

GE-Government: Factors Influencing the E-Government Citizens'
Adoption in Relation to the Geographic Information

By

Hassan Dennaoui

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Department of Management & Management Information System
University of Nicosia

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ABSTRACT

E-government, as per The World Bank Group (2004), encompasses the use of E-government services that transform relations with citizens, businesses, and other arms of government. The e-government services 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. E-government employment may lead to less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions. Studies on the subject have been conducted in different contexts including developed countries (O'Reilly 2005, Siau and Long 2005, Frank 2004, Siau and Tian 2004, Davidrajuh 2003) as well as in developing countries (Kurunananda and Weerakkody 2006, Heeks 2002).

A reoccurring theme in many studies is the development and examination of adoption models for e-government initiatives, which are based on adoption theories (Rogers 1995, Venkatesh et al. 2003, Davis 1989). As substantiated by the extensive literature review we have conducted, proposed e-government adoption models, that study the impact over the users' adoption for the government e-services, have not taken under consideration the influence of Geographic Information, defined by Goodchild (1997, 2010) as the location or information linked to a place or property on or near Earth and the knowledge about the location of something and its description at a specific time or time interval. The GI is characterized by its two components: the geographical information system (GIS) which provides the geographic information with "the infrastructure, tools and methods for tackling real world problems within acceptable timeframes" (Maguire, 2010:2) and the geographic information science (GIScience) which allows us to

consider the philosophical, epistemological and ontological contexts of geographic information” (Maguire, 2010: 2).

Recently, GI has been used widely in advanced Information Systems and e-services, like E-land Administration System, E-tourism System, Disaster Management System and many others, to provide the potential users with advanced usability, flexibility, usefulness, and information accuracy while at the same time maintaining less complexity. Therefore, GI coupled with relevant tools and applications are expected to influence interactions among different stakeholders in various societal settings over the time (Goodchild and Palladino 1995).

In this research, we adopted the secondary data research – systematic literature review– where more than 500 journals, articles, books, reports, etc... related to the e-government, technology adoption and geographic information subjects have been reviewed in order to get better understanding of the overall thesis subject. The e-government has been covered in detail from different perspectives including available definitions, dimensions, staging theories, maturity models, benefits, and barriers. Moreover, we identified 13 well known adoption theories including the main technology adoption ones such as the Diffusion of Innovations (Rogers, 1995), The Diffusion and Rejection of Innovations (Abrahamson, 1991), Technology Acceptance Model – TAM (Davis 1985), Unified Theory of Acceptance and Use of Technology – UTAUT (Venkatesh et al. 2003), Technology Organization and Environment Framework – TOE (Tornatzky and Fleischer 1990). Furthermore, the literature review identified and described in detail sixteen (16) e-government citizens’ adoption models based on well known Technology Adoption theories in addition to the researchers’ identified E-government adoption influential factors.

The geographic information has been covered from various perspectives including its definition, components and adoption over various e-government application and services where we highlighted the GI influence over some e-government citizens' adoption influential factors.

Based on the literature review findings, we could identify the research gap, objectives, questions, hypotheses and proposed the GE-government framework, new GI based e-government citizens' adoption framework using the Technology Adoption Model – TAM (Davis, 1989) as the basis in addition to the identified social and demographic influential factors, to be tested within the Lebanese context considered as our research case study. Accordingly, the quantitative primary data research – structured questionnaire survey has been adopted in the research methodology. This structured questionnaire survey method helped the author in getting response to the research objectives and questions, testing the GE-government framework, accepting/rejecting the proposed hypothesis in order to reach a final GE-government framework that specifies the e-government citizens' adoption influential factors and highlighted the exact role of the geographic information over the E-government adoption.

Keywords: Geographic Information, Geographic Information System, Digital Government, E-government, E-services, GE-government, Adoption

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DECLARATION

“I declare that the work in this thesis was carried out in accordance with the regulations of the University of Nicosia and is original except where indicated by specific reference in the text. This thesis has not been presented or submitted to any other education institution in Cyprus or overseas. Any views expressed in the thesis are those of the author and in no way represent those of the University.”

Hassan Dennaoui



UNIVERSITY of NICOSIA

PUBLICATIONS

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Chapter 1: Introduction

During the last 4 decades, the Information System researchers studied and explored the various factors that have impact on enhancing the citizens' usage of the e-government services. Moreover, governments built their e-government development plans as well as their e-services based on the researchers' recommendations with a main objective of reaching out the maximum benefits to citizens. With more than 15 years of experience and observations in the technology domain, especially in the online services development and the geographic information deployment dealing with various governmental authorities in the Middle East, Europe and the United States, I realized that the majority of the authorities have considered development strategies and implementation plans in there IS to provide online and electronic services enabled with mapping services (named under geo-enabled e-services). Those authorities believe in the capability of the geographic information, especially after the huge arise of the Google map services in the early 2000, to attract citizens to use more frequently their e-services. They consider that the geo-enabling of the e-services will improve its simplicity, appealance, accuracy and effectiveness.

