),
- United States (Carter & Belanger, 2005),
- Mexico (Gomez-Reynoso & Sandoval-Almazan, 2013),
- Australia (W. Huang, Ambra, & Bhalla, 2002).
- Russia (Srednik & Cha, 2016)
- Turkey (Kurfalt, Arifoğlu, Tokdemir, & Paçoın, 2017)

From the above snapshot, which shows the spread of research that employed technology adoption models to explain the adoption behaviour of e-government
services, it can be seen that this type of research has been conducted on all world continents from America, Asia, Europe, Africa, and Australia. This shows the importance of such models and their applicability in the context of e-government adoption regardless of the cultural, demographic and economic differences between countries.

In the next subsections, a brief description of the most frequently used models to explain technology adoption behaviour is presented.

2.4.1 Technology Acceptance Model (TAM)

TAM is the most widely used model by information technology researchers in trying to understand IT adoption (Sumak, Polancic, & Hericko, 2010). TAM is adapted from the Theory of Reasoned Action (TRA) which states that beliefs influence intentions, and intentions influence one's actions (Ajzen & Fishbein, 1972).

According to Davis (1989) who was the developer of TAM, a user’s decisions about the acceptability and use of new technology are impacted by a number of factors. Two major factors are:

- **Perceived Usefulness (PU)** – As defined by Davis, "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis 1986, p. 26).

- **Perceived Ease Of Use (PEOU)** - As defined by Davis, "the degree to which an individual believes that using a particular system would be free of physical and mental effort." (Davis 1986, p. 26).

TAM is a key model widely used for studying IT adoption behaviours (Polančič, Heričko, & Rozman, 2010).
According to King and He (2006), TAM is one of the most broadly used and empirically verified models in information system research. Since its introduction, TAM has been employed in different technologies and has been examined in different contexts; including e-mail, voice mail, word processing, spreadsheets, online gaming and mobile technologies. In the e-government context, TAM has been used in many studies conducted in many countries around the world to investigate the effects of TAM constructs on citizens’ adoption of e-government services.

TAM is an extension of the Theory of Reasoned Action (TRA) and replaces many of its technology acceptance measures with the two measures mentioned above. TRA postulated that beliefs impact intentions, and intentions impact one's actions (Ajzen & Fishbein, 1972).

Figure 2-1. represents a general overview of the TAM.

![Figure 2-1 Technology Acceptance Model (Davis,1989)](image)

Following is a brief interpretation of TAM model presented above (right to left):

- TAM proposes that a person's actual use of technology is determined by his or her behavioural intention to use that technology (referred as BI in above figure)
The behaviour intention to use technology (BI), in turn, is driven by the attitude towards technology (referred to as ‘A’ in above figure),

‘A’ in turn is driven by the two major beliefs previously mentioned, i.e. PU and PEOU.

PEOU has a direct impact on PU.

Both PU and PEOU can be impacted by a number of external factors which researchers explore according to the scenarios and locations being studied. (Davis 1986).

The impact of cognitive instrument processes (e.g. job relevance, output quality, PEOU, etc.) and socials influence (subjective norms (SNs), images, etc.) have been studied by researchers to explain further PU and BI resulting in an extended model known as TAM2. This extended model was tested for both mandatory and voluntary adoption scenarios, and results supported the validity of the theory (Venkatesh & Davis, 2000).

### 2.4.2 Diffusion of Innovation (DOI) theory

DOI is another extensively used theory in information systems research to explain user adoption of new technologies (Urbaczewski, Wells, Sarker, & Koivisto, 2002).

Rogers (1995) defines diffusion of innovation as "the process by which an innovation is communicated through certain channels over time among the members of a social society". Figure 2-2. represents a general overview of the DOI.
The two key concepts in the DOI theory, according to Rogers (1995), are ‘Innovation’ and ‘Diffusion’:

- **Diffusion**: "The process by which an innovation is communicated through certain channels over time among the members of a social society." (Rogers, 1995, p. 5)
- **Innovation**: "An idea, practice or object that is perceived as new by an individual or another unit or adopter" (Rogers, 1995, p. 11).

According to the DOI theory, the likelihood of adopting an innovation depends on the following five attributes:

- Innovation's relative advantage ("the degree to which an innovation is seen as being superior to its predecessor")
- Complexity ("the degree to which an innovation is seen by the potential adopter as being relatively difficult to use and understand")
- Compatibility ("the degree to which an innovation is seen to be compatible with existing values, beliefs, experiences and needs of adopters")
- Trialability ("degree to which an idea can be experimented with on a limited basis")
- Observability ("degree to which the results of innovation are visible")

(Rogers, 1995)

Some researchers have argued that constructs used by TAM are a subset of perceived innovation characteristics and, hence, support merging of TAM with DOI (Agarwal & Prasad, 1997; Y.-H. Lee, Hsieh, & Hsu, 2011b).

The constructs in the present research were based on DOI theory factors and factors mentioned in TAM (described further in Table 3-1 Research model constructs mapping to DOI).

The DOI, with the above 5 factors represented with stages of adoption, is as illustrated in Figure 2-3.
Figure 2-3 Diffusion of innovation model with stages of adoption (Rogers, 2003)

In the ‘Knowledge’ stage, individuals come to know about the innovation, and while doing so, they have certain already established thinking patterns which impact their perceptions about the innovation. In the ‘Persuasion’ stage, individual seeks more information about the product. In this early stage, factors such as PU, ease of use, image, compatibility, etc. come into play. In the ‘Decision’ stage, individuals make a decision about adopting the service/ innovation or rejecting it. However, this decision may not be absolute and can change over time: Those who adopt a service early may choose to stop using it over time; and, similarly, those who do not adopt the service initially, may choose to start using the services later on. The timing of the present research coincided with the initial phases of e-government implementation and adoption. Further research at a later date would be required to investigate the later stages in the implementation and adoption process (see section 6.4 for further discussion). In the ‘Implementation’ stage, individuals implement the innovation and often require further information on how to do that. In the process, they re-enforce or
change their opinions about the product or service. In the ‘Confirmation’ phase, individuals finalise their decisions about the service.

2.4.3 Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) was derived from the Theory of Reasoned Action (TRA) in an effort to improve its predictive power by including perceived behavioural control (Ajzen, 1991). It has been used for predicting individuals’ behaviour towards technology use in a number of different settings. Figure 2-4 below illustrates the TPB.

![Diagram of TPB](image)

Figure 2-4 Theory of planned behaviour (Ajzen, 1991)

An interpretation of the above model is as follows:

- Individuals’ behaviour can be explained by their intention to perform the behaviour.
- The intention is driven by their ‘perceived behavioural control’, their ‘subjective norms’, and their ‘attitude’ toward the specific behaviour.’

- ‘Perceived behavioural control’, together with ‘behavioural intention’, can be used directly to predict behavioural achievement (Ajzen, 1991).

2.4.4 Unified Theory of Acceptance and Use of Technology (UTAUT)

UTAUT was created by Venkatesh et al. (2003). They came up with the model through an integrative study in which they merged eight existing IT / IS technology adoption models and theories which resulted in the formation of a single integrated acceptance model. The eight models used are:

- TRA (Theory of Reasoned Action)
- TAM (Technology Acceptance Model)
- MM (Motivational Model)
- TPB (Theory of Planned Behaviour)
- C-TAM-TPB (a model combining the theory of planned behaviour and the technology acceptance model)
- MPCU (Model of PC Utilisation)
- IDT (The Innovation Diffusion Theory)
- SCT (Social Cognitive Theory)

All of the above-mentioned models used in this integrative study focus on prediction and explanation of user behaviour, utilising relevant independent variables. UTAUT is illustrated in Figure 2-5.
The models developed for e-government adoption are generally based on one of the models listed above or by integrating them. This is quite rational since e-government is itself a technological artefact. These models generally extend the technology adoption models by including several supplementary constructs to cater for the multidisciplinary nature of the technology adoption scenarios and diverse applications. The present research also uses a similar approach.

E-government adoption models can analyse the factors contributing to e-government services adoption by citizens, which is the governing factor in determining the success of such services. A high percentage of studies examine e-government services adoption in developed countries and significantly less research is done in the context of developing countries (AlAwadhi & Morris, 2008)

Following is an overview of some e-government studies and models utilised therein:
2.5.1 A proposed model for the adoption of electronic tax-filing system by Wang

Y.-S. Wang (2003) proposed a research model based on TAM. A new factor was introduced in this study (perceived credibility). This factor dealt with the user’s intrinsic belief in the technology being studied (electronic tax-filing systems in this case) and examined the effect of Computer Self Efficacy on the Intention To Use of an electronic tax-filing system. Wang’s research model is illustrated in Figure 2-6.

Significant antecedents of the intention to use the electronic tax-filing system were found to be:

- Perceived Ease Of Use,
- Perceived Usefullness, and
- Perceived credibility.

CSE was found to be an important determinant for:

- PEOU,
- PU, and
- Perceived credibility of the electronic tax-filing system.

Figure 2-6 Wang’s model of intention to use e-tax filing system (2003)
2.5.2 A proposed model for the adoption of e-government by Carter & Belenger

Carter and Belanger (2005) proposed a model of e-government adoption by integrating constructs from the following models:

- TAM,
- DOI, and
- Trustworthiness models.

As an outcome of this integrative study, an insightful model of e-government adoption was produced. The study was conducted by surveying a broad diversity of citizens at a community event.

Carter and Belanger's research model is illustrated in Figure 2-7.

![Figure 2-7 Carter and Belanger's research model (2005)]
The results indicated that PEOU, compatibility and trustworthiness were significant contributing factors. Moreover, the results indicated that higher levels of perceived image, and higher levels of perceived relative advantage do not directly affect citizens’ intentions to use e-government services.

2.5.3 A model for the adoption of e-government in Jordan by Almahamid and McAdams

Almahamid and McAdams (2010) developed a model to analyse, examine and empirically evaluate the relationship between:

- PU,
- PEOU,
- Perceived information quality, and
- ITU e-government.

Almahamid and McAdams' research model is illustrated in Figure 2-8.

![Figure 2-8 Almahamid and McAdams' research model (2010)](image-url)
The focus of the study was Jordanian citizens and their use of services to gather information and conduct transactions. The results showed that PU, PEOU, and perceived information quality had a significant positive relationship with ITU e-government for gathering information. The study also found the impact of moderating factors, identifying that gender and level of education played a critical role in using e-government for relevant tasks.

2.5.4 A model for the adoption of e-government services in Pakistan

Ahmad et al. (2012) explored the factors that influenced the adoption of e-government services in Pakistan. The UTAUT model was used to investigate the factors. Ahmad et al.’s research model is illustrated in Figure 2-10. The results showed that the factors influencing the adoption of e-government services in Pakistan were related to:

- Performance expectancy,
- Effort expectancy,
- Social Influence, and
- Facilitating Conditions.

![Diagram of UTAUT model](image)

Figure 2-9 Ahmad, Jouni, et al.’s research model (2012)
From the above, it is evident that a number of factors were identified in various studies that determine the adoption of e-government services in a variety of contexts and countries around the world. However, there is no existing significant relevant study conducted in Libya, concerning citizens' adoption of e-government services.

Alshawi and Alalwany (2009) argued that there is an urgent need to address the lack of effective utilisation of e-government services from the citizen's point of view in developing countries.

2.6 Libyan Context

In order to establish a context for this research, the following is a broad overview of Libya and its situation with regards to e-government implementation and adoption.

2.6.1 Geography and Population:

Libya is a developing Arab country located in the north-central part of Africa (CIA, 2013).

Implications for this research: In line with Libya’s geo-economic positioning, similarities and differences between developing and developed countries in terms of technology adoption along with their implications for this research are discussed.
Libya is the fourth largest country by area in Africa and fifteenth among the countries of the world, and it has a population of 6.4 Million. The country occupies an area of almost 1.8 million square kilometres and a Mediterranean coastline of nearly 1,800 kilometres. The vast portion of the country covered by the Sahara Desert is hardly inhabited.

Implications for this research: Data is collected from areas where the population is more concentrated, and relevant services and infrastructure are available.

Islam is the dominant religion in Libya (BBC, 2015) upon which cultural norms are based.

Implications for this research: In this research, ‘beliefs’ is considered as one of the constructs in the research model to ascertain its role in technology adoption in the Libyan context. This may be related to religion in terms of general perception about the Internet, and the requirement for women to go out in order to utilise certain e-government services, etc.

The official language of Libya is Arabic, while English and Italian are also being used in business and trade (CIA, 2013).

Implications for this research: The questionnaire of this research was accordingly written in Arabic.

The overall level of education in Libya varies by gender. For example, the literacy rate in the country is 91%; however, the percentage of literacy in males is higher than females (CIA, 2013).
Implications for this research: Due to the difference in educational levels between males and females, this research investigated gender as a moderating factor. There can be differences in technology adoption due to different levels of education. Accordingly, gender has also been investigated as a moderating factor.

2.6.2 Economy:

Libya’s economy is almost entirely dependent on the nation’s energy sector (BBC, 2015; WorldBank, 2015b), which generates about 65% of GDP and 96% of government revenue.

Implications for this research: This indicates that most economic activity in the country is driven by the government, and if efficient e-government systems are implemented, it may result in higher productivity and financial gains for the government.

Libya has usually enjoyed one of the highest nominal per capita GDPS in Africa due to income generated from the sale of crude oil and natural gas and its relatively small population governed by the geographical nature and demographic factors in the country. Despite these factors, it can be noticed that there is little investment in national infrastructure, including ICT. Libyan sales of oil and natural gas have seen ups and downs in recent times due to a number of internal and external factors. Sales activity fell significantly during the Revolution of 2011. However, they rebounded in 2012 and 2013. In late 2013 and 2014 protests erupted in Libyan ports around the country and sales plunged again. In recent times, Libya has seen massive problems in terms of revenue generation from the sales due to falling oil prices. The Libyan economy is considered to be at high risk of failure due to this crisis in addition to Iraq.
Implications for this research: Due to economic instability, it can be expected that the use of sustainability and implementation of e-government services will decline. This research accordingly highlighted a need for future studies to identify and measure the impacts of these factors and any changes in services provision and adoption rates.

The state sector is large and growing, with the majority of the Libyan workforce being employed by the government in 2014.

Implications for this research: This means that those working with government are probably already exposed to e-government services through the use of salary payment systems and other services. This was confirmed by Abdelsadeq, Ismail, and Abdullah (2014) who found in their study that 84.1% of the population is aware of the e-government services. It also links to the previous discussion where it is explained that launching e-government services, as they impact most citizens in some capacity, can bring in high productivity gains.

The budget deficit in 2014 increased to 50% as compared to 4% in 2013. Some of the contributing factors are considered to be sharply decreased revenues, increased payments for state salaries, and subsidies on fuel and food. The situation, however, had improved to-date in 2015. Due to the prevailing political conditions in the country since 2014, funding for economic reform and infrastructure projects has ceased to be available.
2.6.3 Libyan Communications infrastructure and Internet usage

The following information from International Communication Union ITU (2014) is useful for interpreting the current situation of ICT infrastructure in Libya:

- Telephone line subscriptions generally are at the lower level on a global scale (11 per 100 inhabitants).

- In contrast to fixed telephone lines, however, mobile/ cellular phones have much higher adoption rates (161 per 100 inhabitants in 2014), which is higher than many other countries in the region. It is also important to note that 98% of the population is covered by mobile network signals. According to a UN report on E-government in African countries, Libya is mentioned as one of the leaders in cell phone diffusion (UN, 2010).

- The number of Internet users in Libya is low at the moment (17.67% of total population in 2014), which is lower than many other countries in the region.

See Figures 2-10, 2-11, and 2-12 for the comparative percentages of fixed phone subscriptions, mobile phone subscriptions and Internet usage in Arab countries.
Figure 2-10 Fixed Phone Subscriptions (per 100 people) in Arab Countries

Figure 2-11 Mobile Phone Subscriptions (per 100 people) in Arab Countries
From the above data, the following can be deduced:

- Those e-government services that rely on land-line telephones will not be readily accepted. However, those services which are exclusive to land-line are not expected to constitute a significant percentage as mobile phones can serve the same purpose and are abundantly used.

- A successful adoption example in the use of mobile phones gives confidence that if the right technology is offered, adoption is expected from Libyan citizens. However, a higher number of connections per person may also indicate that citizens try more than one product before settling on a
particular service. Potential factors contributing to this can be PU, Subjective Norms (SNs), Trust, Image, and FCs.

- Currently, a little less than a quarter of Libyans are Internet users. However, there are some interesting aspects to usage patterns. One aspect is that usage data presented by the World Bank (World Bank, 2015a) suggests clustering of usage percentages which differ between most of the developed countries and most of the developing countries. In 2000, only 2% of the population used the Internet, while in 2015 the percentage of individual using the Internet was 19%. Another aspect is that between 2006 and 2014, growth in Internet user numbers around the globe was 131%; whereas, in Libya, it was 314%. Therefore, from such a trend, a higher level of adoption of services offered through the Internet can be expected in Libya in the future, including the higher adoption of e-government. It is, therefore, timely to assess factors that influence such adoption in Libya. Research in the initial stages of implementation and adoption will potentially be able to inform system developers and help the government focus on suitable areas to enhance adoption.

The introduction of the Internet to the public in Libya is believed to have started in 1998-99 by the state-run Libyan Post and Telecommunications Information Technology Company (LIPTC) (Kifah, 2012), formerly the General Post and Telecommunications Company (GPTC). In 1999, the GPTC awarded the first Internet service provider (ISP) license to Libya Telecom and Technology (LTT), a subsidiary of the state-owned firm. There are at least seven other companies—including Modern World Communication, Alfalak, and Bait Shams, which have also been granted a
license to provide Internet services. However, LTT retains sole control over Libya’s international gateway to the Internet (Sanja, Sarah, & Mai, 2012).

As happens with most user technologies, initial prices were very high, and use was restricted to certain factions within society. However, as the price started coming down, adoption increased in line with basic economics principles. Wide availability was not prevalent until early 2000 (Kifah, 2012). In 2000, there were only 0.2 users per 100 inhabitants (WorldBank, 2015a). As such, growth seen in last 15 years is quite phenomenal. In the coming years following 2000, a large number of Internet cafes opened up, consequently offering low-cost Internet to both urban and rural users. The availability of cheap Internet services resulted in increased public awareness. The sharp rise and increase in the number of Internet users, as explained above, was credited to increased public awareness through the government, non-governmental agencies, schools and higher education institutions, IT corporate firms, and so on.

Furthermore, use of the Internet was boosted further as the state telecom operator reduced its charges, invested in a fiber-optic network backbone, and expanded ADSL, WiMAX and other wireless technologies throughout the country.

This expansion was coupled with strong awareness campaigns, such workshops and training courses. Hundreds of such interventions were made in schools, workplaces, higher education institutes and universities at no cost to citizens to enable members of the public to make an informed decision about the use of Internet and be fully aware of its potential use, as well becoming equipped with the required skills to be able to use it. Owing to these initiatives, during the last 15 years, ICT and the Internet saw considerable growth in Libya. However, there were some barriers to across-the-board
acceptance and adoption. Some of these barriers are still in place and need to be investigated. This research is expected to play an important role in that regard.

2.6.4 e-government

According to UN report on e-government in Africa, Libya is rated as the second best in North Africa in terms of readiness for e-government (Hafkin, 2009). This shows Libya’s high potential for successful implementation and rollout of e-government services if they are designed in accordance with the needs of the local population, following the best practices in the field.

In 2012, the National Transitional Council (NTC) made ambitious plans for an “eLibya” which was a national policy to accelerate commerce, e-learning, online government services, and the expansion of wireless and Internet connectivity. This was an initiative supporting four main objectives: open and transparent government; the provision of government services online; improved e-commerce capacities; and the improved use of technology in the educational system. The following were the expected benefits of the eLibya program, as identified by the Ministry of Communications and Informatics:

1. Improve, facilitate and strengthen the relationship between citizens and government institutions.
2. Increase transparency and reduce corruption.
3. Support decentralization in providing services.
4. Reduce bureaucracy and complexity of government procedures.
5. Maximise utilisation of government investments in information technology projects through shared systems and services, rather than separately implementing these in every government entity.
6. Focus on being able to provide eGovernmnet services regardless of the service provider.

7. Increase the efficiency and productivity of government employees.

The United Nations Department of Economic and Social Affairs (UNDESA) eGovernment survey in 2014 ranked Libya in the e-government development index as tenth in the African region and 121st globally. Libya had improved its rank by 70 places since 2012, which was the biggest jump in the region. Table 2-1 shows the top 20 countries in the African region based on eGovernment Development.

Table 2-1 eGovernment development index in Africa

<table>
<thead>
<tr>
<th>Country</th>
<th>EGDI</th>
<th>2014 Rank</th>
<th>2012 Rank</th>
<th>Change in Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tunisia</td>
<td>0.5390</td>
<td>75</td>
<td>103</td>
<td>28</td>
</tr>
<tr>
<td>Mauritius</td>
<td>0.5338</td>
<td>76</td>
<td>93</td>
<td>17</td>
</tr>
<tr>
<td>Egypt</td>
<td>0.5129</td>
<td>80</td>
<td>107</td>
<td>27</td>
</tr>
<tr>
<td>Seychelles</td>
<td>0.5113</td>
<td>81</td>
<td>84</td>
<td>3</td>
</tr>
<tr>
<td>Morocco</td>
<td>0.5060</td>
<td>82</td>
<td>120</td>
<td>38</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.4869</td>
<td>93</td>
<td>101</td>
<td>8</td>
</tr>
<tr>
<td>Botswana</td>
<td>0.4198</td>
<td>112</td>
<td>121</td>
<td>9</td>
</tr>
<tr>
<td>Namibia</td>
<td>0.3880</td>
<td>117</td>
<td>123</td>
<td>6</td>
</tr>
<tr>
<td>Kenya</td>
<td>0.3805</td>
<td>119</td>
<td>119</td>
<td>–</td>
</tr>
<tr>
<td>Libya</td>
<td>0.3753</td>
<td>121</td>
<td>191</td>
<td>70</td>
</tr>
<tr>
<td>Ghana</td>
<td>0.3735</td>
<td>123</td>
<td>145</td>
<td>22</td>
</tr>
<tr>
<td>Rwanda</td>
<td>0.3589</td>
<td>125</td>
<td>140</td>
<td>15</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>0.3585</td>
<td>126</td>
<td>133</td>
<td>7</td>
</tr>
<tr>
<td>Cape Verde</td>
<td>0.3551</td>
<td>127</td>
<td>118</td>
<td>9</td>
</tr>
<tr>
<td>Gabon</td>
<td>0.3294</td>
<td>131</td>
<td>129</td>
<td>2</td>
</tr>
<tr>
<td>Algeria</td>
<td>0.3106</td>
<td>136</td>
<td>132</td>
<td>4</td>
</tr>
<tr>
<td>Swaziland</td>
<td>0.3056</td>
<td>138</td>
<td>144</td>
<td>6</td>
</tr>
<tr>
<td>Angola</td>
<td>0.2970</td>
<td>140</td>
<td>142</td>
<td>2</td>
</tr>
<tr>
<td>Nigeria</td>
<td>0.2929</td>
<td>141</td>
<td>162</td>
<td>21</td>
</tr>
<tr>
<td>Cameroon</td>
<td>0.2782</td>
<td>144</td>
<td>147</td>
<td>3</td>
</tr>
</tbody>
</table>

The patchy nature of e-government implementation at the time of this research in Libya made it difficult to make a complete list of available e-government services.
Following is a summary of available e-government services identified through the present research:

Table 2-2 Some e-government services in Libya

<table>
<thead>
<tr>
<th>Description of available services</th>
<th>Service provider</th>
<th>Service web site</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Form of social research for the purpose of obtaining Social Assistant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-Form of Displaced and war affected people</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3- Form to collect data about disabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The nomination of students to undertake study abroad in the field</td>
<td>Ministry of transport</td>
<td><a href="http://mot.gov.ly">http://mot.gov.ly</a></td>
</tr>
<tr>
<td>of maritime transport.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2- Booking an appointment for a passport application.</td>
<td>Foreigners Affairs/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ministry of Interior</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Department</td>
<td>Website</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>Registration and renewal forms of foreign and national companies.</td>
<td>Ministry of Planning</td>
<td><a href="http://www.planning.gov.ly">http://www.planning.gov.ly</a></td>
</tr>
<tr>
<td>The Open University: Offers distance education courses</td>
<td>Ministry of Education</td>
<td><a href="http://www.libopenuniv-edu.org">http://www.libopenuniv-edu.org</a></td>
</tr>
<tr>
<td>Intelligence sharing systems; Inter-government military cooperation and training systems.</td>
<td>Ministry of Defense</td>
<td><a href="http://www.defense.gov.ly">http://www.defense.gov.ly</a></td>
</tr>
</tbody>
</table>
An important trend seen in e-government services adoption in Libya is a relationship between need for a particular service (i.e. usefulness) and higher adoption rates. One example is that of the electronic voter registration system; which, not only demonstrates the success on the part of the developers who in just six months developed a state-of-art one of its kind system, but which was also was successful in terms of users massively adopting it and using it for the 2014 elections (Chao, 2014). One potential reason for this high uptake was reliance on a form of technology which was already well-established and well-accepted (i.e. mobiles). Therefore, it can be concluded that uptake of mobile phone based e-government services presently has a high probability of success compared to uptake of applications and services relying on other forms of technology. The present research is expected to increase understanding of how to enhance uptake rates of e-government services on mobile phones as well as on other forms of technology.

From examining the case of implementing the voter registration e-government service, the TOI factor was given special consideration. After much discussion, a fee of 2 cents (US) was introduced to avoid spam emails flooding the networks. Analysis revealed that the fee was not a prohibiting factor. From this, two things can be observed. First, there are concerns about trust of the Internet. Second, there are methods available to counter those concerns successfully. Another key observation from this case is that some people (a small percentage compared to the overall percentage who adopted the new service) still used face to face methods. Other factors such as SNs, Image, Belief, CSE, TOI and so on, were also playing their role.

Analysts of the e-voting system in Libya claim that the project led to huge cost savings for government and enabled accuracy and transparency. Furthermore, the readily
available information from the service could be used later for a variety of planning and monitoring tasks. Similar successful outcomes are expected from other e-government services as well. Based on the positive outcomes from this experience, it can be hypothesised that public opinion may shift towards even more acceptance of further e-government services. This could be because of perceived enhanced image, PU, PEOU (based on experience), prior experience with technology and other factors. The case of e-voting also demonstrates the successful use of multiple technologies to facilitate uptake, which could also be a good strategy for future services rollouts.

From the e-voting experience, there is also the finding that a small percentage of society will not adopt e-government or other similar services despite their benefits. Chao (2014) explains: “The reality is that technology can make it easier for those who want to register, but it cannot change the minds of those who don’t.” Unfortunately, one issue that needs to be considered is that the future of e-government services in Libya hinges on the political situation in the country, and it is therefore probable that achieving a stable government is a necessary step towards establishing ongoing reliable e-government services, and in turn positively influencing rates of implementation and adoption. Forecasting political outcomes is beyond the scope of the present research, but the impact of the uncertain situation in Libya cannot be overlooked.

2.7 Summary

This chapter reviews some key statistics about Libya and how they impact on the present research in terms of the study’s population sample selection, consideration towards religious and cultural beliefs, technological background, educational levels, gender and other aspects. It can also be seen that the use of the Internet is growing at
a very rapid pace and accordingly is encouraging for the viability of e-government services. As evident from this literature review and statistics; e-government in Libya, although available for some Government to Citizens (G2C) transactions, is still in the early stages and, therefore, the present research is expected to be able to inform the future directions of later stages of e-government development.

In Libya, the success of rollout and implementation initiatives is dependent upon correct decision-making in terms of:

- What services to launch?
- What factors to consider during design?
- Which platforms to use for applications and apps?
- Which population group to focus more?
- Which geographic areas in Libya to target first?
- What resistance is expected to be faced and what would be the right response?
- What to focus on in marketing campaigns (gender, age, education, etc.)?
- What infrastructural investments to make?

This research will provide foundation information for some aspects of this decision-making especially in understanding citizens’ adoption decisions, and it will be the first study of its kind conducted in Libya.
Chapter 3 RESEARCH MODEL AND HYPOTHESES

3.1 Introduction

The previous chapter presented the literature review and the theoretical background on e-government adoption.

Farrugia, Petrisor, Farrokhyar, and Bhandari (2010) highlight the importance of compatibility between the research question and objectives and the hypotheses by considering them a crucial phase in the research process. They propose that their correct selection and development determine the most appropriate research design and data collection methodologies. Accordingly, in this chapter, the conceptual model, and the research hypotheses are presented. Moreover, the key factors considered in the proposed model and rationale behind their inclusion are explained. In addition, relationships between various factors according to the previous literature, the middle-eastern context and other relevant factors are presented in order to explicate the formation of the proposed research model.

3.2 The research Model and Hypotheses

The main objective of this research is to identify, analyse and explain factors that affect and citizens’ adoption of e-government services in Libya. In achieving this objective, a model is provided to explain the relationships between the factors likely to play a role in citizens’ acceptance of e-government services. The TAM has been used as a base-model and extended by adding some constructs from DOI theory and the literature on the trust of the worldwide web.
3.2.1 **Rationale for using TAM and DOI as an integrated model:**

The TAM and DOI as an integrated model are used for the following reasons:

- Many studies have established the applicability of the TAM model in technology adoption studies. King and He (2006) analysed 88 different TAM studies and identified TAM as a ‘valid’ and ‘robust’ model.

- Y.-H. Lee, Hsieh, and Hsu (2011a) explain that many researchers recommend integrating TAM with other acceptance theories to improve identification and explanation of factors involved. They also note the commonalities between TAM and IDT/DOI in their constructs and argue that this integration can provide stronger results as compared to each of these theories separately or individually. Note that each of the 5 qualities of innovation spread from the DOI theory is used in the present research as either a direct factor or integrated with another factor.

The decision to use the TAM integrated with DOI in the present research is based on the technology acceptance research studies previously discussed which analysed a wide range of situations.

The mapping between DOI constructs and factors considered in the modified TAM model in this research are presented in section 3.3.

3.2.2 **Factors:**

This research utilises a number of factors deemed as important and relevant to a number of other studies in order to understand the citizens’ decisions for adopting e-government services; in this case, in Libya. Reference to these studies and explanation about the constructs included in the research model are explained in the sections that
follow. The research model formed by utilising these constructs is a modification to the TAM model presented in Chapter 2, Section 2.4.1. Constructs from other relevant models have also been included as supported by studies in other Middle-Eastern countries. Section 3.4.3 present findings from previous research, which support the argument that Middle-Eastern countries have many commonalities in the way e-government is being implemented and adopted. Constructs identified as significant in studies based in Middle-Eastern countries accordingly need due consideration while researching the Libyan context.

As shown in research model below, the factors included in this research include:

- Intention To Use e-government services.
- Perceived Ease Of Use,
- Perceived Usefulness,
- Computer Self Efficacy,
- Facilitating Conditions ,
- Subjective Norms,
- Image,
- Beliefs, and
- Trust Of Internet.

For the purpose of this research, ITU, PU and PEOU are dependent variables whereas all the other factors (external stimuli) are independent variables. Citizens’ acceptance of e-government services is measured by citizen intention to use e-government services within the research model (Figure 3-1). The proposed model has 13 associated hypotheses based on the interaction between factors, their relationships and contribution toward intention to use e-government services in Libya.
The research model for this research suggests that various factors and attitudes influence the likelihood that citizens will intend to use e-government services, and in additions, there are moderating effects of the demographic variables of gender, education, age, and Internet experience. The relationships between the constructs are the basis for the hypotheses, which are illustrated below in Figure 3-1:

![Proposed Research Model](image)

Figure 3-1 Proposed research model

According to above model, Intention To Use e-government services is determined by Perceived Ease Of Use and Perceived Usefulness. Perceived Ease Of Use also has a relationship with Perceived Usefulness. Both Perceived Usefulness and Perceived Ease Of Use are affected by external factors and hence impact adoption of e-government based on those external factors (aAlharbi & Drew, 2014).

Perceived Ease Of Use is determined by:

- Computer Self Efficacy
- Facilitating Conditions

Perceived Usefulness is determined by:

- Subjective Norms,
- Image
- Beliefs
- Trust Of Internet

Demographic factors also influence the above relationships.

The above mentioned factors and the hypotheses regarding their relationships are explained below.

3.2.3 The rationale behind selection of factors in the proposed model:

Following is an explanation of the selection of factors included in the model proposed in the present research.

In addition, the following important contextual of Arab/ Libyan society need to be considered with regards to their specific preferences for technology adoption.

- Arab countries face many common barriers to full implementation of e-government systems (Salem, 2006). Therefore, planners need to have knowledge of the influential factors and barriers identified by other studies in similar contexts and utilise such knowledge to optimise adoption levels. Therefore, this research has initially identified important factors from previous studies in contexts considered to have much in common with the Libyan context. This is further explained when reviewing individual factors.
- After establishing the point that Middle-Eastern countries have similar environments in terms of technology adoption, Al-Sukkar (2005) presented a number of factors contributing to the late adoption of technology in developing countries. All the factors presented in that study can be categorised under Trust Of Internet, Facilitating Conditions, Subjective Norms, Beliefs and lack of prior Internet experience (‘Internet Experience’ in the present study). In the light of this finding, it makes perfect sense for us to build further on outcomes of their research and study these factors in Libyan context.

- Arabs enjoy high affinity towards their culture and beliefs which govern the way they judge, analyse and adopt new systems and technologies, as explained by (Al-Shehry, Rogerson, Fairweather, & Prior, 2006). Accordingly, consistent with this finding, Beliefs is included as one of the contributing factors for determining Perceived Usefulness in this research.

- Adding variables to a base TAM model as ‘external factors’ and studying their relationships is an approach adopted by many researchers (Amini, Ahmadinejad, & Azizi, 2011; Herbjørn, Per, & Helge, 2005; Pousttchi & Wiedemann, 2007; Tsai, 2012). Chandio (2011) highlights the fact that the core TAM model cannot explain user adoption in emerging contexts and developing economies. The literature review suggests that researchers have frequently used factors identified by previous studies and contextualised them according to the situation at hand in order to analyse the adoption scenario being studied (Maarop & Win, 2011). Accordingly, this research used this approach and added factors found to be significant through previous research.
- The literature identified a high-level of ‘uncertainty avoidance’ in Arab cultures and its scrutiny before adoption (Al-Gahtani, Hubona, & Wang, 2007). SNs and TOI have been included in proposed research model to investigate this aspect.

- Other factors, coming directly from the TAM are deemed as suitable for inclusion in a study in line with previous studies which confirm the high validity and reliability in Arab cultures (aAlharbi & Drew, 2014; Al-Gahtani, 2001).

- Qualitative meta-analysis of previous researchers also established usability of TAM but suggested the inclusion of human and social process (Legris, Ingham, & Collerette, 2003). Accordingly, SNs, Beliefs, Image and demographic moderators are included in the research model.

- Yoh, Damhorst, Sapp, and Laczniaik (2003) identified psychological factors (i.e. belief/ attitude) and social factors i.e. socials support/ acceptance (FCs/ SNs) as major variables. They also noted that prior experience with the Internet (a moderating demographic factor in this research) has a strong influence on technology adoption.

- Yousafzai, Foxall, and Pallister (2007) use a metaphor that the factors which influence PU and PEOU are the levers which can be pulled to enhance adoption of e-government services. From a meta-analysis of a large number of TAM studies, they came up with 74 potential factors that could affect either PU or PEOU. They re-classified those factors as follows: 1) Factors related to organisational scale, 2) Factors related to national/ general large scale, and 3) Moderating variables. The factors included in the research model of the present
research are well represented by the variables mentioned in their study, including all moderating variables).

- Through the literature review, it is identified that adoption parameters considered in developed countries are different in some aspects from parameters considered in studies conducted in developing countries. In his technology adoption research, Al-Sukkar (2005) also pointed out the fact that for Jordan, a Middle-Eastern country, factors need to be made relevant as the environment was significantly different to western countries from where the TAM model originated. In another study by Du Plooy and Roode (1993) pointed out differences between developing and developed countries in terms of application and management of Information Systems (ISs). These differences stemmed from which stage of implementation/stabilisation the particular e-government services were at the time of the study. Therefore, for studies in countries where e-government systems are not fully established or adopted by the vast majority, ‘perceived value’ is considered for factors such as output quality, satisfaction, and so on. This point is supported by previous research such as that by S. Kumar and Sikri (2013) who consider PEOU and PU to be determinants for Perceived Quality. A similar approach has also be used in other studies, such as that by Ho Cheong and Park (2005) in which ‘perceived’ quality and its related aspects are considered. The Business Dictionary describes service quality as “an assessment of how well a delivered service conforms to the client's expectations”. In many studies, service quality is included in calculations for PEOU, FCs, Image, Belief and other factors (as elaborated in the section describing the selection of questions for survey based constructs used by previous researchers). Middle-Eastern citizens are in
general ‘late-adopters’ in terms of technology acceptance, and Libya is no different in this regard. Therefore, in this research, in line with the Libyan context, perceived value for these factors is measured.

The following sub-sections present a more detailed discussion of all the factors selected for this research.

3.2.3.1 Intention to Use (ITU)

ITU is a measure of the likelihood a person will engage in a given technological application (Ajzen & Fishbein, 1980). Some researchers have argued in their discussions of e-government services in developed countries that Willingness/ITU are uni-dimensional measures for adoption, and other factors need to be included e.g. frequency of use, time spent using services, and so on (V. Kumar et al., 2007).

However, it is to be noted the e-government system in Libya is in its initial stages of implementation and adoption. TAM can be used to make forward estimates of technology adoption levels prior to actual adoption (Shih, 2004). Hence, the present research will determine the intention to adopt e-government services within a given context rather than work from data on actual usage of past and current e-government applications.

A similar approach was taken by Phuangthong and Malisawan (2005), who have measured factors affecting the user adoption by examining attitude/intentions towards use rather than the actual use; and their justification was that the technology they were investigating was in the initial development stages at that time – which is similar to the Libyan context for this research.
The literature review suggests that in order to ‘implement’ a successful information system, it is important to determine the factors that influence the ITU of that system. Behaviour intention has been theorised as the key dependent factor in explaining the acceptance of information technology in most of the technology acceptance models. Turner, Kitchenham, Brereton, Charters, and Budgen (2010) studied 79 empirical technology adoption studies and found that ‘intentions’ to adopt or to not adopt correlate highly with ‘actual usage’ levels.

In accordance with the findings mentioned above, the scope of this research is aimed at identifying influences on adoption rates during the implementation and consolidation phases by studying intention to use. Once e-government becomes consolidated and well-established, other factors could be brought in for future research.

3.2.3.2 Perceived Ease of Use (PEOU)

Davis, Bagozzi, and Warshaw (1989) defined PEOU as “the degree to which the user expects the target system to be free of effort”. According to Gefen, Straub, and Boudreau (2000), the perception of how much a system is seen as easy or difficult to use affects the adoption rate of the system. PEOU was found to be able to accurately predict the ITU of e-government services in numerous adoption studies (Carter & Belanger, 2004; Horst et al., 2007; Iyer & Srivastava, 2015; V. Kumar et al., 2007). According to Davis (1989), PEOU is a secondary determinant of ITU after PU. Y.-S. Wang (2003), in his study on technology adoption of the e-filing system, identified that PEOU was a more important factor in predicting people’s ITU when compared with PU.
It is also to be noted that some researchers have found inconsistencies in these PU-ITU and PEOU-ITU relationships; and account for these differences as being due to moderating factors such as prior experience, system complexity (i.e. whether or not users understand the system well enough and can use it well enough), gender, education (in relation to certain professions such as physicians) and so on (Chau & Hu, 2002; Igbaria, Zinatelli, Cragg, & Cavaye, 1997; Subramanian, 1994; Sun & Zhang, 2006; Venkatesh & Morris, 2000).

Thus, the following hypothesis is proposed:

**Hypothesis 1: Perceived ease of use \( \rightarrow \) Intention to use e-government services**

Hypothesis 1 is that: PEOU of e-government services will positively influence the ITU these services in Libya.

**3.2.3.3 Perceived Usefulness (PU)**

PU refers to “the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis et al., 1989).

Researchers consider it one of the most important factors in determining technology adoption and have accordingly provided it with due consideration and inclusion (Sun & Zhang, 2006). In this research, PU is also included in the model, based on the fact that almost all of the studies reviewed have found a positive relationship between PU and adoption rates (Sun & Zhang, 2006).

The perception of the usefulness of a system increases the usage of that system (Carter, Weerakkody, Phillips, & Dwivedi, 2016). Previous studies have also examined the

PU is a major determinant of attitude affecting ITU in the TAM model. Using e-government services can lead to improved convenience and reduced costs in terms of time, money and effort to access services. However, these numerous potential benefits of adopting e-government services will not be fully realised without a satisfactory level of adoption of e-government services by the citizens.

The PU of the e-government service has been found in much research to play an important role in users’ ITU that service (Iyer & Srivastava, 2015). According to Davis (1989), PU is shown as a primary determinant to use a certain technology. Carter and Belanger (2004) also found PU to be a significant construct in the e-government adoption. Gilbert et al. (2004) found that citizens’ willingness to use e-government services increases if they perceive that the electronic delivery of public services is saving them money and time.

It is noted in the literature that if a technological application is relatively easy to use, it is generally perceived to be more useful for users and in turn ITU is found to be at a higher rate (Davis et al., 1989).

Therefore, the following hypothesis is set for this research:

**Hypothesis 2: Perceived Usefulness → Intention To Use**

Hypothesis 2 is that: PU of e-government services will positively influence the ITU these services in Libya.
Many researchers have examined the relationship between PU and PEOU. Most of the research findings, which are described in the literature review, validate this relationship. For instance, Dalle and Rg (2011) studied the relationships between PU, PEOU and ITU with regards to educational technology acceptance and found PEOU to be a contributing factor toward PU. Similarly, in a study of banking technology adoption, Amin (2007) found similar results; and in a study of the health care sector, the relationship was found to be significant (Ning, Jiang, & Kim, 2014). Another Middle-Eastern study examined the adoption of geoinformatics technology and identified that the impact of PEOU on PU was significant (Faruque, Naieni, Ardalan, Ahmadnezhad, & Mohammadinia, 2014). A study in Malaysia exploring the use of services offered by IEEE validated the relationship as well. In a study of online buying technology adoption, E. S.-T. Wang and Chou (2014) found their hypothesis of a positive relationship between PEOU and PU was supported. With regards to e-government services adoption, Alhujran (2009) provided a comprehensive comparative analysis of relevant factors in numerous countries including Middle-Eastern environments. In his PhD thesis entitled “Determinants of e-government services adoption in developing countries: a field survey and a case study”, he came to the same conclusion that there is a positive relationship between PU and PEOU.

Therefore, the following hypothesis is set for this research:

**Hypothesis 3: Perceived Ease Of Use (PEOU) → Perceived Usefulness (PU)**

Hypothesis 3 is that: Perceived Ease Of Use of e-government services will positively influence the Perceived Usefulness of these services in Libya.
### 3.2.3.4 Computer Self-Efficacy (CSE)

Compeau and Higgins (1995, p. 191) defined CSE as “an individual’s perceptions of his or her ability to use computers in the accomplishment of a task”. CSE has been found to be a significant factor affecting the adoption of e-government services (Iyer & Srivastava, 2015; Wangpipatwong, Chutimaskul, & Papasratorn, 2005). Evidently, the study of Kabir, Saidin, and Ahmi (2017) has shown that CSE is a factor that influences the behavioural intention to use e-collection system in Nigerian federal hospitals.

Several studies in numerous other fields have also yielded similar findings of a strong relationship between CSE and PEOU (C. Anderson, Al-Gahtani, & Hubona, 2012; Guriting & Oly Ndubisi, 2006; Y.-S. Wang, 2003).

The literature of CSE in Middle-Eastern and developing countries does not yield any different results from those above. In a Middle-Eastern banking technology acceptance study, PU and CSE were found to be the most influential factors (Amini et al., 2011). In another study of TAM antecedents in Saudi Arabia, which included a comparison with western countries, CSE was found to have a positive effect on PEOU (C. Anderson, Al-Gahtani, & Hubona, 2008).

Accordingly, this relationship is included in the research model.

**Hypothesis 4: Computer Self-Efficacy (CSE) → Perceived Ease Of Use (PEOU)**

Hypothesis 4 is that: CSE has a positive effect on the PEOU of e-government services in Libya.

### 3.2.3.5 Facilitating Conditions (FCs)
Facilitating conditions are defined as the extent to which an individual perceives that the organisational and technical infrastructure required to use the intended system exists (Venkatesh et al., 2003). According to another definition, FCs are aspects in the environment that make the accomplishment of an act much easier (Thompson, Higgins, & Howell, 1991).

In developing countries, like Libya, it is believed that resources are very limited; therefore, FCs are likely to affect adoption rates. Supporting people with training and assisting them on how to use new technology is an example of FCs that can influence the acceptance of this technology. The effect of this variable on acceptance of new technology was tested in a number of studies and found to be a significant factor (Ghalandari, 2012; Sargent, Hyland, & Sawang, 2012).

This factor and the impact has been studied with various factor names and sub-factors. Maarop and Win (2011) define a number of sub-factors of FCs, including technology support, availability of instructions, organisational support, training, accessibility, location, completeness of equipment, network stability, program awareness and the amount of associated workload. However, as Maarop and Win’s research scope was restricted to hospitals; some of these factors may or may not be relevant in other settings.

One of the prominent FCs mentioned above as a sub-factor in Maarop and Win’s (2011) research of factors contributing to technology adoption, is ‘Accessibility’. Many researchers have found that Accessibility impacts contentment with and adoption of technology by citizens and is one of the important factors in user-centred e-government services (Alomari, Woods, & Sandhu, 2010; Bertot & Jaeger, 2006; V. Kumar et al., 2007). Other researchers have also found a number of other facilitating
conditions such as proper training, accessibility and expertise (P. J. Hu, Chau, Sheng, & Tam, 1999).

A study of technology adoption to perform transactions in Iran identified that availability and access to computers is an important contributing factor. Findings were that when access to computing systems is readily available, the adoption rate is higher; and when not readily available then the rate is lower (Amini et al., 2011).

In one of the studies at the Dubai School of Government, it was found that most Arab government employees lack the relevant skills required for e-government systems adoption at the national level (Salem, 2006). That study further identified that proper ICT infrastructure is a pre-requisite for effective e-government implementation; however, this is lacking in most cases, except for a few departments. In this study availability and access to resources required to use e-government services, were tested. Moreover, technology support is also been tested in this study.

Thereby, the following hypothesis is proposed:

**Hypothesis 5: Facilitating conditions (FCs) → Perceived Ease Of Use (PEOU):**

Hypothesis 5 is that: Facilitating Conditions (FCs) have a positive effect on the PEOU of e-government services in Libya.

**3.2.3.6 Subjective Norms (SNs)**

The variable of subjective norms (SNs) refers to a person’s perception of the social pressure to either participate or not participate in a particular behaviour (Fishbein & Ajzen, 1975). According to another definition, it is how a person perceives the opinion
of most people important to him about whether or not he or she should engage in a particular behaviour under discussion (M. Y. Wu, Chou, Weng, & Huang, 2008).

Potential users’ or relevant individuals’ acceptance of innovations and technology are mainly dependent on and formed by the norms they have become aware of from a variety of communication channels (Rogers, 2010).

Although SNs were not included in the first TAM, they were included in TAM2 to explain an aspect of users’ adoption behaviour better. Moreover, regarding the theory of reasoned action and the theory of planned behaviour, they both hypothesise that subjective norms can be an important determinant of changed behaviours, and therefore, these would apply to technology acceptance and usage. M. Y. Yi, Jackson, Park, and Probst (2006), and Venkatesh and Davis (2000) theorised that SNs are an important antecedent of PU. T. Teo and Zhou (2014) used the TAM in a study on the technology acceptance among university students and found subjective norms to be a significant predictor of perceived usefulness and perceived ease of use.

Some research suggests that the reason behind the effectiveness of SNs is a reduction of perceived risk associated with adoption (T. S. Teo & Pok, 2003). According to Venkatesh and Davis (2000), in earlier stages of adoption, the factor of SNs seems to be more significant than in later stages; that is because when people have little or no experience with a particular technology, they tend to comply with others’ views. For the present research, because e-government in Libya is in its earlier stages, it is expected that SNs will have a significant influence on citizens.

According to a study from Hsu and Lu (2004), SNs plays an important role in governing acceptance of technology by users. Similar findings were put forth in another study (Malhotra & Galletta, 2005) on the effects of SNs, which found that it
plays a significant part in shaping the user behaviour for technology/innovation acceptance. One of the reasons why it becomes a considerable factor for new adopters is the uncertainty that any new idea, technology or innovation brings along, leaving most people feeling uncomfortable until they get formal or informal acceptance from the networks they come into contact with. Accordingly, SNs is included in this research and tested in the following hypothesis:

**Hypothesis 6: Subjective Norms (SNs) \(\rightarrow\) Perceived Usefulness (PU):**

Hypothesis 6 is that: Subjective Norms supporting the use of e-government services in Libya will have a positive effect on the Perceived Usefulness.

### 3.2.3.7 Image

Image is defined as the extent to which using an innovation is perceived to uplift one's status in his or her social system (Moore & Benbasat, 1991). In DOI theory, Image is one of the factors contributing towards ‘relative advantage’ (Saleh, 2013) and for some people, it is the most important motive. Saleh (2013) argues that in many cases, technology may be adopted in order to enhance one’s social image rather than for satisfying any actual need.

Abu Nadi (2010) has linked the use of personal connections in acquiring and adopting e-government services to the factor of perceived ‘Image’ in Saudi Arabia. The present study accordingly includes ‘Image’ as one of the factors to investigate in Libya.
Users who believe or perceive prestige in using certain systems have higher levels of intention to use that particular system as compared to those who do not value it that way (Carter & Belanger, 2005). As such, a positive image has a positive effect on the PU.

In a previous study (Tapscott, 1996), the variable of Image was found to have a significant relationship with ITU. However, the effect of Image on PU was found not significant in a study conducting in Greece regarding the adoption of e-government services by teachers (Y. Lee, Kozar, & Larsen, 2003).

Fink (2005) pointed about that for many people, personal relationships and face-to-face contacts in making transactions are valued. In such instances, the Image of e-government transactions would be low. A low Image would result in lower adoption for e-government services.

According to Fernandes and Awamleh (2006), Image has been found as a significant determinant of technology adoption study carried out in UAE, a Middle-Eastern country. In another study conducted on e-government adoption in Saudi Arabia, Image was found to be a significant influencer (A. Alzahrani, 2011). Venkatesh and Davis (2000) in their study on the extension of TAM identified Image as a significant factor to influence PU.

The above findings are in contrast to finding by Carter and Belanger (2005) who found in their study of e-government adoption in the US that Image is not a significant factor which they attributed to the use of the Internet having already become widespread, and that the e-government technology applications they were analysing for adoption was no longer perceived as an image enhancer.
Due to there being much research supporting a factor of Image, it is included in the present study of e-government adoption in Libyan context. Notably, there are differences in the findings, however, as the majority of studies have found a positive relationship, this will be used to inform the present study design. The following hypothesis is proposed:

**Hypothesis 7: Image → Perceived Usefulness (PU).**

Hypothesis 7 is that: Image has a positive effect on the Perceived Usefulness of e-government services in Libya.

### 3.2.3.8 Beliefs

Alomari et al. (2010) claim that a negative attitude of citizens towards using e-government is one of the main factors behind lower adoption rates for e-government systems. They also point out that in other studies of technology adoption, religious beliefs have been found to have an impact. Some negative attitudes concern the impersonal aspect of interacting with machines and the potential for job losses by automating services.

Similar observations about religious beliefs have been made by other researchers (D. Evans & Yen, 2005). The gist of the religious issues is that the Internet has a great potential for evil and should be avoided.

In Arab society, culture and beliefs play a key role in terms of decision making. Hill, Loch, Straub, and El-Sheshai (2008) criticised studies that did not consider these aspects; as did Abu Nadi (2010) who pointed out that many studies have paid limited attentions to cultural beliefs. In getting the benefits from their research on the importance of inclusion of cultures and beliefs, this factor is included in this research.
Hofheinz (2005) also identified that religious beliefs play an important role in determining how the Internet is used for various transactions in Arab countries. A similar finding was put forth by Al-Sukkar (2005) who noted that culture and religion plays an important role in business and social behaviour in Middle Eastern countries.

Therefore, the following hypothesis is tested in this research.

**Hypothesis 8: Beliefs → Perceived Usefulness (PU)**

Hypothesis 8 is that: Beliefs have a negative effect on the Perceived Usefulness of e-government services in Libya.

**3.2.3.9 Trust of Internet (TOI)**

Researchers have found that ‘Trust in medium’ (i.e. in this case, the Internet) plays a key role in technology acceptance (Thatcher & Foster, 2003).

In describing a Middle-Eastern context, Alomari et al. (2010) explain that the predominant method of government transaction is paper-based and many citizens have the inclination to stay with the current method, which in turn is a cause of negative attitudes towards adopting e-government systems. It has also been noted that relevant e-government alternatives are not communicated well to stakeholders and are not backed up by right legislative frameworks; thus, causing lower adoption rates in Arab countries (Salem, 2006).

AlAwadhi and Morris (2009) while studying e-government implementation in Kuwait, a Middle-Eastern country, identified that people have more inclination to remain attached to the existing paper-based systems in case ‘something goes wrong’ – with Internet security and privacy issues being a strong concern.
In any online services, all transactions between the user and the supplier are passing through a third party, namely the Internet. Previous research finds a lack of trust in the use of the Internet for transactions due to privacy and security concerns (Scott, Acton, & Hughes, 2004). Deakins and Dillon (2002) also found that trust is affected by concerns about privacy and security. Such a concern stems from the perception that personal information may end up in the wrong hands, such as with hackers or fraudsters, resulting in misuse (J. W. Lee, 2003; Scott et al., 2004).

Despite the many benefits offered by many online services, the use of these services varies from one citizen to another, depending on the extent of trust in the Internet. A low level of trust in the Internet is an obstacle that prevents citizens from using online services, whereas a high level of trust of the Internet may be an important factor that gives citizens the confidence to engage in online services. This importance of ‘trust’ in e-government systems adoption was also highlighted elsewhere (Carter et al., 2016; Tolbert & Mossberger, 2006). Prior research has also considered trust as a key determinant in interactions (Warkentin, Gefen, Pavlou, & Rose, 2002).

The sensitivity of citizens towards storage of personal data has negative impacts on using online services. Some people are fearful of providing their personal information online, and they believe that this information might be exploited, and their privacy might be compromised. This fear makes them reluctant to engage in such an action as using e-government services because the information that users share about themselves online could make it possible for a thief to gather enough information to steal their identity. Citizens want to be sure that their information is safe when they are using e-services.
According to REUTERS (2014), antivirus software maker Symantec Corp announced that it discovered an advanced malicious software application that has been used to spy on governments, individuals, private companies and research institutes in 10 countries since 2008. If users come across such incidents and hear about such insecurity, their trust in the Internet medium and e-government gets shaken and levels of intention to adopt declines accordingly.

This highlights the importance of considering appropriate measures and safeguards to protect information perceived as important and private by users. If these clear safeguards and security/privacy protocols are missing, e-government initiatives may not be able to succeed.

As much e-government is about transactions using government provided services, it is of paramount importance to ensure transactional security and prioritise it to give a secure experience to users.

For citizens to adopt e-government services they should have the intention to receive and provide information through online channels. Trust in government and trust in the Internet have been found to be significant variables influencing the adoption of e-government services. Research conducted in the USA examining the adoption of e-voting has found trust in the Internet to be a significant factor (Schaupp & Carter, 2005). Another investigations examined the influence of ‘trust’ and ‘risk’ in e-government services adoption and found that TOI contributes to higher adoption rates (Alomari et al., 2010; Belanger & Carter, 2008; Carter et al., 2016).

Researchers have used various names for this factor of TOI and its subfactors. One of the commonly used alternative titles is ‘Perceived Risk’ which has been used by a number of researchers in their research models (Campbell & Goodstein, 2001; De
Ruyter, Wetzels, & Kleijnen, 2001; Hansen, 2005; Nui Polatoglu & Ekin, 2001). High ‘Perceived Risk’ is defined as “a fear of losing personal information and fear of being monitored on the Internet”; it is noted to have negative impacts on adoption rates (V. Kumar et al., 2007, p. 65).

Salem (2006) identifies trust of e-services (TOI) as a key barrier to adoption of e-government. He also identified factors related to SNs and IMAGE as contributing factors (e.g. the need for increasing public awareness and positive perceptions about e-government services which can contribute to shaping the opinions of new users) Thereby; the following hypothesis is proposed:

**Hypothesis 9: Trust of the Internet (TOI) → Perceived Usefulness (PU):**

Hypothesis 9 is that: Trust Of the Internet has a positive effect on the Perceived Usefulness of e-government services in Libya.

### 3.2.3.10 Moderating variables (Gender, Age, Education, Internet experience)

Demographic characteristics of Gender, Age, Education, and Internet experience, have been shown to influence ITU directly, or indirectly via perceptions; and they also moderate the relationship between perceptions and intention to use new technologies and services. Venkatesh et al. (2003) argued that these demographic variables moderate the relationship between the independent and dependent variables.
Researchers have pointed out the fact that adding moderated variables adds to the explanatory power of technology adoption modelling as they reduce many inconsistencies by highlighting situational difference (Sun & Zhang, 2006).

Moderating variables of gender, age, education and Internet experience have been used by previous studies to identify specific details and conditions related to contributing factors of technology adoption (S. Kumar & Sikri, 2013).

In the present research, the moderating effects of demographic variables on the relationships between constructs of interest are tested. Following is a brief summary of the key findings of previous relevant studies with regard to above-mentioned demographic factors, followed by the other hypotheses in this research on the basis of these findings.

**Gender:**

In terms of gender, men tend to be more task-oriented than women (Merchant, 2012). This could lead to ‘the expectations of the usefulness of new technology’ being higher in men than in women. In the e-government context, studies in Malaysia and Kuwait showed that gender has a significant effect on the intention of using e-government services (Aladwani, 2013; Ambali, 2009).

In referring to a number of previous studies, the following findings with regards to the impact of gender on factors affecting e-government services adoption can be described:

- Men are generally found to be more inclined to consider risk-taking than women. A meta-analysis by Byrnes, Miller, and Schafer (1999) reviewed over 150 papers on gender differences in risk perception. They concluded that the
literature “clearly” indicated that “male participants are more likely to take risks than female participants” (p. 377). This may encourage men to adopt e-government services earlier than women.

- Some researchers have found women generally to have lower levels of self-efficacy and computer skills (Cassidy & Eachus, 2002). Conversely, they are found to have higher levels of computer anxiety than men (Broos, 2005), which may become a hindrance in their adoption of e-government.

- There are some studies that have found that the impact is not significantly different from men and women. (In our opinion and literature review, it seems to be different from country to country – In any case, this demands an investigation in Libyan context to identify the relationship and its strength)

- Women are found to focus more on what opinions other people hold (Venkatesh & Morris, 2000; Venkatesh et al., 2003). On the other hand, men were found to be more inclined towards engaging others in seeking advice (this potentially impacts all factors in proposed research model that impact PU i.e. image, SNs, beliefs and trust)

Based on above, the following hypothesis is added to this research:

**Hypothesis 10: Gender moderates the relationships between the constructs of the adoption Model.**

**Age:**

The research identified that the demographic factor of age is a significant variable which impacts ‘intention’ and ‘acceptance of new technology’ directly and also has a moderating role in their relationships. In UTAUT model, Venkatesh et al. (2003) found that within an organisational context, the relationship between performance
expectancy (equivalent to PU in TAM) and BI was stronger for younger employees. They also found age has a moderating effect on the relationship between effort expectancy (PEOU in TAM) and Behavioural intention (BI) to use, with the relationship stronger for older users. Thus, the following hypothesis is proposed:

**Hypothesis 11: Age moderates the relationships between the constructs of the adoption Model.**

**Education:**

Education is considered to be one of the major factors that impacts the adoption of e-government services and is also considered to be a factor contributing to Computer Self-Efficacy (Alomari et al., 2010).

In addition, people with different level of education can project a variety of perceived usefulness and perceived ease of use. According to Rogers (1995), innovators (who in his study possess higher education) are more favourable to accept new technology. The relationship between level of education and acceptance of new technology has also been observed by many other researchers (Agarwal & Prasad, 1997; Igbaria & Parasuraman, 1989; Rogers, 2003). Thus, the following hypothesis is proposed:

**Hypothesis 12: Education moderates the relationships between the constructs of the adoption Model.**

**Internet Experience:**

Finally, according to Rogers Everett (1995), individual's prior experience with technology influences the degree of innovation adoption. Several prior studies suggested that experience influences relationships between PU and ITU (Taylor &
Todd, 1995b), SNs and PU (Venkatesh & Morris, 2000; Venkatesh et al., 2003), and PEOU and ITU (Y. Yi, Wu, & TUNG, 2005).

It has also been found that adopters of Internet services and non-adopters differ in terms of demographics, age, education and keenness to experiment with technology.

In a policy brief, Dubai School of Government points out toward digital divide in Arab countries due to low IS/IT literacy (Salem, 2006). They further mention about several efforts from Arab governments to leverage this gap but without success. This accordingly is considered one of the reasons for low adoption rates.

Researchers have identified that awareness and understanding of the Internet along with information technology skills play a critical role in technology adoption and consider these to be a factor hindering adoption of e-government services in Arab countries (Alomari et al., 2010; Pons, 2004).

Also, it has been pointed out that highest adoption of technology comes from those countries where the population is more well-versed with Internet use (Hamilton, 2002).

Based on this background, the following additional hypothesis is proposed in this research:

**Hypothesis 13:** Internet experience moderates the relationships between the constructs of the adoption Model.

### 3.3 Mapping with DOI:

According to Robinson (2009), DOI consists of 5 main factors:
- Relative Advantage (degree to which an innovation is perceived as more useful as compared to existing options – e.g. paper based system in this research context. This is specifically explored in the survey under Beliefs and PU.

- Compatibility with existing values and practices (degree to which perceived as being consistent with the values, past experiences, and needs of potential adopters – this is explored under the factors Image, SNs, Beliefs and PU)

- Simplicity and ease of Use (degree to which an innovation is easy to use – this directly links to PEOU and CSE)

- Trialability (degree to which innovation can experiment with limited bias – this factor and associated beliefs and attitudes about this are determined by FCs, SNs and TOI in addition to PU and PEOU)

- Observable results (the degree to which results can be seen – this factor is more relevant to marketing strategy and product overviews from the government so that citizens can realise the benefits associated with using e-government systems and observing their results. This research classified these aspects under FCs, PU and SNs in the survey of this research).

In line with above discussion and according to our interpretation, factors considered in our model map with constructs from DOI as following:
### Table 3-1 Research model constructs Mapping to DOI

<table>
<thead>
<tr>
<th>Construct from DOI</th>
<th>Factors considered in proposed model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Advantage</td>
<td>Beliefs, PU, Image</td>
</tr>
<tr>
<td>Compatibility with Existing Value and practices</td>
<td>Beliefs, Image, SNs and PU</td>
</tr>
<tr>
<td>Simplicity/Ease of Use</td>
<td>PEOU, CSE</td>
</tr>
<tr>
<td>Trialibility</td>
<td>FCs, SNs, TOI, PEOU</td>
</tr>
<tr>
<td>Observable Results</td>
<td>FCs, PU, SNs</td>
</tr>
</tbody>
</table>

### 3.4 Summary

This chapter explains the proposed research model. The reason for the inclusion of each construct used in the model and findings from previous studies is presented to explain justifications for considering these factors. This chapter also presents commonalities within Arab culture, as pointed out by many researchers, which prompt building further on previous studies and exploring their findings and constructs in Libyan context.

This chapter then explained the various relations shown in the model and their shed light relevant hypotheses. Moreover, moderating factors in this research, which are found to eliminate/ reduce inconsistencies in research findings and make them more reliable, are also included.

Following 13 hypotheses are identified in this chapter:

**H1**: Perceived Ease Of Use (PEOU) of e-government will positively influence the Intention To Use (ITU) these services in Libya.
**H2**: Perceived Usefulness (PU) of e-government services will positively influence the Intention To Use (ITU) these services in Libya.

**H3**: Perceived Ease Of Use (PEOU) of e-government services will positively influence the Perceived Usefulness (PU) of these services in Libya.

**H4**: Computer Self-Efficacy (CSE) has a positive effect on the Perceived Ease Of Use (PEOU) of e-government services in Libya.

**H5**: Facilitating Conditions (FCs) have a positive effect on the Perceived Ease Of Use (PEOU) of e-government services in Libya.

**H6**: Subjective Norms (SNs) regarding the use of e-government services in Libya will have a positive effect on the Perceived Usefulness (PU).

**H7**: Image has a positive effect on the Perceived Usefulness (PU) of e-government services in Libya.

**H8**: Beliefs have a negative effect on the Perceived Usefulness (PU) of e-government services in Libya.

**H9**: Trust of the Internet (TOI) has a positive effect on the Perceived Usefulness (PU) of e-government services in Libya.

**H10**: Gender moderates the relationships between the constructs of the adoption Model.

**H11**: Age moderates the relationships between the constructs of the adoption Model.

**H12**: Education moderates the relationships between the constructs of the adoption Model.
H13: Internet experience moderates the relationships between the constructs of the adoption Model.

The next chapter discusses the research design and methodology adopted throughout the research.
Chapter 4 RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

This chapter explains research design and methodology. It starts with an explanation of research paradigm used in this research and then justifies the basis of using quantitative research methodology.

Sampling methodology is also covered in detail in line with the special geo-demographic situation in Libya and its impact on population representation from the analysis of samples.

After this, the instrument design, its various sections and constructs being measured are presented. Moreover, data collection processes and ethical considerations are explained afterwards.

4.2 Justification for using a Quantitative research methodology

Research Paradigm:

According to A. Alzahrani (2011), research are conducted with various paradigms which determine the way information is collected. There are three basic research paradigms: positivist, interpretive, and critical science. These three research paradigms are presented in the following sections.

The interpretive paradigm is concerned with understanding the world as it is from subjective experiences of individuals. They use meaning (versus measurement) oriented methodologies, such as interviewing or participant observation, that rely on a subjective relationship between the researcher and subjects. Interpretive research does
not predefine dependent and independent variables, but focuses on the full complexity of human sense making as the situation emerges (Kaplan and Maxwell, 1994). Main disadvantages associated with interpretivism relate to subjective nature of this approach and great room for bias on behalf of researcher. Primary data generated in interpretivist studies cannot be generalized since data is heavily impacted by personal viewpoint and values. Therefore, reliability and representativeness of data is undermined to a certain extent as well.

Critical science, or the critical approach, explores the social world, critiques it, and seeks to empower the individual to overcome problems in the social world. Critical science enables people to understand how society functions and methods by which unsatisfactory aspects can be changed. Similar to interpretivist researchers, critical researchers recognise that research is not value free, but they go further in that the goal of the research is to actively challenge interpretations and values in order to bring about change. Research methods used in critical research include interviews and group discussions. The critical paradigm is not appropriate for this research because it focuses on criticising the status quo rather than understanding the relevant factors of adoption.

The positivist paradigm, according to Mackenzie and Knipe (2006), intends to test a theory using observation and measurement. Dash (2005) mentions that positivist researchers use quantitative research methods. Bryman (2004) has also identified that quantitative research holds values of positivist paradigm. This point of view is also supported by reasoning and literature review presented by A. Alzahrani (2011). In the Information Systems research, according to a study, 96.8% researchers have used positivist paradigm (Orlikowski & Baroudi, 1991). A more recent study, which
analysed much bigger sample from IS research papers, confirms the same fact that
positivist approach is most commonly used in this type of research. A. Alzahrani
(2011) also concludes that positivist approach is most suited for IS research where
relationships between constructs of a structured model are analysed, and causal
relationships are identified.

Accordingly, this research adopted the positivist approach and used quantitative
research methodology.

**Quantitative Methods:**

There are numerous other reasons and justifications behind using quantitative research
methodology in this research:

- Quantitative methods are used to check/assess theories whereas Qualitative
  methods are used to develop them (John, 2015). This research is testing
  relationships hypothesised about the acceptance of e-government technology
  and accordingly adopted quantitative research methodology.

- Bhattacherjee (2012) explains the difference between Inductive and Deductive
  research through the following diagram. Quantitative research is the
  methodology recommended for deductive studies (John, 2015).
Ben-Eliyahu (2014) explains that the quantitative approach to information collection aims to explain a phenomenon or relationship across a larger number of participants. It accordingly provides a possibility of summarising characteristics across groups or relationships that can then be subjected to statistical analysis. The researcher further explains that this approach deals with a large number of participants and assist researchers in recognising overall patterns in the relationships. In considering the objectives of this research, quantitative methods are considered more appropriate.

It is also to be noted that most studies exploring the adoption of e-government systems are conducted on the basis of quantitative methods based on their suitability for this type of study. A. Alzahrani (2011) presents a number of studies conducted to analyse e-government systems adoption among citizens, and all of them are based on quantitative methods.

There are numerous reasons for this preference. One of the reasons for this is a lack of possibilities for direct observation (i.e. following qualitative methods) as explained by Morris and Dillon (1997). The authors argue that the most appropriate technique for
examining the adoption of technology at an individual’s level is survey research while at the organisation level case studies are more relevant.

Moreover, they argue that the survey questionnaire represents a suitable method when the researchers aim to collect data from a large number of individuals and wants to obtain standard data by employing one group of questions for all participants.

There are some researchers who have also used qualitative methods for studying technology acceptance. However, these research use these techniques in situations where the concepts under study are still unknown, for example, Charnkit (2010), or when theory-building is the objective, for example (Vogelsang, Steinhueser, & Hoppe, 2013).

This research is different from these situations as it is studying factors contributing to e-government systems acceptance under modified TAM model. This research can be augmented with qualitative methods, as recommended in section 6.5, Future Research, to further refine underlying theories and models by adding more contributing factors and scenarios.

4.3 Participants and Sampling methods

While selecting survey participants and sampling methodology, the following are considered:

- Participation from a highly representative sample.

- Availability and willingness of participants to participate in the study.

- Utilising clusters where most elements from intended population are included.
- Managing the cost and practicality of the research.

- Lowering the possibility of spending time and resources with segments from where usable data are not expected.

### 4.3.1 Selection of sampling strategy:

After reviewing and rationalising various sampling methodologies available, the following two choices are:

- Purposive sampling (non-probability)

- Cluster Sampling (probability) (Kothari, 2004)

Following points are considered in analysing which approach to select from above:

- Cluster sampling is one of the techniques classified under ‘probability sampling in which all elements from population have equal chances of inclusion (Kothari, 2004).

A. N. Evans and Rooney (2013) have explored ‘cluster sampling’ (one of the types of probability sampling) and when it can be used. According to them, when a complete list of the members of a population for intended research is not available, researchers can identify various groups from the intended research population from a given geographical location and randomly select a number from them for sampling, called clusters.

The above suggests suitability of Cluster sampling of this research.
Kelley, Clark, Brown, and Sitzia (2003) mention that cluster sampling is often used in national-scale studies which further validates the use of this strategy for this research.

According to Trochim and Donnelly (2007), this sampling requires random selection. He also mentions that for employing random selection methods, one MUST set up techniques or processes to ensure that all elements in the population have equal probabilities of being chosen.

Above requires the use of random selection feature for cluster sampling as a mandatory requirement. However, considering the objectives of this research and the fact that e-government systems in Libya are currently in their initial stages, it has been preferred in this research to analyse those clusters only from where most useful inputs and insights are expected with better representation of the overall sample. In line with the above recommendations, purposive sampling appears as a suitable fit.

Tongco (2007) has identified that purposive sampling is a widely used tool for deliberate informants (participants) selection based on their characteristics and is a non-random technique. He also suggests that this technique can be employed for both quantitative and qualitative studies. According to research reviews presented by him, the researcher makes a decision on a decision about identifying who can and are willing to provide the information based on relevant characteristics.

In light of the above, purposive sampling is selected in this research. However, in order to enhance the effectiveness of research results, some of the aspects of cluster sampling are also included. Through purposive methodologies, this
research selected the clusters with required characteristics and then handled the cluster in accordance with cluster sampling technique in which all elements within the cluster were provided with an opportunity to get involved in the study (Participation rates are explained later on in this section).

- It is generally recommended that all elements within a particular cluster should be surveyed (Data Analysis Australia, n.d.).

However, Psychology Department, University of California, US explains that while sampling through cluster sampling methodology, researchers select samples in multiple stages. In the initial stage, groups of clusters or element are selected. In the second stage, individual elements from each cluster are selected. Hence, selection of elements (2nd stage) from selected clusters (1st stage) is acceptable in research studies.

In this research, all elements within purposive clusters were provided with an equal opportunity to participate, and the survey was handed over to all elements/units.

4.3.2 Target Population:

In line with research objectives, the target population for this research was Libyan citizens.

The sampling frame was Libyan citizens at:

- Two of Jamhouria Bank branches:
  
  o Tajoura branch located in Tripoli,
- Tarhuna branch located in Tarhuna.

- Students, teachers, and employees at two of Libyan universities:
  - The university of Tripoli located in Tripoli.
  - Azzaytuna University located in Tarhuna.

**Population Concentration in Libya:**

In order to understand how the sampling frame represents overall population, the following demographic facts need to be considered:

- According to the BBC, most of Libya's population is concentrated along the coast and around the country's oilfields (BBC News, 2011).

- Population density is about 50 persons/ km$^2$ along the coast.

- Whereas in most of other places, it is very low (<1 person/ km$^2$) because of inhospitable desert.

![Figure 4-2 Libyan Population Spread (Courtesy: BBC)](source)
- The map shows that most of the people live in less than 10% of the area and urban population.

- According to Dennis, Mukhtar, Carl, Gary, and Nevill (2016), Libyan population is concentrated in Tripolitania (which mainly includes Tripoli and other cities along the coast and on the Nafūsah Plateau). A relatively less dense population resides in Cyrenaica, (primarily in Banghāzī and other coastal cities). The remainder of the population is found in the oasis towns of the Fezzan.

4.3.3 **Overview of sampling frame from the point of view of population representation:**

- Jamhouria Bank is one of the biggest Libyan banks and employs 5,807 employees in its 146 branches/agencies (Jumhoruiabank, 2015).

![Jamhouriya Bank – Number of Branches](image)

Figure 4-3 Spread of Jamhouria Bank branches within Libya
The above graph is based on branch/agency location mentioned on the Jamhouria Bank website.

Reviewing above mentioned chart with demographical information presented before clarifies the appropriate of using Jamhouria Bank in the sampling frame. This provides this research with the geographical diversity and outreach required for the purpose of analysis. Due to such a wide spread of branches and high concentration of population in specific areas, we can safely take an assumption that its customers are representative of the broader society and its various strata. The study would, therefore, be a generalisation to the broader population, i.e. Libyan citizens.

- The bank also offers electronic solutions in addition to its other services. These services are also used by citizens which do not even have a bank account. This compliments above point on the representation of population through this sample frame.

- As mentioned above, most of the Libyan population is centred around Tripolitania, having the University of Tripoli in the sampling frame also adds to the representation of the broader population. The university offers a range of degrees at the undergraduate, graduate and post-graduate level and is the biggest and one of the most important universities in the country.

- The questionnaire was also distributed to students, staff and employees at Azzaytuna University, located in Tarhuna city about 100 Km from the capital city (Tripoli) toward Misurata.
- These universities were chosen as they reflect the geographical diversity in Libya. One of them, as explained above, is located in an urban area (Tripoli), and the other is located in a rural area (Tarhuna).

### 4.4 Development of the Questionnaire

Questionnaires, in educational and evaluation research, are most widely used data collection instruments which, according to a study, are used in 64% of total research (Radhakrishna, Leite, & Baggett, 2003).

#### 4.4.1 Sections in Questionnaire:

The proposed questionnaire for this research consisted of ten sections:

- Perceived Usefulness (PU),
- Perceived Ease Of Use (PEOU),
- Demographic factors,
- Computer Self-Efficacy (CSE),
- Facilitating Conditions (FCs),
- Trust of the Internet (TOI),
- Subjective Norms (SNs),
- Image,
- Beliefs, and
- ITU the e-government services.

Each section of this questionnaire has a number of questions constructed to evaluate the factors affecting user’s intention to use.
Leidner and Jarvenpaa (1995) suggest that researchers should use previously validated instruments wherever possible.

Similarly, Kimberlin and Winterstein (2008) mention that rather than starting with developing a new test or measure, a researcher needs to check if any existing instruments the constructs required to be measured in research at hand. They further recommend that employing already existing instruments, that have substantial evidence about validity and reliability to back them up, should be the starting point. Previous research, such as Alharbi and Drew (2014), have also utilised this approach.

In accordance with above, constructs in this research were measured using validated items from prior research.

- The TAM scales of PU, and PEOU were measured using items adopted from Davis (1989), and Carter and Belanger (2005).

- CSE was measured using items adopted from Compeau and Higgins (1995).

- SNs was measured using items adopted from Venkatesh et al. (2003).

- FCs was measured using items adopted from Taylor and Todd (1995a).

- Trust of the Internet(TOI) was measured using items adopted from Carter and Belanger (2005).

- Image was measured using items adopted from Carter and Belanger (2004).

- Beliefs were measured using items adopted from Vassilakis, Lepouras, Fraser, Haston, and Georgiadis (2005).

- Internet experience items were adopted from AlShihi (2006).
ITU was measured using items adopted from Suki and Ramayah (2010).

Demographic variables (Education level, Age, Gender, and Internet experience) were measured by using category scale.

The other questionnaire items were measured using a Likert scale ranging from 1 to 5 (1= “strongly disagree”, 5=” strongly agree”). Likert scale was chosen because it is easy to construct and administer. Moreover, it is the most frequently used scales in information system research (Uma & Roger, 2003).

4.4.2 Language:

The questionnaire was designed in the English language, and then it translated to Arabic, since it is the official language in Libya and known to almost all Libyan citizens. The Arabic version of the questionnaire was checked and translated back into English by an independent translator to ensure semantic equivalence and appropriateness for use.

Alharbi and Drew (2014) have explored this method and used it in their research to ensure alignment between translation and originally validated instrument in the English language.

4.4.3 Explanation of Questionnaire Sections:

4.4.3.1 Demographic factors

The first section of the Questionnaire collects basic demographic and background information about the participants on a category scale. It consists of 4 questions. These questions help to classify the participants based on their:
- Gender, (nominal scale)

- Age,

- Education, and

- Internet experience.

Age was measured on a five-category scale:

- 18-24,

- 25-34,

- 35-44,

- 45-55,

- > 55

Level of education was measured using four categories:

- Primary school,

- Secondary school,

- Undergraduate degree,

- Postgraduate degree

Internet experience was measured using six categories:

- Constantly,

- Several times a day,
Once a day,

- Several times per week,

- Once a week,

- Less frequently

Internet experience items were adapted from AlShihi (2006).

4.4.3.2 Perceived Usefulness (PU)

This portion of the questionnaire is related to the participants’ perception of the usefulness of using e-government services. PU was measured using items adopted from Davis (1989), and Carter and Belanger (2005). A five-point Likert scale labelled from ‘strongly disagree’ to ‘strongly agree’ was used for the measurement of this item.

- I think using the e-government improve my performance in my workplace and my life.

- I think using the e-government saves me time.

- I think the e-government is useful in my life.

4.4.3.3 Perceived Ease Of Use (PEOU)

This portion of the questionnaire relates to participants’ estimation of the effort they will have to put in to learn and use e-government services. Items adopted from Davis (1989), and Carter and Belanger (2005) was used to measure PEOU. A five-point Likert scale labelled from ‘strongly disagree’ to ‘strongly agree’ was used for the measurement of this part.
- I think it is easy to learn how to use e-government services.

- I think interacting with e-government services is a clear and understandable process.

- I think it is easy for me to become skilful at using e-government services.

- I think e-government services are easy to use.

4.4.3.4 Subjective Norms (SNs)

This section of the questionnaire is used to identify to which degree participants believe that others think they should use e-government services. SNs was measured using items adopted from Venkatesh et al. (2003). A five-point Likert scale labelled from ‘strongly disagree’ to ‘strongly agree’ was used for the measurement of this part. The four items used to measure SNs are:

- People (peers/colleagues/ friends) important to me think that I should use e-government services.

- People who influence my behaviour think that I should use e-government services.

- People who influence my decisions think that I should use e-government services.

- I would use e-government services if my friends and colleagues used them.

4.4.3.5 Image

This portion of the questionnaire about the extent to which the participant sees that their use of e-government services improves their image or status in the community.
Image was measured using items adopted from Carter and Belanger (2004). A five-point Likert scale labelled from ‘strongly disagree’ to ‘strongly agree’ was used for the measurement of this item. The four items used to measure Image are:

- I think people who use E-government services have more prestige.

- I think people who use E-government services have a high profile than those who do not.

- I think using E-government services improves my image among people whom I know.

- I think using E-government services is a status symbol.

4.4.3.6 Trust of the Internet (TOI)

This portion of the questionnaire related to the degree to which participants believe that the Internet is a reliable place to complete their transactions with the government. Trust in the Internet was measured using items adopted from Carter and Belanger (2005). A five-point Likert scale labelled from ‘strongly disagree’ to ‘strongly agree’ was used for the measurement of the items of this part. The four items used to measure TOI are:

- The Internet has enough safeguards to make me feel comfortable using it to perform transactions.

- I feel assured that legal structures adequately protect me from problems on the Internet, e.g., ability to bring up disputes with legal courts or third party institutions.
- I feel assured that technological structures (e.g. Security technologies like data encryption and secure firewalls) make it safe for me to perform transactions there.

- In general, the Internet is now a safe environment in which to perform transactions.

4.4.3.7 Beliefs

This portion of the questionnaire about participant’s beliefs with regard to the e-government services. Beliefs were measured using items adopted from Vassilakis et al. (2005). A five-point Likert scale labelled from ‘strongly disagree’ to ‘strongly agree’ was used for the measurement of this part. The three items used to measure Beliefs are:

- I would prefer paper-based work because of negative impressions I have about electronic transactions.

- I would prefer not to use the Internet because of immorality issues which are displayed on the Internet and which are against the rules of my religion.

- I would have negative attitudes toward the Internet because paper-based work will be eliminated and could affect my work status.

4.4.3.8 Intention To Use (ITU) e-government service

This portion of the questionnaire relates to the degree of intention to use e-government services. ITU was measured using items adopted from Suki and Ramayah (2010). A five-point Likert scale labelled from ‘strongly disagree’ to ‘strongly agree’ was used for the measurement of this part. The three items used to measure Intention are:
- I intend to use the e-government services.

- It is likely that I will use the e-government services.

- I expect to use the e-government services in the future.

4.4.3.9 Computer Self-Efficacy (CSE)

This portion of questionnaire relates to the participant's perception of their capability of using the computer in the accomplishment of the task. A five-point Likert scale labelled from ‘strongly disagree’ to ‘strongly agree’ was used for the measurement of this part. CSE will be measured using items adopted from Compeau and Higgins (1995).

- I feel confident working on the computer although there was no one around to tell me what to do.

- I feel confident troubleshooting computer problems.

- I feel confident using software that I have never used before.

4.4.3.10 Facilitating Conditions (FCs)

This portion of the questionnaire related to the degree to which participants believe that resources exist to support them in interacting with e-government services. A five-point Likert scale labelled from ‘strongly disagree’ to ‘strongly agree’ was used for the measurement of this part. FCs was measured using items adopted from Taylor and Todd (1995a).

- Resources required to use e-government services are available to me.
- I have access to hardware, software, and services needed to use e-government services (e.g. computer facilities, good Internet connection).

- I am constrained by the lack of resources needed to use e-government services.

- It is easy for me to get assistance/support if I needed help using e-government services.

From above, it can be noticed that all items, except Demographic variables, were measured by a five-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’. Likert scale was chosen because it is the most frequently used scales in information system research (Sekaran, 2003).

4.5 Data collection procedures

The collection of the data was taken place on December 25, 2013, to Feb 25, 2014. Letters were sent to the presidents of University of Tripoli, Azzytouna University, and the Manager of Jumhouria Bank seeking the permission to recruit participants and distribute questionnaires.

After the consent had been received, we advertised on campus for the universities, and on advertisement boards for the bank. A sample of the advertisement is provided in Attachment C. The researcher's contact details had been provided in the Advertisement so that bank customers, students, teachers and employees, who would like to participate in this research, can contact the researcher either by phone or by email so as to provide their addresses to the researcher. The information letter, the questionnaire and an envelope with return local address and postage stamp were sent to the interested people by mail. The participants were asked to return the completed questionnaire by post. The questionnaire was anonymous; no identification information was included.
in the return envelope in order to avoid identification of the participants and maintain their privacy. A copy of the information letter provided to the participants is provided in Attachment D. The letter clearly states that the participation in the research is entirely voluntary, and the participants may withdraw their consent to participate without returning the questionnaire. As the questionnaire was anonymous, the participants were notified that the withdrawal from the research would not be possible, after returning the questionnaire.

4.6 Ethical considerations

This research obtained ethical approval from the Human Research Ethics Committee of Murdoch University prior to data collection. The cover sheet explained the aims of the research. Moreover, it also contained information on the confidentiality, anonymity, and voluntary participation. Political and social factors that may jeopardize the safety of participants had been taken into account in this research.

Local beliefs and practices regarding recruitment, consent, and information to participants and the targeted communities for participating in this research had been taken into account during the design of the questionnaire and the data collection process.

Contact details of the Murdoch University’s Research Ethics Office were provided for participants to lodge any complaint if they needed any independent support or raise concerns.

4.7 Summary

This chapter has described the research methodology used in the present research. Quantitative research methodology using a questionnaire was chosen to conduct this
research in line with a positivist paradigm justified in this chapter. The reasons behind the selection of a quantitative methodology were also explained in this chapter. Moreover, the sampling techniques in accordance with a purposive approach based on geo-demographic and other specific characteristics of participants were described and how it is expected to be generalizable the broader population in accordance with our purposive approach based on geo-demographic rationale and specific characteristics of participants. This chapter also explained the 10 sections includes in survey questionnaire and scales used in them to measure constructs. In addition, data collection method and timeframes were explained. Finally, ethical considerations in line with guidelines from Murdoch University were explained.
Chapter 5 DATA ANALYSIS AND FINDINGS

5.1 Introduction

The purpose of this chapter is to report on the data analysis and the findings. First, the procedures used to prepare the data for analysis will be described regarding how data screening and cleaning were performed. Then, the response rates and descriptive statistics of participants will be presented. The SPSS statistical software version 21 was used to calculate frequencies and associated percentages of the sample’s demographic profile, including gender, age group, education level, and Internet experience.

Furthermore, descriptive statistics of all the constructs used in this research will be presented. Then, the chapter will discuss some more complex statistical procedures. First, it discusses the measurement model testing, including the assessment of the reliability and the validity of the constructs. After that, the results of the SEM analysis of the data and testing of the full structural model will be discussed. Finally, the outcomes of hypotheses testing are presented.

5.2 Preparation of the survey for statistical analysis

This procedure included data cleaning and finding any missing responses.

5.2.1 Data cleaning

The objective of the data cleaning process is to preserve meaningful data by removing elements that may impede the ability to run the analyses effectively or affect the quality of the results. This includes removing duplicate cases, missing data and outliers,
extraneous characters within cells, or out-of-range values. This section describes the data screening results; and issues of missing data, outliers, and normality are presented.

5.2.1.1 Missing data

Bennett (2001), maintained that 10% of missing data is likely to make the statistical analysis to be biased. Moreover, Schafer (1999) asserted that a missing data rate of 5% or less on one variable is not considered to be large, and any treatment may yield similar results. As presented in Table 5-1, which shows the frequency and percentage of missing data, none of the items had more than 1 percent of missing observations. This result can be considered acceptable.

Although the amount of missing data was acceptably low, the researcher applied the ‘regression imputation' technique recommended by Byrne (1998) to replace missing data. This technique has two steps. First, the relationships among variables were estimated. Second, the missing values were estimated by using the regression coefficients. This procedure was done by using SPSS software version 21.

Table 5-1 Frequency and percentage of missing data

<table>
<thead>
<tr>
<th>Variables</th>
<th>Item</th>
<th>Valid N</th>
<th>Missing data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Count</td>
</tr>
<tr>
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<td>ITU1</td>
<td>347</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ITU2</td>
<td>347</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ITU3</td>
<td>346</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>PEOU</strong></td>
<td>PEOU1</td>
<td>347</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>PEOU2</td>
<td>345</td>
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<tr>
<td></td>
<td>PEOU3</td>
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</tr>
<tr>
<td></td>
<td>PEOU4</td>
<td>347</td>
<td>1</td>
</tr>
<tr>
<td><strong>PU</strong></td>
<td>PU1</td>
<td>347</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>PU2</td>
<td>347</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>PU3</td>
<td>347</td>
<td>1</td>
</tr>
<tr>
<td><strong>CSE</strong></td>
<td>CSE1</td>
<td>346</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>CSE2</td>
<td>347</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>CSE3</td>
<td>345</td>
<td>3</td>
</tr>
<tr>
<td><strong>FCs</strong></td>
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<td>347</td>
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<tr>
<td></td>
<td>FC2</td>
<td>346</td>
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</tr>
<tr>
<td></td>
<td>FC3</td>
<td>346</td>
<td>2</td>
</tr>
<tr>
<td><strong>SNs</strong></td>
<td>SN1</td>
<td>347</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SN2</td>
<td>347</td>
<td>1</td>
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<tr>
<td></td>
<td>SN3</td>
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<td>---</td>
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<tr>
<td></td>
<td>Image3</td>
<td>347</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Image4</td>
<td>346</td>
<td>2</td>
</tr>
<tr>
<td>Beliefs</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Beliefs1</td>
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<td>1</td>
</tr>
<tr>
<td></td>
<td>Beliefs2</td>
<td>345</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Beliefs3</td>
<td>347</td>
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</tr>
<tr>
<td>TOI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOI1</td>
<td>346</td>
<td>2</td>
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<td>TOI2</td>
<td>346</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>TOI3</td>
<td>348</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>TOI4</td>
<td>347</td>
<td>1</td>
</tr>
</tbody>
</table>

### 5.2.1.2 Outliers

Outliers are extreme data points that are distinctly different from other observations in the data set and which may therefore negatively affect the results of statistical tests (Kline, 2005). A case can have a univariate outlier if it is extreme on a single variable. The univariate outliers were identified by determining frequency distributions of Z-scores of the observed data. As suggested by Kline (2005), any z-score greater than 3 or less than -3 is considered to be an outlier. However, no univariate outlier was
identified for this research, because the questionnaire utilised a 5 point Likert scale ranging from (1) strongly disagree to (5) strongly agree. If respondents answered strongly disagree or strongly agree, these response options could become outliers, as they are the extreme points of the scale.

A multivariate outlier has extreme scores on two or more variables, or its pattern of scores is atypical. The multivariate outlier was checked by determining the Mahalanobis distance (D2), which is a measure of distance in standard deviation units between each observation compared with the mean of all observations (Hair, Tatham, Anderson, & Black, 2006; Kline, 2005). Cases whose D2 values were statistically significant at 0.001 were considered to be outliers (Tabachnick & Fidell, 2007).

Results of the D2 test show that there were a few multivariate outliers. However, Hair et al. (2006) explain that while the deletion of outliers might improve the multivariate analysis, this is done at the risk of limiting generalizability. Therefore, this researcher decided to retain all the multivariate outlier cases.

5.2.1.3 Normality

Hair (1998) refers to normality as ‘the shape of the data distribution or an individual metric variable and its correspondence to the normal distribution, which is the benchmark for statistical methods’ (p: 70). There are two kinds of normality distribution: namely, univariate and multivariate. Univariate normality was identified by assessing skewness and kurtosis of the study variables. Skewness results in shifting the distribution; positive skewness shifts the distribution to the right while negative value shifts it to the left. The Kurtosis test was used to describe the height of the distribution compared to the normal one. The term ‘peakedness’ denotes a positive kurtosis, which is characterised by a more peaked distribution compared to a normal
one, whereas, ‘flatness’ indicates a negative kurtosis where the distribution is flatter. Researchers recommend that the absolute skewness value must be no greater than 3.0, and the absolute value of kurtosis should not exceed 10.0 (Hair et al., 2006; Kline, 2005). Most statistics software (e.g. SPSS, AMOS, and SAS) have provided functions to detect normality problems. In this research, the SPSS program was employed for this purpose. The results of the normality check for the research variables are shown in Table 5-3 to Table 5-11. The skewness and kurtosis statistics were found to have less than the recommended maximum value, which indicated no deviation from data normality. Univariate normality is considered to be affected by multivariate normality. Kline (2005) and Hair et al. (2006) emphasise that it is inapplicable to examine multivariate normality since it is difficult to assess all its aspects.

5.3 Response rate

Among a total of 700 questionnaires were distributed, 365 questionnaires were returned, thus giving a response rate of approximately 52%. However, among those returned questionnaires, 15 responses were discarded because they were returned completely blank. Therefore, the remaining 348 questionnaires were used for further data analysis. Consequently, the final response rate for this research was approximately 50%.

Researchers have observed various response rates to survey questionnaires. Richardson (2005) cited Babbie (1973, p.165) and Kidder (1981, pp.150–151) when stating that 50% is regarded as an acceptable response rate in social research postal surveys. In the light of above figures, the response rate in this research can be considered acceptable.

5.4 Demographic Characteristics of Participants
The descriptive analysis was used to portray the data about the respondents and the variables involved in the research. The characteristics of the respondents were exposed descriptively through the relevant demographic parameters of age, gender, level of education, and Internet user experience.

Table 5-2 Descriptive analysis of demographic variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>208</td>
<td>59.8</td>
</tr>
<tr>
<td>Female</td>
<td>140</td>
<td>40.2</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>124</td>
<td>35.6</td>
</tr>
<tr>
<td>25-34</td>
<td>91</td>
<td>26.1</td>
</tr>
<tr>
<td>35-44</td>
<td>88</td>
<td>25.3</td>
</tr>
<tr>
<td>45-55</td>
<td>36</td>
<td>10.3</td>
</tr>
<tr>
<td>More than 55</td>
<td>9</td>
<td>2.6</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>11</td>
<td>3.2</td>
</tr>
<tr>
<td>Secondary</td>
<td>57</td>
<td>16.4</td>
</tr>
<tr>
<td>University</td>
<td>241</td>
<td>69.3</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>39</td>
<td>11.2</td>
</tr>
</tbody>
</table>
The descriptive analysis of data is important to understand the sample of participants and how this relates to the overall population. From the frequency distribution of the respondents (table 5-2) it can be seen that there was a total of 348 respondents. Among the respondents, 59.8 % (208) were male, and 40.2 % (140) were female. According to the World Bank collection of development indicators, compiled from officially recognized sources, female population (% of total) in Libya was reported at 49.7 % in 2015. It can be seen that the sample does not reflect the Libyan population. This may be due to the reluctance of women to participate in the questionnaire due to social constraints in conservative societies such as Libya.

In terms of age, the age group analysis shows that the majority of the respondents (35.6%) were in the age range of 18-24 years. Moreover, 26.1% were in the 25-34 years and 25.3% were in the 35-44 years old which means 51.4 of the participants
where in the 25-44 years old. In Libya, the median age of the population is 28.5 years (CIA, 2014) so the sample is within the national average.

5.5 Descriptive Statistics of Construct Items

This section presents descriptive statistics of the questionnaire constructs. Tables 5-3 to 5-11 report the means, standard deviation, variance, skewness, and kurtosis of nine variables: ITU, PU, PEOU, CSE, FCs, SNs, Image, Beliefs, and TOI.

5.5.1 Intention To Use (ITU)

The respondents were asked to indicate their intentions of using e-government services. Three items on a five-point Likert scale ranging from strongly disagree (scale 1) to strongly agree (scale 5) were used to measure this construct. The results of the respondents’ ratings for each item of this construct are reported in Table 5-3. The mean scores ranged between 3.98 (±0.810) and 4.21 (±0.750). In summary, the average mean scores of all items are 4.08 (±0.757) indicating that the sample strongly agree that they have intention to use e-government services.

Table 5-3 Descriptive statistics of Intention to use’s item

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean Statistic</th>
<th>Std. Deviation Statistic</th>
<th>Variance Statistic</th>
<th>Skewness Statistic</th>
<th>Kurtosis Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITU1</td>
<td>3.98</td>
<td>.810</td>
<td>.657</td>
<td>-.677</td>
<td>.565</td>
</tr>
<tr>
<td>ITU2</td>
<td>4.05</td>
<td>.712</td>
<td>.507</td>
<td>-.946</td>
<td>2.260</td>
</tr>
</tbody>
</table>
5.5.2 Perceived Usefulness (PU)

The respondents’ perceptions of usefulness were measured by three items using a five-point Likert scale ranging from ‘Strongly disagree’ (scale 1) and ‘Strongly agree’ (scale 5). Table 5-4 reports the descriptive statistics of measured items of the PU construct. The mean rating of the PU construct items was between 4.12 (±.798) and 4.23 (±.811). In summary, the average mean scores of all items are 4.18 (±0.819) indicating that the sample strongly agrees that e-government services are perceived as useful.

Table 5-4 Descriptive statistics of PU’s items

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean Statistic</th>
<th>Std. Deviation Statistic</th>
<th>Variance Statistic</th>
<th>Skewness Statistic</th>
<th>Kurtosis Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>PU1</td>
<td>4.12</td>
<td>.798</td>
<td>.637</td>
<td>-.836</td>
<td>.716</td>
</tr>
<tr>
<td>PU2</td>
<td>4.20</td>
<td>.850</td>
<td>.722</td>
<td>-1.168</td>
<td>1.607</td>
</tr>
<tr>
<td>PU3</td>
<td>4.23</td>
<td>.811</td>
<td>.657</td>
<td>-1.135</td>
<td>1.492</td>
</tr>
</tbody>
</table>

5.5.3 Perceived Ease Of Use (PEOU)

PEOU construct was measured by four-items. Table 5-5 presents descriptive results of measured items of this construct. The highest and lowest mean ratings of the items were 3.81(±.891) and 4.05(±0.873), respectively. In summary, the average mean
scores of all items are 3.94 (±0.874) indicating that the sample agrees that e-government services are perceived as easy to learn, to understand, and to use.

Table 5-5 Descriptive statistics of PEOU’s items

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean Statistic</th>
<th>Std. Deviation Statistic</th>
<th>Variance Statistic</th>
<th>Skewness Statistic</th>
<th>Kurtosis Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEOU1</td>
<td>4.03</td>
<td>.826</td>
<td>.682</td>
<td>-1.221</td>
<td>2.394</td>
</tr>
<tr>
<td>PEOU2</td>
<td>3.81</td>
<td>.891</td>
<td>.794</td>
<td>-.676</td>
<td>.189</td>
</tr>
<tr>
<td>PEOU3</td>
<td>4.05</td>
<td>.873</td>
<td>.761</td>
<td>-.907</td>
<td>.747</td>
</tr>
<tr>
<td>PEOU4</td>
<td>3.88</td>
<td>.907</td>
<td>.823</td>
<td>-.731</td>
<td>.312</td>
</tr>
</tbody>
</table>

5.5.4 Computer Self-Efficacy (CSE)

Table 5-6 reports the summary of the descriptive statistics of the respondents’ reported levels of CSE concerning their usage of e-government services on a 5-point scale ranging from 1 referring to “strongly disagree” to 5 referring to “strongly agree”. There were three items used to measure this construct. The highest mean rating of 3.97 (±0.986) was found for the CSE1 item while the lowest mean rating was 2.96 (±1.085) for CSE2 item. In summary, the average mean scores of all items are 3.39 (±1.089) indicating that the respondents show agreements that they feel confident working on computers.
Table 5-6 Descriptive statistics of CSE’s items

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean Statistic</th>
<th>Std. Deviation Statistic</th>
<th>Variance Statistic</th>
<th>Skewness Statistic</th>
<th>Kurtosis Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE1</td>
<td>3.97</td>
<td>.986</td>
<td>.973</td>
<td>-1.199</td>
<td>1.338</td>
</tr>
<tr>
<td>CSE2</td>
<td>2.96</td>
<td>1.085</td>
<td>1.177</td>
<td>-.037</td>
<td>-.524</td>
</tr>
<tr>
<td>CSE3</td>
<td>3.26</td>
<td>1.197</td>
<td>1.433</td>
<td>-.293</td>
<td>-.809</td>
</tr>
</tbody>
</table>

5.5.5 Facilitating Conditions (FCs)

The FCs construct was measured by three items using a five-point Likert scale ranging from ‘Strongly disagree’ (scale 1) and ‘Strongly agree’ (scale 5). Table 5-7 presents descriptive results of measured items of this construct. The highest and lowest mean ratings of the items were 3.42 (±1.101) and 3.57 (±1.166), respectively. In summary, the average mean scores of all items are 3.45 (±1.150) indicating that the respondents agrees that resources required to use e-government services are available to them.

Table 5-7 Descriptive statistics of FC’s items

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean Statistic</th>
<th>Std. Deviation Statistic</th>
<th>Variance Statistic</th>
<th>Skewness Statistic</th>
<th>Kurtosis Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>FC1</td>
<td>3.57</td>
<td>1.166</td>
<td>1.359</td>
<td>-.551</td>
<td>-.476</td>
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<tr>
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<td>1.404</td>
<td>-.408</td>
<td>-.765</td>
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</table>
5.5.6 Subjective Norms (SNs)

The SNs construct was measured by four-items using a five-point Likert scale ranging from ‘Strongly disagree’ (scale 1) to ‘Strongly agree’ (scale 5). Table 5-8 presents descriptive results of items for this construct. The highest and lowest mean ratings of the items were 3.29 (±1.020) and 3.62 (±0.970), respectively. In summary, the average mean scores of all items are 3.41 (±1.09) indicating that the sample agrees that subjective norms play a role on their intention to use e-government services.

Table 5-8 Descriptive statistics of SN’s items

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean Statistic</th>
<th>Std. Deviation Statistic</th>
<th>Variance Statistic</th>
<th>Skewness Statistic</th>
<th>Kurtosis Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>SN1</td>
<td>3.62</td>
<td>.970</td>
<td>.940</td>
<td>-.794</td>
<td>.406</td>
</tr>
<tr>
<td>SN2</td>
<td>3.29</td>
<td>1.020</td>
<td>1.041</td>
<td>-.387</td>
<td>-.431</td>
</tr>
<tr>
<td>SN3</td>
<td>3.42</td>
<td>1.117</td>
<td>1.248</td>
<td>-.640</td>
<td>-.290</td>
</tr>
<tr>
<td>SN4</td>
<td>3.33</td>
<td>1.255</td>
<td>1.575</td>
<td>-.454</td>
<td>-.817</td>
</tr>
</tbody>
</table>

5.5.7 Image

The Image construct was measured by four-items using a five-point Likert scale ranging from ‘Strongly disagree’ (scale 1) to ‘Strongly agree’ (scale 5). Table 5-9 presents descriptive results of measured items of this construct. The highest and lowest
mean ratings of the items were 3.30 (±1.235) and 3.43 (±1.194), respectively. In summary, the average mean scores of all items are 3.37 (±1.186) indicating that the sample agrees that using e-government services plays a role in shaping person's image among the people.

Table 5-9 Descriptive statistics of Image’s items

<table>
<thead>
<tr>
<th></th>
<th>Mean Statistic</th>
<th>Std. Deviation Statistic</th>
<th>Variance Statistic</th>
<th>Skewness Statistic</th>
<th>Kurtosis Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image1</td>
<td>3.43</td>
<td>1.194</td>
<td>1.427</td>
<td>-.511</td>
<td>-.669</td>
</tr>
<tr>
<td>Image2</td>
<td>3.36</td>
<td>1.196</td>
<td>1.430</td>
<td>-.321</td>
<td>-.842</td>
</tr>
<tr>
<td>Image3</td>
<td>3.42</td>
<td>1.122</td>
<td>1.259</td>
<td>-.401</td>
<td>-.572</td>
</tr>
<tr>
<td>Image4</td>
<td>3.30</td>
<td>1.235</td>
<td>1.525</td>
<td>-.286</td>
<td>-.938</td>
</tr>
</tbody>
</table>

5.5.8 Beliefs

The Beliefs construct was measured by three items using a five-point Likert scale ranging from ‘Strongly disagree’ (scale 1) to ‘Strongly agree’ (scale 5). Table 5-10 presents descriptive results of measured items of this construct. The highest and lowest mean ratings of the items were 2.64 (±1.201) and 2.70(±1.243), respectively. In summary, the average mean scores of all items are 2.66 (±1.234) indicating that the sample disagrees that beliefs play any role in shaping their decision on using e-government services.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean Statistic</th>
<th>Std. Deviation Statistic</th>
<th>Variance Statistic</th>
<th>Skewness Statistic</th>
<th>Kurtosis Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beliefs1</td>
<td>2.64</td>
<td>1.201</td>
<td>1.443</td>
<td>.351</td>
<td>-.909</td>
</tr>
<tr>
<td>Beliefs2</td>
<td>2.70</td>
<td>1.243</td>
<td>1.546</td>
<td>.287</td>
<td>-.990</td>
</tr>
<tr>
<td>Beliefs3</td>
<td>2.65</td>
<td>1.259</td>
<td>1.584</td>
<td>.217</td>
<td>-1.108</td>
</tr>
</tbody>
</table>

### 5.5.9 Trust of Internet (TOI)

Table 5-11 reports the summary of the descriptive statistics of the respondents’ reported levels of TOI concerning their usage of e-government services on a 5-point scale ranging from 1 referring to “strongly disagree” to 5 referring to “strongly agree”.

There were four items to measure this construct. The highest mean rating of 3.60 (±0.98) was found for TOI, while the lowest mean rating was 3.05 (±1.116) for TOI2. In summary, the average mean scores of all items are 3.38 (±1.030) indicating that the sample agrees that the Internet is trustworthy.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean Statistic</th>
<th>Std. Deviation Statistic</th>
<th>Variance Statistic</th>
<th>Skewness Statistic</th>
<th>Kurtosis Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOI1</td>
<td>3.60</td>
<td>.980</td>
<td>.961</td>
<td>-.570</td>
<td>.037</td>
</tr>
</tbody>
</table>
5.6 The SEM analysis

Structural equation modelling (SEM) is a combination of statistical techniques that is used to explain relationships among multiple variables. Using these techniques allows researchers to examine interrelationships among multiple dependent and independent variables simultaneously (Hair et al., 2006). SEM was selected for the present data analysis for two reasons. Firstly; SEM has the ability to test causal relationships between constructs with multiple measurement items (Hair et al., 2006). Secondly, SEM has the ability to deal with complex models due to its powerful statistical procedures (Hair et al., 2006; Tabachnick & Fidell, 2001). SEM is built upon two basic parts: a measurement model and a structural model. The measurement model is about measurement and data collection, and a structural model specifies how well some variables could predict some other variables. A two–step approach was adopted to perform the SEM analysis, as recommended by J. Anderson and Gerbing (1988). In the first step, the measurement model was specified using the interrelationships between measured (observed) and latent (unobserved) variables. In the second step, the structural model related to dependent and independent variables was specified in order to test the hypotheses. The results from the measurement and structural models are presented next.
5.6.1 Testing the measurement model

The measurement model shows the relationships between the measured variables and latent variables. The strength of the measurement model is determined by its **reliability** and **validity**.

5.6.1.1 Constructs' reliability

The reliability of a measure refers to the degree to which the instrument is free of random error. It is concerned with consistency and stability of the measurement. Internal consistency tends to be a frequently used type of reliability in the IS domain (Sekaran, 2003).

Instrument reliability was determined using Cronbach alpha. The reliability function in SPSS was used to test the internal consistency of the items for each construct measured in the questionnaire. Table 5-12 shows the Cronbach alpha value for each scale based on the criteria suggested by Nunnally (1978). All alpha values indicate the high internal reliability of the survey instrument as their Cronbach alpha coefficient was greater than 0.7.

Table 5-12 Mean and Cronbach's Alpha for each construct

<table>
<thead>
<tr>
<th>Scale</th>
<th>No. of Items</th>
<th>Mean</th>
<th>Cronbach's Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEOU</td>
<td>4</td>
<td>3.940</td>
<td>.840</td>
</tr>
<tr>
<td>PU</td>
<td>3</td>
<td>4.186</td>
<td>.847</td>
</tr>
<tr>
<td>CSE</td>
<td>3</td>
<td>3.395</td>
<td>.779</td>
</tr>
</tbody>
</table>
### 5.6.1.2 Constructs’ validity

Construct validity is defined as the degree to which an operational measure correlates with the theoretical concept investigated. In this research, a confirmatory factor analysis was conducted to assess the overall measurement models and examine the convergent and discriminant validity.

#### 5.6.1.2.1 Convergent validity

Convergent validity was assessed using Composite reliability (CR) and Average Variance Extracted (AVE).

As shown in Table 5-13, the composite reliabilities of the different measures exceeded the minimum threshold point of 0.70. Table 5-13, in addition, shows that AVE for all constructs exceeded the threshold point of 0.50, which is a minimum recommended by Hair et al. (2006). Additionally, factor loadings of items to corresponding constructs were in the acceptable range, and all loadings were significant, indicating convergent validity.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>CR</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCs</td>
<td>3</td>
<td>3.471</td>
</tr>
<tr>
<td>SNs</td>
<td>3</td>
<td>3.443</td>
</tr>
<tr>
<td>Image</td>
<td>3</td>
<td>3.402</td>
</tr>
<tr>
<td>Beliefs</td>
<td>3</td>
<td>2.661</td>
</tr>
<tr>
<td>TOI</td>
<td>4</td>
<td>3.384</td>
</tr>
<tr>
<td>ITU</td>
<td>3</td>
<td>4.080</td>
</tr>
</tbody>
</table>
validity. This indicates that all items are valid in reflecting their corresponding constructs.

Table 5-13 Summary of measurement scales

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Items</th>
<th>B</th>
<th>CR</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PEOU</strong></td>
<td>I think it is easy to learn how to use e-government services.</td>
<td>.650</td>
<td>0.8248</td>
<td>0.544</td>
</tr>
<tr>
<td></td>
<td>I think interacting with e-government services is a clear and understandable process.</td>
<td>.797</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I think it is easy for me to become skilful at using e-government services.</td>
<td>.673</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I think e-government services are easy to use.</td>
<td>.814</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PU</strong></td>
<td>I think using e-government improve my performance in my workplace and my life.</td>
<td>.701</td>
<td>0.797</td>
<td>0.570</td>
</tr>
<tr>
<td></td>
<td>I think using e-government saves me time.</td>
<td>.886</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I think e-government is useful in my life.</td>
<td>.658</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNs</td>
<td>People (peers/colleagues/ friends) important to me think that I should use e-government services.</td>
<td>.938</td>
<td>0.836</td>
<td>0.634</td>
</tr>
<tr>
<td></td>
<td>People who influence my behaviour think that I should use e-government services.</td>
<td>.683</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>People who influence my decisions think that I should use e-government services.</td>
<td>.746</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSE</td>
<td>I feel confident working on the computer, although there was no one around to tell me what to do.</td>
<td>.734</td>
<td>0.777</td>
<td>0.538</td>
</tr>
<tr>
<td></td>
<td>I feel confident troubleshooting computer problems.</td>
<td>.746</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I feel confident using software that I have never used before.</td>
<td>.720</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCs</td>
<td>Resources required to use e-government services are available to me.</td>
<td>.896</td>
<td>0.919</td>
<td>0.791</td>
</tr>
<tr>
<td></td>
<td>I have access to hardware, software, and services needed to use e-government services (e.g. computer facilities, good Internet connection).</td>
<td>.906</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Image</td>
<td>Beliefs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is easy for me to get assistance/ support if I needed help using e-government services.</td>
<td>.866</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think people who use e-government services have more prestige.</td>
<td>.764</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think people who use e-government services have a higher profile than those who do not.</td>
<td>.759</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think using e-government services improves my image among people whom I know.</td>
<td>.661</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would prefer paper-based work because of negative impressions I have about electronic transactions.</td>
<td>.920</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would prefer not to use the Internet because of immorality issues which are displayed on the Internet and which are against the rules of my religion.</td>
<td>.898</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would have negative attitudes toward e-government services because paper-</td>
<td>.777</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOI</td>
<td>based work will be eliminated and could affect my work status.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>---------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Internet has enough safeguards to make me feel comfortable using it to perform transactions.</td>
<td>.665</td>
<td>0.811</td>
<td>0.519</td>
</tr>
<tr>
<td></td>
<td>I feel assured that legal structures adequately protect me from problems on the Internet, e.g., ability to bring up disputes with legal courts or third party institutions.</td>
<td>.808</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I feel assured that technological structures (e.g. security technologies like data encryption and secure firewalls) make it safe for me to perform transactions there.</td>
<td>.648</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In general, the Internet is now a safe environment in which to perform transactions.</td>
<td>.749</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ITU</td>
<td>I intend to use the e-government services.</td>
<td>.650</td>
<td>0.803</td>
<td>0.579</td>
</tr>
<tr>
<td></td>
<td>It is likely that I will use the e-government services.</td>
<td>.842</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
I expect to use the e-government services in the future.

5.6.1.2.2 Discriminant validity

Discriminant validity is achieved when an indicator correlates more closely with the construct that it is intended to measure than with other constructs (Garson, 2009). In addition, the correlation between exogenous constructs should be less than 0.85. If discriminant validity is not established, “constructs [have] an influence on the variation of more than just the observed variables to which they are theoretically related” and, as a consequence, “researchers cannot be certain results confirming hypothesized structural paths are real or whether they are a result of statistical discrepancies” (Farrell, 2010, p. 324). Table 5-14 shows the implied correlations between the constructs in the model. Discriminant validity appeared to be satisfactory for all constructs as the estimated correlations were not excessively high.

Table 5-14 Factor Correlation Matrix

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEOU</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU</td>
<td>0.200</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSE</td>
<td>-0.189</td>
<td>0.039</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCs</td>
<td>0.290</td>
<td>0.084</td>
<td>0.111</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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5.6.2 Testing the structural model

The structural model in a SEM context is the full model, specifying both the constructs with their indicators and the causal relationships between the constructs. One of the most important steps in structural equation modelling is assessing whether a specified model fits the data (Yuan, 2005). There are several indices used to determine the overall fit of the model. These indices are known as Goodness-of-fit indices. Goodness-of-fit indices are used to determine the degree to which the theoretical model as a whole is consistent with the empirical data. These indices can be classified into three classes: absolute fit indices, incremental fit indices, and parsimony fit indices (Shah & Goldstein, 2006).

Absolute fit indices are used to measure how well a priori model reproduces the sample data. These type of fit indices include the Chi-Squared test, Root Mean Square Error of Approximation (RMSEA), Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit
Index (AGFI), Root Means Square Residual (RMR) and Root Mean Square Error of Approximation (SRMR).

Incremental fit indices reflect the improvement in fit gained by a given factor model relative to the most restrictive (null or independence) model (L. t. Hu & Bentler, 1999). They include the Comparative Fit Index (CFI), Tucker-Lewis' Index (TLI) and Incremental Fit Index (IFI).

Parsimony fit indices are relative fit indices that are adjustments to most of the ones above. The adjustments are intended to penalise models that are less parsimonious so that simpler theoretical processes are favoured over more complex ones. The more complex the model, the lower the fit index. Parsimonious fit indices include the Adjusted Goodness of Fit index (AGFI), Parsimony Comparative of Fit index (PCFI), and Parsimony Normed Fit index (PNFI).

From the above indices, this research adopted only the following indices recommended by Hoyle and Panter (1995) and Kelloway (1998), as the criteria for the model’s evaluation.

1. The most common index is the chi-square ($\chi^2$) statistic. According to Gefen et al. (2000), $\chi^2$ indicates a good fit model when the associated $p$-value with $\chi^2$ is insignificant. However, the literature shows that $\chi^2$ is greatly affected by sample size (Hair et al., 2006). Alternatively, normed chi-square (NC) is used to minimise the effect of sample size. NC is calculated by dividing the chi-square by the degree of freedom where the value of less than 3.0 indicates a good fit (Kline, 2005).

2. Root Mean Square Error of Approximation (RMSEA) represents the average difference between correlations of the sample and predicated
matrix by the model (Brown, 2006). The RMSEA tells us how well the model, with unknown but optimally chosen parameter estimates, would fit the population’s covariance matrix (Byrne, 1998). A value of less than 0.08 for RMSEA is an indication of fair fit (Hair et al., 2006).

3. Comparative Fit Index (CFI): This statistic assumes that all latent variables are uncorrelated (null model) and compares the sample covariance matrix with this null model. According to (L. t. Hu & Bentler, 1999), a value greater than 0.90 indicates a good fit.

4. Goodness-of-fit GFI: This statistic calculates the proportion of variances accounted for by the estimated population covariance. Values for the GFI range between 0 and 1 and it is generally accepted that values of 0.90 or greater indicate a good fit.

5. Tucker-Lewis Index (TLI): also referred as the non-normed fit index (NNFI), is a comparative fit index that compensates for the effect of model complexity. Specifically, the TLI provides a penalty for adding freely estimated parameters that do not substantially improve the model fit. The cut-off criteria for the TLI are the same as those for the CFI.

6. Incremental Fit Index (IFI) is used to determine the improvement in fit between two models visa vis the baseline model and determine whether any meaningful information remains unexplained by the model. Fitting two models, one with correlated residuals and one without can test the hypothesis that the correlation between the residuals is zero. $\chi^2$ statistics for the two models can be compared using IFI. If the decrease in $\chi^2$ that indicates an improvement in the models fit to the data is not significant, the
model is acceptable. The values of IFI can range from 0 to 1. Higher values indicate a better model fit.

7. Normed fit index (NFI): The normed fit index (NFI) analyses the discrepancy between the chi-squared value of the hypothesised model and the chi-squared value of the null model. NFI should range between 0 and 1, with a cut-off of .95 or greater indicating a good model fit (L. t. Hu & Bentler, 1999).

8. Adjusted Goodness of Fit index (AGFI): The AGFI is applied to the measure adjusted by the ratio of degrees of freedom for a proposed model to the degrees of freedom for a null model (Hair et al., 2006).

**Interpretation of results:** Based on the viability and statistical significance of important parameter estimates - the considerably good fit of the model (NC, CFI, GFI, IFI, TLI, RMSEA, NFI), it can be concluded that the hypothesised model has a satisfactory fit. The goodness of fit measures are shown in Table 5-15. The normed chi-square was 1.857 which was less than 3, RMSEA was 0.05 which was below 0.08, CFI was 0.94 which was greater than 0.90, the GFI was 0.884 which was greater than 0.8, TLI was 0.93 which was greater than 0.90, IFI was 0.94 which was greater than 0.90, NFI was 0.96 which was greater than 0.95, and AGFI was 0.87 which was greater than 0.8. All these goodness-of-fit measures indicated that the model has a good fit with the data.

Table 5-15 Goodness of fit measures

<table>
<thead>
<tr>
<th>Model fit measure</th>
<th>Recommended value</th>
<th>Model value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NC= $X^2$/df</td>
<td>&lt; 3.0</td>
<td>1.857</td>
</tr>
<tr>
<td>-------------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>RMSEA</td>
<td>&lt;= 0.08</td>
<td>0.05</td>
</tr>
<tr>
<td>CFI</td>
<td>&gt;= 0.90</td>
<td>0.94</td>
</tr>
<tr>
<td>GFI</td>
<td>&gt;= 0.80</td>
<td>0.884</td>
</tr>
<tr>
<td>TLI</td>
<td>&gt; 0.90</td>
<td>0.93</td>
</tr>
<tr>
<td>IFI</td>
<td>&gt; 0.90</td>
<td>0.94</td>
</tr>
<tr>
<td>NFI</td>
<td>&gt; 0.95</td>
<td>0.96</td>
</tr>
<tr>
<td>AGFI</td>
<td>&gt; 0.80</td>
<td>0.87</td>
</tr>
</tbody>
</table>

### 5.6.3 Hypotheses testing

Testing the hypotheses is undertaken to determine which predictors (independent variable) provide a meaningful contribution to the explanation of the dependent variables. The structural paths on the hypothesised relationships between the proposed constructs were examined for the full sample with maximum likelihood method using AMOS version 21. Structural model results are shown in Figure 5-1. The square multiple correlation values ($R^2$) indicate the amount of variance of the dependent variable that can be explained by the independent variables. Path coefficients ($\beta$) indicate the positive and negative relationships between the constructs and their statistical significance.
Interpretation of results: Overall, the model indicated 43% of the variance in ITU, 14% in PEOU, and 32% in PU. It can be seen from Table 5-16 that:

Hypothesis 1: Perceived Ease Of Use (PEOU) of an e-government service will positively influence the Intention To Use (ITU) the services in Libya.

The results (refer to Figure 5-1) revealed that PEOU of e-government services significantly influenced ITU e-government (p value was significant < 0.001). The standardised direct effect of the PEOU on ITU was $\beta=0.25$; which means that, when this construct increases by 1 standardised deviation, ITU increases by 0.25 standardised deviation. This indicates that when citizens expect e-government services as to be ease to use, they increase their intentions to use them. Therefore, Hypothesis 1 is supported.
**Hypothesis 2:** *Perceived Usefulness (PU) of e-government services will positively influence the Intention To Use (ITU) these services in Libya.*

The results (refer to table 5-16) revealed that the PU of an e-government services construct had a significant positive influence on ITU e-government services (p value was significant <0.001). The standardised direct effect of this construct on ITU was 0.49; which means that, when this construct increases by 1 standardised deviation, ITU increases by 0.49 standardised deviation. This indicates that when citizens perceived e-government services as useful, their intentions to use these services will be increased. Thus, Hypothesis 2 is supported.

**Hypothesis 3:** *Perceived Ease Of Use (PEOU) of e-government services will positively influence the Perceived Usefulness (PU) of these services in Libya.*

The results (refer to figure 5-1) show that the PEOU construct had a significant influence on PU (p-value < 0.001). The standardised direct effect of this construct on PU was 0.47; which means that, when this construct increases by 1 standardised deviation, ITU increases by 0.47 standardised deviation. This indicates that the more the citizens perceived the e-government services as ease to use the more they will perceived them as useful. Therefore, Hypothesis 3 is supported.

**Hypothesis 4:** *Computer Self-Efficacy (CSE) has a positive effect on the Perceived Ease Of Use (PEOU) of e-government services in Libya.*

The results (refer to table 5-16) showed that the CSE construct had a significant positive influence on PEOU of e-government services (p value was significant <0.001). The standardised direct effect of this construct on PEOU of e-government services was 0.35; which means that, when this construct increases by 1 standardised
deviation, PEOU of e-government services increases by 0.35 standardised deviation. This indicates that the more the citizens know how to use computers the more they perceived the e-government services as ease to use. Thus, Hypothesis 4 is supported.

**Hypothesis 5:** Facilitating Conditions (FCs) have a positive effect on the Perceived Ease Of Use (PEOU) of e-government services in Libya.

The results (refer to table 5-16) showed that the FCs construct had a significant positive influence on PEOU of e-government services (p value was significant <0.05). The standardised direct effect of this construct on PEOU of e-government services was 0.14; which means that, when this construct increases by 1 standardised deviation, PEOU of e-government services increases by 0.14 standardised deviation. This indicates that the more facilitating conditions available to the citizens to use e-government services the more they perceived these services as ease to use. Thus, Hypothesis 5 is supported.

**Hypothesis 6:** Subjective Norms (SNs) regarding the use of e-government services in Libya will have a positive effect on the Perceived Usefulness (PU).

The results (refer to table 5-16) revealed that the SNs construct had a significant positive influence on PU of e-government services (p value was significant p <0.01). The standardised direct effect of this construct on PU of e-government services was 0.17; which means that, when this construct increases by 1 standardised deviation, the PU of e-government services increases by 0.17 standardised deviation. This means that when citizens’ peers or someone important to them suggests that they use e-government services, they increase their perception of the usefulness of these services. Thus, Hypothesis 6 is supported.
**Hypothesis 7:** *Image has a positive effect on the Perceived Usefulness (PU) of e-government services in Libya.*

The results (refer to table 5-16) revealed that the Image construct had a significant positive influence on the PU of e-government services (p value was significant < 0.001). The standardised direct effect of this construct on PU of e-government services was 0.22; which means that, when this construct increases by 1 standardised deviation, the PU of e-government services increases by 0.22 standardised deviation points. This indicates that when citizens believe that using e-government services will enhance their social image, their perception of the usefulness of these services will be increased. Thus, Hypothesis 7 is supported.

**Hypothesis 8:** *Beliefs have a negative effect on the Perceived Usefulness (PU) of e-government services in Libya.*

The results (refer to table 5-16) show that the Beliefs construct had a significant negative influence on PU of e-government services (p value was significant < 0.01). The standardised direct effect of this construct on PU of e-government services was 0.14; which means that, when this construct increases by 1 standardised deviation, the PU of e-government services decreases by 0.14 standardised deviation. This indicates that beliefs play negative impact on the citizens’ perception of usefulness of e-government services. Thus, Hypothesis 8 is supported.

**Hypothesis 9:** *Trust Of the Internet (TOI) has a positive effect on the Perceived Usefulness of e-government services in Libya.*
The results (refer to Table 5-16) revealed that the Trust Of the Internet (TOI) construct did not have a significant influence on the PU of e-government services (p value was not significant at 0.127). Thus, Hypothesis 9 is rejected.

Therefore, overall, these results show that all hypotheses are supported except for H9 (TOI $\rightarrow$ PU).
Table 5-16 Results of hypotheses testing in the Structural Model

<table>
<thead>
<tr>
<th>Hypothesis relationship</th>
<th>Path coefficient</th>
<th>t-value C.R</th>
<th>P</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1 PEOU → ITU</td>
<td>0.25</td>
<td>4.109</td>
<td>***</td>
<td>Yes</td>
</tr>
<tr>
<td>H2 PU → ITU</td>
<td>0.49</td>
<td>7.102</td>
<td>***</td>
<td>Yes</td>
</tr>
<tr>
<td>H3 PEOU → PU</td>
<td>0.47</td>
<td>7.578</td>
<td>***</td>
<td>Yes</td>
</tr>
<tr>
<td>H4 CSE → PEOU</td>
<td>0.35</td>
<td>5.251</td>
<td>***</td>
<td>Yes</td>
</tr>
<tr>
<td>H5 FCs → PEOU</td>
<td>0.14</td>
<td>2.535</td>
<td>*</td>
<td>Yes</td>
</tr>
<tr>
<td>H6 SNs → PU</td>
<td>0.17</td>
<td>2.979</td>
<td>**</td>
<td>Yes</td>
</tr>
<tr>
<td>H7 IMG → PU</td>
<td>0.22</td>
<td>3.691</td>
<td>***</td>
<td>Yes</td>
</tr>
<tr>
<td>H8 Beliefs → PU</td>
<td>-0.014</td>
<td>-2.633</td>
<td>**</td>
<td>Yes</td>
</tr>
<tr>
<td>H9 TOI → PU</td>
<td>0.09</td>
<td>1.526</td>
<td>.127</td>
<td>No</td>
</tr>
</tbody>
</table>

Note: *** supported at p value < 0.001; ** supported at p value < 0.01; * supported at p value < 0.05
5.6.4 Demographic variables’ moderating effects

After calculating and interpreting the results and analysing the hypotheses H1-H9, the following section incorporates the inclusion of the suggested moderator variables into the model to gain further insights.

Multiple group analysis was calculated in a hierarchical approach comparing two sub-samples which were selected according to gender or based on the median split of the respective moderating variables.

This type of analysis has two steps.

- Firstly, the general moderating effect of the moderator on all the links among the eight constructs is examined. This analysis was done by finding the Chi-square difference between a model in which all the eight paths were restricted (constrained model) and a model in which all the eight paths were freed (unconstrained model). This test indicates whether a general moderating effect exists among the eight paths. As shown in table 5-17, gender has a moderating effect at level 0.1, age at level 0.01, education at level 0.01, and Internet experience at level 0.05. Therefore, it can be concluded that all the moderating variables have effects on one or more of the eight paths.

Table 5-17 Chi-square difference between constrained and unconstrained models

<table>
<thead>
<tr>
<th>Gender</th>
<th>Df</th>
<th>$\chi^2$</th>
<th>$\Delta$df</th>
<th>$\Delta\chi^2$</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>678</td>
<td>1090.085</td>
<td>28</td>
<td>39.523</td>
<td>0.073 *</td>
</tr>
</tbody>
</table>
- Secondly, the moderating effect of the moderation for each individual link between two constructs are examined. Each link was constrained separately to be equal across groups, and the $\chi^2$ difference with respect to the general model was calculated. Because these models are nested with the general model having one degree of freedom less than the restricted model, the $\chi^2$-value will always be lower for the general model. If the Chi-square difference between the two models (one degree of freedom) is greater than 2.71 (p=0.1), it indicates with

<table>
<thead>
<tr>
<th></th>
<th>Constrained</th>
<th>General</th>
<th>Constrained</th>
<th>General</th>
<th>Constrained</th>
<th>General</th>
<th>Constrained</th>
<th>General</th>
<th>Constrained</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>706</td>
<td>530</td>
<td>1129.608</td>
<td>897.049</td>
<td>555</td>
<td>949.263</td>
<td>25</td>
<td>52.214</td>
<td>0.001***</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>530</td>
<td>822.362</td>
<td>25</td>
<td>53.267</td>
<td>0.001***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Internet experience</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>530</td>
<td>878.778</td>
<td>25</td>
<td>39.22</td>
<td>0.035**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: * p < 0.1; ** p < 0.05; *** p < 0.01
90% confidence that the two groups are different on this particular path. If the Chi-square difference is greater than 3.81 (p=0.05), this indicates with 95% confidence that the two groups are different. If the Chi-square difference is greater than 6.48 (p=0.01), it indicates with a 99% confidence level that the two groups are different.

The results presented in Table 5-18 show that gender has a moderating effect only on the relationship between SNs and PU.

The results presented in Table 5-19 show that age has a moderating effect on four paths: SNs $\rightarrow$ PU; PEOU $\rightarrow$ PU; PEOU $\rightarrow$ ITU and PU $\rightarrow$ ITU.

The results presented in Table 5-20 show that Education has a moderating effect only on the relationship between PEOU and ITU.

The results presented in Table 5-21 show that Internet experience has a moderating effect only on the relationship between PEOU and ITU.

All these findings for both supported and unsupported hypotheses are reviewed, and their implications are discussed in the "discussion" section.
Table 5-18 Results of Multigroup Analyses (Gender)

<table>
<thead>
<tr>
<th>Hypothesized paths</th>
<th>Male</th>
<th>Female</th>
<th>Subgroup comparison</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>Standardized</td>
<td>C.R</td>
<td>Coefficient</td>
</tr>
<tr>
<td>PEOU $\rightarrow$ ITU</td>
<td>0.32***</td>
<td>0.18*</td>
<td>1.966</td>
<td>1091.003</td>
</tr>
<tr>
<td>PU $\rightarrow$ ITU</td>
<td>0.46***</td>
<td>0.53***</td>
<td>4.716</td>
<td>1090.087</td>
</tr>
<tr>
<td>PEOU $\rightarrow$ PU</td>
<td>0.51***</td>
<td>0.35***</td>
<td>3.577</td>
<td>1090.491</td>
</tr>
<tr>
<td>CSE $\rightarrow$ PEOU</td>
<td>0.42***</td>
<td>0.21</td>
<td>1.921</td>
<td>1092.282</td>
</tr>
<tr>
<td>FCs $\rightarrow$ PEOU</td>
<td>0.10</td>
<td>0.19*</td>
<td>2.055</td>
<td>1090.330</td>
</tr>
<tr>
<td>SNs $\rightarrow$ PU</td>
<td>0.06</td>
<td>0.31***</td>
<td>3.328</td>
<td>1094.316</td>
</tr>
<tr>
<td>IMG $\rightarrow$ PU</td>
<td>0.14*</td>
<td>0.32**</td>
<td>3.124</td>
<td>1091.758</td>
</tr>
<tr>
<td>Beliefs $\rightarrow$ PU</td>
<td>-0.14*</td>
<td>-0.13</td>
<td>-1.484</td>
<td>1090.103</td>
</tr>
<tr>
<td>Hypothesized paths</td>
<td>Young</td>
<td>Old</td>
<td>Subgroup comparison</td>
<td>Result</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------</td>
<td>-----</td>
<td>---------------------</td>
<td>--------</td>
</tr>
<tr>
<td></td>
<td>St. Coefficient</td>
<td>C.R</td>
<td>St. Coefficient</td>
<td>C.R</td>
</tr>
<tr>
<td>PEOU $\rightarrow$ ITU</td>
<td>0.26***</td>
<td>3.968</td>
<td>1.00</td>
<td>-0.768</td>
</tr>
<tr>
<td>PU $\rightarrow$ ITU</td>
<td>0.43***</td>
<td>5.901</td>
<td>-0.11***</td>
<td>4.384</td>
</tr>
<tr>
<td>PEOU $\rightarrow$ PU</td>
<td>0.43***</td>
<td>6.582</td>
<td>0.68***</td>
<td>3.878</td>
</tr>
<tr>
<td>CSE $\rightarrow$ PEOU</td>
<td>0.35***</td>
<td>4.794</td>
<td>0.46**</td>
<td>2.639</td>
</tr>
<tr>
<td>FCs $\rightarrow$ PEOU</td>
<td>0.14*</td>
<td>2.316</td>
<td>0.11</td>
<td>0.738</td>
</tr>
<tr>
<td>SNs $\rightarrow$ PU</td>
<td>0.22***</td>
<td>3.485</td>
<td>-0.2</td>
<td>-0.201</td>
</tr>
<tr>
<td>IMG $\rightarrow$ PU</td>
<td>0.22***</td>
<td>3.387</td>
<td>0.26</td>
<td>1.94</td>
</tr>
<tr>
<td>Beliefs $\rightarrow$ PU</td>
<td>-0.16**</td>
<td>-2.677</td>
<td>0.06</td>
<td>-0.516</td>
</tr>
</tbody>
</table>

Table 5-19 Results of Multigroup Analyses (Age)
Table 5-20 Results of Multigroup Analyses (Education)

<table>
<thead>
<tr>
<th>Hypothesized paths</th>
<th>High</th>
<th>Low</th>
<th>Subgroup comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>C.R</td>
<td>Coefficient</td>
</tr>
<tr>
<td>PEOU $\rightarrow$ ITU</td>
<td>0.16*</td>
<td>2.509</td>
<td>0.55*</td>
</tr>
<tr>
<td>PU $\rightarrow$ ITU</td>
<td>0.61***</td>
<td>7.593</td>
<td>0.11***</td>
</tr>
<tr>
<td>PEOU $\rightarrow$ PU</td>
<td>0.39***</td>
<td>5.808</td>
<td>0.63***</td>
</tr>
<tr>
<td>CSE $\rightarrow$ PEOU</td>
<td>0.29***</td>
<td>3.86</td>
<td>0.29***</td>
</tr>
<tr>
<td>FCs $\rightarrow$ PEOU</td>
<td>0.17**</td>
<td>2.646</td>
<td>0.06**</td>
</tr>
<tr>
<td>SNs $\rightarrow$ PU</td>
<td>0.22***</td>
<td>3.431</td>
<td>0.09***</td>
</tr>
<tr>
<td>IMG $\rightarrow$ PU</td>
<td>0.21**</td>
<td>3.102</td>
<td>0.30**</td>
</tr>
<tr>
<td>Beliefs $\rightarrow$ PU</td>
<td>-0.18**</td>
<td>-2.926</td>
<td>0.02**</td>
</tr>
</tbody>
</table>
Table 5-21 Results of Multigroup Analyses (Internet experience)

<table>
<thead>
<tr>
<th>Hypothesized paths</th>
<th>High</th>
<th>Low</th>
<th>Subgroup comparison</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>**C.R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEOU ( \rightarrow ) ITU</td>
<td>**0.17</td>
<td>2.57</td>
<td>***0.57</td>
<td>4.273</td>
</tr>
<tr>
<td>PU ( \rightarrow ) ITU</td>
<td>***0.55</td>
<td>6.848</td>
<td>0.22</td>
<td>1.633</td>
</tr>
<tr>
<td>PEOU ( \rightarrow ) PU</td>
<td>***0.41</td>
<td>5.901</td>
<td>***0.58</td>
<td>4.791</td>
</tr>
<tr>
<td>CSE ( \rightarrow ) PEOU</td>
<td>***0.36</td>
<td>4.403</td>
<td>0.18</td>
<td>1.33</td>
</tr>
<tr>
<td>FCs ( \rightarrow ) PEOU</td>
<td>0.09</td>
<td>1.456</td>
<td>**0.25</td>
<td>2.07</td>
</tr>
<tr>
<td>SNs ( \rightarrow ) PU</td>
<td>**0.13</td>
<td>2.067</td>
<td>**0.29</td>
<td>2.714</td>
</tr>
<tr>
<td>IMG ( \rightarrow ) PU</td>
<td>**0.21</td>
<td>3.07</td>
<td>**0.36</td>
<td>3.045</td>
</tr>
<tr>
<td>Beliefs ( \rightarrow ) PU</td>
<td>**-0.17</td>
<td>-2.778</td>
<td>0.03</td>
<td>0.303</td>
</tr>
</tbody>
</table>

Note: *p<0.05 , ** p<0.01 , *** p<0.001
5.7 Summary

The main purpose of this chapter was to report the results of the data analysis undertaken to test the proposed model. Firstly, methods used to prepare the survey for statistical analysis were presented. The response rate of the survey, the respondent characteristics, and the descriptive analysis of the variables used in this research were presented. Furthermore, the chapter presented the SEM analysis starting with an assessment of the measurement model. The reliability and validity of the measurement model were investigated. All constructs showed acceptable internal reliability and validity. In addition, the assessment of the structural model was presented. The results showed that the model had a good fit of data. Finally, the results of the study’s hypotheses tests were presented; with all hypotheses supported except for Hypothesis 9 (TOI \(\rightarrow\) PU). For the moderating effect of demographic variables, gender was found to moderate only the relationship between SNs and PU, age had a moderating effect on four paths: SNs \(\rightarrow\) PU; PEOU \(\rightarrow\) PU; PEOU \(\rightarrow\) ITU and PU \(\rightarrow\) ITU, and both education and Internet experience moderated only the relationship between PEOU and ITU.
Chapter 6 DISCUSSION AND CONCLUSION

6.1 Introduction

The primary purpose of this research was to develop and test a model to identify and assess the factors and their relationships that influence citizens to adopt e-government services in Libya. With the availability of the findings of the present study, optimisation, future projects, upgrades and infrastructure planning can benefit hugely. Such research will also assist e-government practitioners in determining which antecedent to focus on to increase the adoption rate of e-government. As mentioned earlier, there was no prior data available from the Libyan perspective, and this research is expected to play an important role in the further shaping and development of e-government systems.

Moreover, unlike most previous studies, the sampling frame for this research took into account the participation of all segments of society (as mentioned in the demographic profiling section). The sample included all ages and educational levels, as well as geographically spread participants, thereby being representative of Libyan citizens and which in turn aid the relevance to a discussion of the results’ implications for practice.

6.2 Discussion and conclusion

According to the results of the present research through the SEM analysis, it is found out that the Perceived Ease Of Use of e-government services was affected by Computer Self-Efficacy and Facilitating Conditions. However, Computer Self-Efficacy had the strongest influence on Perceived Ease Of Use as shown in the figure of 0.35 - the highest path coefficient. Perceived Usefulness was affected by Image,
Subjective Norms, Beliefs, and Perceived Ease Of Use with Perceived Ease Of Use having the strongest effect (0.47). Both Perceived Usefulness and Perceived Ease Of Use contribute towards Intention To Use. Following is a detailed explanation of each of the research hypothesis and their implications.

Discussion of Relationships and Suggestions to e-government System Developers/Implementers:

Hypothesis 1: Perceived Ease Of Use (PEOU)  Intention To Use (ITU) e-government services

Perceived Ease Of Use (PEOU) of e-government will positively influence the Intention To Use (ITU) these services in Libya.

Discussion in Accordance with Previous Research Findings:

Numerous researchers have found a similar relationship to this finding from the present research. It is consistent with a study by Al Hujran, Aloudat, and Altarawneh (2013). Also, during their study of health information technology acceptance, (Kim & Park, 2012) found this relationship between Perceived Ease Of Use and Intention To Use to be supported. In his study on Internet banking, (Amin, 2007) also observed the abovementioned relationship. Research results for PEOU-ITU were found by (Ramayah & Ignatius, 2005; Tarcan, Varol, & Toker, 2010).

Implications for the Libyan Context:

The more, Libyan users perceive e-government websites and services as being easy to understand and easy to use, the more they will intend to use them. This finding suggests that the government should, therefore, launch its services and information in an easy-
to-navigate manner by ensuring simplicity yet ensuring effectiveness. Transaction
tasks and navigating websites should be assisted with relevant tips and decision
questions to save time and move the user in the right direction. This is aimed at making
systems user-friendly and enabling the quick location of information.

Additionally, this finding suggests that the Libyan government should take into
consideration ease of use when designing the interfaces of the services they are willing
to implement. This could be done by designing their e-government services to be
compatible with others with which the target users may be familiar (e.g. Online forms
could mimic as much as possible paper forms currently in use). Also, the government
could make a difference by providing support and training citizens in the use of e-
government services, such that their level of perceived ease of use may increase over
a period of time.

Hypothesis 2: Perceived Usefulness (PU) \(\rightarrow\) Intention To Use (ITU)

Perceived Usefulness (PU) of e-government services will positively influence the
Intention To Use (ITU) these services in Libya.

Discussion in Accordance with Previous Research Findings:

The Perceived Usefulness factor had a significant influence on the Intention To Use e-
government services factor. The questionnaire findings from the present research are
consistent with prior research results that confirm the effect of Perceived Usefulness
on citizens' intention to use e-government services (Al Hujran et al., 2013; Chang et
al., 2005; Phang, Li, Sutanto, & Kankanhalli, 2005). Research results are also
consistent with findings from Tarcan et al. (2010). In his study on Internet banking,
Amin (2007) also observed this relationship. However, it is inconsistent with some
previous work in which Perceived Usefulness was not a significant predictor of Intention to Use. On their study of online tax services in Taiwan, L. Wu and Chen (2005) found that Perceived Usefulness was insignificant predictor of Intention to use on-line tax. However, Perceived Usefulness was found to have indirect influence on behavioural intention to use via the mediator, attitude toward using on-line tax. They explained the reason behind that as the on-line tax context in their study was focused on the stage of the initial adoption and voluntary use in tax declaration, and users’ positive Perceived Usefulness in this case may not immediately lead to a behavioural intention to use, rather than firstly form a favourable attitude to use on-line tax.

**Implications for the Libyan Context:**

Above discussion suggests that the Libyan government should strive to provide e-government services that are centred around the needs of users. Users can be engaged to participate in the development of these services, as this is proven to deliver positive results in terms of acceptance and use of technology. Investigations should be undertaken to identify the needs of citizens prior to embarking on the execution of projects that may otherwise not be seen as useful by citizens. Moreover, the government should publicise to its citizens the advantages of using e-government services as an alternative to other means of interacting with government agencies. Citizens appear to be more inclined to utilise e-government services if these services offer improvements or advantages, such as in terms of convenience, ease of use, cost saving or faster delivery of services. Hence, governmental agencies should communicate the benefits of using electronic services to the citizens to attract non-adopters. Advertisements and awareness campaigns on television, newspapers and
government agencies websites may convince the citizens to adopt e-government systems more rapidly.

**Hypothesis 3: Perceived Ease Of Use (PEOU) \(\rightarrow\) Perceived Usefulness (PU)**

Perceived Ease Of Use (PEOU) of e-government services will positively influence the Perceived Usefulness (PU) of these services in Libya.

Perceived Ease Of Use of e-government services in Libya had a significant influence on Perceived Usefulness.

**Discussion in Accordance with Previous Research Findings:**

This finding is consistent with prior TAM research results (Davis, 1989) and e-government adoption research (Al Hujran & Shahateet, 2010; Wangpipatwong et al., 2008). This result suggests that the easier the e-government services are to use; the more useful citizens will perceive it to be. An implication of this finding is that government agencies should pay attention to ease of use when designing their services. Some accepted methods to increase perceived ease of use are mentioned in the discussion of Hypothesis 2.

The results of Hypothesis 1, Hypothesis 2, and Hypothesis 3 indicate that the TAM model is applicable to explaining citizens' intention to use and perceived usefulness of e-government services in the Libyan context.

**Implications for the Libyan Context:**

It is an important aspect to consider by relevant government authorities. If users perceive that it easy to use government e-services, they will also perceive them to be more useful. In line with the previous discussion, the government by giving priority to
ease of use when designing and implementing its services might help to raise the level of perception of the usefulness of that services.

**Hypothesis 4: Computer Self-Efficacy (CSE) → Perceived Ease Of Use (PEOU)**

Computer Self-Efficacy has a positive effect on the Perceived Ease Of Use (PEOU) of e-government services in Libya.

**Discussion in Accordance with Previous Research Findings:**

The Computer Self-Efficacy factor had a significant influence on the Perceived Ease Of Use. This is consistent with previous findings regarding the impact of high self-efficacy on Perceived Ease Of Use. While studying self-service banking technologies focusing on senior consumers, Rose and Fogarty (2006) found the same relationship. In a study by Amin (2007), a similar result for a population consisting of young individuals was found. Y.-S. Wang, Wang, Lin, and Tang (2003) also found a hypothesis in their research to be proven for this relationship. However, the finding is inconsistent with Wangpipatwong et al. (2008). This is likely to be due to a difference in the population under study who all had at least bachelor’s degree and some experience with e-government systems so the comparisons amongst the groups in this population could possibly be due to effects such as high Computer Self-Efficacy users being critical of particular applications or interfaces: and their findings, therefore, cannot be generalised to a broader population consisting of a range of demographic backgrounds and education levels.

**Implications for the Libyan Context:**

This knowledge presents the government with an opportunity to launch efforts to increase IT literacy. With increased literacy, Computer Self-Efficacy would increase,
resulting in higher levels of Perceived Ease Of Use which would accordingly increase Intention To Use and result in higher acceptance and use of e-government systems.

**Hypothesis 5: Facilitating Conditions (FCs) → Perceived Ease Of Use (PEOU)**

Facilitating Conditions have a positive effect on the Perceived Ease Of Use (PEOU) of e-government services in Libya.

**Discussion in Accordance with Previous Research Findings:**

Consistent with past research, the Facilitating Conditions factor was found to be a significant predictor of Perceived Ease Of Use. This finding accords with the research of (Tarcan et al., 2010; Taylor & Todd, 1995b) that both found a relationship between Facilitating Conditions and Perceived Ease Of Use. In their study on e-filing, Ramoo, Ramayah, Lo, and Ping (2013) also found the above-mentioned relationship to be valid.

**Implications for the Libyan Context:**

This finding suggests that the government should upgrade IT infrastructure and provide the population with the required resources to use e-government systems. Such resources could include both at-home and external facilities (e.g. public places for using e-government systems, such as libraries etc.).

**Hypothesis 6: Subjective Norms (SNs) → Perceived Usefulness (PU)**

Subjective Norms (SNs) regarding the use of an e-government service in Libya will have a positive effect on the Perceived Usefulness.

**Discussion in Accordance with Previous Research Findings:**
The findings confirm that there is a significant influence of citizen's subjective norms on their perceived usefulness of e-government services. The finding of a significant effect of Subjective Norms on Perceived Usefulness accords with the research finding of (Alryalat, Dwivedi, Williams, & Rana, 2013; Venkatesh & Davis, 2000). While studying software adoption in the Middle East, Monzavi, Zarei, and Ghapanchi (2013) also observed this relationship. Other Middle-Eastern research has also found similar results (C. Anderson et al., 2008; Yaghoubi, 2010).

However, the finding for Hypothesis 6 does not accord with the findings from some research studies conducted in other geographical zones e.g. Greece (Zafiropoulos et al., 2012), South Africa (Maduku, 2014). This highlights the facts that impact of Subjective Norms on Perceived Usefulness varies from one population to other and may be impacted by factors affecting Subjective Norms of a population and reasons that shape it. Generally, research in Middle-East shows a positive impact, as was found through this research (Alryalat et al., 2013; C. Anderson et al., 2012; Monzavi et al., 2013). This argument is further complemented by the explanation provided for such results by Tan (2011, p. 69) regarding the impact of Saudi cultural aspects on Subjective Norms. According to Tan, Saudi Arabia has a culture that values collective achievement and interpersonal relationships. In such a culture, the lack of emphasis on individual achievement and the great importance attached to collective achievement and collective success provide an additional justification for anticipating a strong relationship between subjective norms and behavioural intentions (Tan, 2011, p. 69).

Some other factors to consider are the determinants and factors behind Subjective Norms. In their research, Shen, Laffey, Lin, and Huang (2006) tested social influence from various angles and found some sources of Subjective Norms to be more
influential than others. On the other hand, some Subjective Norms factors were found to be non-impacting, which also supports above discussion on this relation.

A. Alzahrani (2011) examined the influences that form Subjective Norms and found that family influence had a lesser role to play than the influence of friends and the media.

**Implications for the Libyan Context:**

Based on the above discussion, the government can work on influential factors in society and seek their support in implementing e-government systems. In achieving this, many companies use the concept of brand ambassadors, relying on key influential figures to represent their products, such as websites. This would mainly be done through communication and marketing interventions.

**Hypothesis 7: Image → Perceived Usefulness (PU)**

Image has a positive effect on the Perceived Usefulness (PU) of e-government services in Libya.

**Discussion in Accordance with Previous Research Findings:**

Image was found to have a positive influence on Perceived Usefulness. This result is similar to the findings highlighted by (Chong & Chan, 2012; Tan, 2011). Other Middle-Eastern studies e.g. C. Anderson et al. (2008) also reveal the same relationship. However, this finding for Hypothesis 7 does not accord with the findings from some studies conducted at other geographical locations, e.g. Greece (Zafiropoulos et al., 2012). This highlights the fact that impact of Image on Perceived Usefulness varies from one population to other.
Implications for the Libyan Context:

From this, it can be concluded that e-government services should be prepared in a way that uplifts the image of its users in their own eyes and others. This should increase the Perceived Usefulness of e-government services and ultimately result in higher intention to use, thereby contributing to greater acceptance and use.

**Hypothesis 8: Beliefs→ Perceived Usefulness (PU)**

Beliefs have a negative effect on the Perceived Usefulness (PU) of e-government services in Libya.

**Discussion in Accordance with Previous Research Findings:**

It was found that beliefs also impact Perceived Usefulness (PU) as hypothesised.

- Respondents generally showed a negative impression towards the e-government system. This could have been due to past bad experiences and the general tendency towards resistance to change in the initial stages of implementation.

- Respondents indicated their preference not to use the Internet because of immorality issues which are displayed on the Internet. This is likely to have been based on a general perception that has been formed by this type of use of the Internet or may even in some cases be based on past experiences of unintentionally finding content perceived to be immoral (Alomari, 2014).

- There is also a belief that paperwork based on the system are more useful and reliable as compared to Internet based systems (Alomari et al., 2010). As with above two points, this is also linked to past experience and is expected to change once systems get used more in future.
- Results from this research are consistent with findings from Alomari et al. (2010). While researching medical innovation management among type 1 diabetes patients and physicians, Uncu (2014) studied a number of various beliefs and their impact on perceived usefulness. Results of his research indicate that different beliefs have different impacts. Four out of 6 beliefs tested on patients were consistent with finding of this research on patients’ side. For physicians, 2 out of 4 beliefs tested had a positive relation. This leads us to the conclusion that impact of belief on perceived usefulness varies from population to population and from belief to belief.

Implications for the Libyan Context:

Above discussion suggests decision makers and developers of e-government systems to give special factors to aspects that can have relation to prevalent beliefs and society values. Anything is a contradiction to common beliefs can potentially result in system rejection and low acceptance.

Hypothesis 9: Trust of the Internet (TOI) $\rightarrow$ Perceived Usefulness (PU)

Trust of the Internet (TOI) has a positive effect on the Perceived Usefulness of e-government services in Libya.

Additionally, contrary to the expectation, Trust on the Internet (TOI) is found to have no effect on Perceived Usefulness of using e-government services.

Discussion in Accordance with Previous Research Findings:

This is consistent with previous findings by Alomari, Woods, and Sandhu (2012).
This finding could be due to the fact that there is not much past experience with the respondents to shape opinion about Trust Of the Internet. This finding may change over a period of time as users experience various situations and scenarios related to Trust Of the Internet.

Above argument is supported by results presented by AlAwadhi and Morris (2009), where the participants in their sample who had prior experience with systems similar to e-government system -Internet banking and e-commerce- were more confident in using the Internet as a mediator for e-government.

**Implications for the Libyan Context:**

Over a period of time, to increase and sustain technology use, the government should proactively focus on developing trust on the Internet and ensuring higher security in transactions in addition to establishing reliable systems and infrastructure.

To sum up, the analysis of the empirical data indicates the following actions from Libyan government will have implications for successful adoption of e-government services in Libya: launched its services in ease to use manner, provide services that are centred around the need for the users, identify to its citizens the advantages of using e-government services as an alternative to other means of interacting with its government agencies, launch efforts to increase Information Technology literacy, provide people with required resources to use e-government, and give special concerns to aspects that can have relation to prevalent beliefs in the Libyan society.
6.3 Demographic Variables:

Gender:

**Hypothesis 10: Gender moderates the relationships between the constructs of the adoption Model.**

Additionally, the results of this research suggest that gender is not an important moderating factor in most of the relationships between research variables, except for the relationship between Subjective Norms and Perceived Usefulness.

**Discussion in Accordance with Previous Research Findings:**

For women, Subjective Norms is a direct determinant of Perceived Usefulness to a greater extent than for men. This can be explained from the cultural point of view where women in Libya generally consider themselves more interdependent. On the contrary, men are thought to be more independent, as explained by Cross and Madson (1997).

Moreover, women are more likely to be influenced by the opinions of others and their social structure. Consequently, the decision of adopting new technologies and services is more likely to be affected by social influence for women than men (Venkatesh & Morris, 2000; Venkatesh et al., 2003). According to Venkatesh and Morris (2000), Subjective Norms had an effect on women's decisions at the initial stage of technology introduction.

Results from the present research are consistent with Mardikyan, Beşiroğlu, and Uzmaya (2012) who also observed that there is no significant difference between male and female respondents and their intention to use the technology they were exploring.
Implications for the Libyan Context:

The above conclusion presents government with an opportunity to work on shaping those social norms positively which can favourably impact of adoption of e-government system by women. It can accordingly be taken care of in communication/marketing campaigns.

Age:

Hypothesis 11: Age moderates the relationships between the constructs of the adoption Model.

Important relations and findings with regards to age are as follows:

- Subjective Norms → Perceived Usefulness; The moderating effect of Subjective Norms on Perceived Usefulness is higher for younger participants as compared to older.

- Perceived Ease Of Use → Perceived Usefulness; The moderating effect of Perceived Ease Of Use on Perceived Usefulness is higher for older than younger.

- Perceived Ease Of Use → Intention To Use; Perceived Ease Of Use has more influence on Intention To Use for older people than younger.

- Perceived Usefulness → Intention To Use; Perceived Usefulness has more influence on Intention To Use for younger people than older.

Implications for the Libyan Context:

From the above findings, the following conclusions can be made which can benefit the government in its decision-making regarding e-government systems:
- Younger population is influenced more by Subjective Norms. This presents government with an opportunity to focus its interventions from Subjective Norms point of view on youth and ensure higher acceptance and usage of the e-government system by this Workgroup.

- Elder population weighs the usefulness of the system from perceived ease of use point of view. This presents government with an opportunity to focus more on training for this age group in order to enhance their acceptance and technology use. We also see that if they consider a system easy-to-use, their intention to use technology would be enhanced which further highlights the importance of keeping systems simple and user-friendly, and to ensure an appropriate level of training to increase Perceived Ease Of Use.

- We see that Perceived Usefulness has a stronger relation with the Intention To Use. This presents government with an opportunity to explain potential uses and benefits of systems clearly to the younger population, which would enhance their intention to use the system. Marketing/communication efforts can be targeted accordingly.

**Education:**

**Hypothesis 12: Education moderates the relationships between the constructs of the adoption Model.**

Education moderated only the relationship between Perceived Ease Of Use and Intention To Use. The moderating effect of Perceived Ease Of Use on Intention To Use is significantly higher for people with higher level of education than for lower.

**Discussion in Accordance with Previous Research Findings:**
Rogers (2003) found that usage intention varies with the level of education and results for various sub-groups from the sample (e.g. those who graduated from high school, those with a bachelor degree, and those with Masters/ PhD) could be differentiated from each other according to relations being explored in research. Research conducted at Jordan partially agrees with our findings where education was observed to have a direct relation to user’s intention to use e-government system for acquiring information. However, it did not have a significant impact on Intention To Use for performing transactions (Almahamid, Mcadams, Al Kalaldeh, & Al-Sa’eed, 2010).

**Implications for the Libyan Context:**

This gives an indication that citizens with higher education may adopt the services earlier than those with lesser education due to the fact that they have a higher Perceived Ease Of Use which also translates to Intention To Use.

**Internet experience:**

**Hypothesis 13: Internet experience moderates the relationships between the constructs of the adoption Model.**

**Discussion in Accordance with Previous Research Findings:**

Internet experience moderated only the relationship between Perceived Ease Of Use and Intention To Use. The moderating effect of Perceived Ease Of Use on Intention To Use is significantly higher for people with higher Internet experience than for lower experience. Perceived Ease Of Use has been proposed to be important in influencing Intention To Use for older users and users with less experience (Sun & Zhang, 2006).

**Implications for the Libyan Context:**
To ensure that government services are reached by all citizens, the government must provide suitable delivery channels to users (such as public kiosks, public centres and Internet cafés). These channels could benefit users who cannot use the online system and overcome any social injustice impressions among citizens. Moreover, the government must provide training in computers, devices and Internet use as well as deployment of simple mobile device apps that facilitate use for inexperienced users of e-government functions.

6.4 The Contribution

The present research provides three main contributions to knowledge:

First, the present research is unique in the Libyan context because it focuses on the user’s perspective, which can serve as a starting point for other e-government adoption researches both in Libya and other Arab countries. The majority of previous studies have focused on developed countries, and hence, due to the large cultural differences between Arab countries such as Libya and those previously studies, the results from these studies may not be relevant in an Arabian context.

Second, the present research has contributed to the body of knowledge on technology adoption literature and tested proposed integrated model, which integrated Technology Acceptance Model and Diffusion Of Innovation theory, in Libyan context.

Thirdly, the practical implication of this research is that it can be helpful for government policy and decision makers in the design and implementation of e-government services in Libya and other developing countries. Similarly, future
research on technology adoption in Libya in the later stages of implementation can also benefit from this research.

6.5 Research Limitations

This research is not free of limitations. Following are some of the factors that need to be considered while utilising this research into e-government systems in Libya:

- This research has been conducted in the initial stages of e-government services roll-out. Over the last 15 years, there has been a tremendous increase in the uptake of e-government systems. Therefore, it can be predicted that once e-government services get well established, adoption of the services will happen on larger scales. The data and results of this thesis will then need to be re-validated.

- This research is based on positivist quantitative approach. Future researchers may adopt other techniques (e.g. interpretive qualitative approaches etc.) to increase the understanding of relevant factors affecting the use of e-government services. Qualitative research may identify more factors and other existing relationships.

- This research was conducted mainly in metropolitan areas of Tripoli and Tarhouna where the Internet and other services are readily available. However, a smaller percentage of the population lives in rural areas which may see the adoption of e-government services in a completely different context and may have a very different portfolio of service availability for them depending on infrastructure and other relevant factors. Though the geographical scope of this research included some rural areas, further investigation may be required specifically for rural areas.
- As mentioned earlier, Libya as an e-government adoption case has not been sufficiently researched before. Therefore, there is a necessity for more empirical studies to investigate the cultural and structural issues that inhibit the adoption of information communication technology within Libyan context.

- This research used modified TAM model. Studies based on other models may be used to verify or re-interpret results from this research.

6.6 Future Research

Some of the potential focus areas for future research are as follows:

- Analysis of additional moderating variables, e.g. geographical location (within Libya), income level, the level of interaction with government departments, etc. These moderating variables could explain more about the relationships between the factors in this research’s model. For example, the geographical location could explain if there are any differences between the people who live in urban area and the people who live in rural area, where the distances involved to obtain face-to-face services are longer than in an urban environment, in terms of their perception of the usefulness of e-government service. Also, the income level of an individual could affect the relationship between their perception of usefulness and their intention to use e-government services. The level of interaction required to interact with government departments could also explain more about users’ intentions to use e-government services. People who do intend to the services to acquire information may simultaneously reject using the services to make transactions requiring their personal information to complete the transaction.
- The influences contributing to Subjective Norms (SNs) could be investigated in more detail, particularly in regards to changing norms to encourage adoption of e-government services. Studies trialling intervention methods to change norms could also be included.

- The Libyan government policies and practices could be compared with recommendations highlighted in this research.

- A further breakdown of the ‘beliefs’ factor could be investigated; followed by segregation of significantly contributing beliefs from the non-significant ones. Studies trialling intervention methods to change beliefs in relation to this issue could also be included.

- Analysis of change in various factors considered in this research over a period of times (as it is anticipated that some factors (e.g. Trust Of the Internet etc.) and moderators (e.g. Gender etc.) will yield different results over a period of time.

- Facilitating Conditions needs to be broken down further in future research to enable identification of present key requirements to allow developers and implementers of e-government systems to focus their energies on a direction where it is most required.

- Future research could also profile the population as per the 5 stages of adoption, as suggested by, and identify any changes over time, and the processes and timeframes for those changes.
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