This progress or change in the governments' strategies along with the appearance of a growing complimentarity relation between the e-government and the mapping services motivated the author to study the potential relation between e-government & geographic information, and the real influence of the geographic information on citizens to increase their ability and willingness to adopt the e-government services.

In this chapter, we will provide an introduction to the full research area. In the upcoming sections, we will provide an overview of the electronic government and the geographical information, and describe the research aim, objectives and questions. The study context

(Lebanon) will be then described in section 5. The significance of the study as well as the research structure will be described in the sections 6 & 7. We will end up with a summary of Chapter One.

1.1 Research Context Background

The electronic and digital services have been offered by government authorities and public agencies since more than three decades in order to improve the government operations (Smith, 1985; Toth, 1984). They have evolved throughout multiple stages since the early 90s with the web expansion till today. Many e-government initiatives were launched by several developed countries in the 90s (Grönlund *et al.*, 2005; Grönlund, 2001) followed by the developing countries which started their initial e-government implementations in the beginning of the 21st Century (Kurunananda and Weerakkody, 2006; Heeks, 2002).

Huge governments' investments and efforts have been put in order to provide citizens with the most effective, efficient, easy to use, useful, reliable, accessible and trustful e-services to guarantee a minimum level of citizens' satisfaction. However, the e-government citizens' adoption has been a major concern. Many researchers, from developed and developing countries, have studied the e-government citizens' adoption and explored many factors that could have an influential role over the citizens' intention to adopt the government e-services. Accordingly, many models have been developed based on existing adoption theories, such as Technology Adoption Model – TAM (Davis, 1985) and Diffusion of Innovation (Rogers, 1995), associated with the identified potential influential factors, such as trustworthiness, attitude, website design and many other social and demographic factors.

In the last four decades, the geographic information (GI) concept, known as map or location based information, has been widely implemented by governments in developed and developing

countries to facilitate their internal operations. Since 2005, mainly with the official launch of Google maps and the fast evolution of the Google online map services, such as Google online Maps, Google Navigator, Google Earth, etc..., and later on with Esri, Bing, Nokia Here and other companies online map services, the public and the private sectors have taken the decision to invest in the geo-enabling of many of its offered e- services to the public. O'Looney (2000) stated that the GI will start soon to be used widely in the public sector through a geo-enabling of its applications. Kurwakumire (2013) indicated that the geo-enabling of those applications responded effectively to the citizens' needs and facilitate their interaction with the government.

Therefore, the private sector has offered various online applications such as hotel and car rental booking, point of sales & transportation route for banks, shopping malls, stores and retail, marketing of properties and lands for the real estate and many other e-services, whereas the public sector developed and provided multiple interesting and useful government e-services such as E-Land Administration, Online Disaster Management System, E-Tax, Web GI Transportation Information System, Complaints Management System, E-public Participation, E-tourism, E-Election, etc....

With the increasing level of citizens' use and adoption of the mapping and geo-enabled e-services that exceed one billion users in 2016 according to many agencies such as Google, TechCrunch and other statistics agencies, the author found that is necessary to assess the potential role of the geographic information as an additional factor having influence on the citizens' intention to adopt the government e-services and also explore the potential relation between the GI and other influential factors.

Given the aforementioned, in chapter two– literature review on the e-government system including definitions, dimensions, staging theories and maturity models, benefits and

barriers/challenges– the author provided an overview of the main Adoption Theories, identifying the main e-government technology adoption models. Furthermore, the literature review covered the geographical information (GI) from all its aspects including its definition and applications in addition to the GI implementation's benefits, and finally identified the GI adoption role as an enabler of the e-government services.

As a result of chapter two findings, a conceptual GE-government (GI based e-government) citizens' adoption framework was developed and tested, taking the Lebanese context as the case study, according to a very well-defined, structured and clear methodology. This framework covered the different e-government adoption influential factors including the technology adoption theory (TAM), social and demographic in addition to the GI potential factor.

In the next sections, we will brief on the e-government adoption theories and the Geographical Information topics and then present our research aim, objectives and questions, followed by a summary of the Lebanese context and the importance of this study.

1.2 Overview of E-Government

As per the World Bank Group definition (2004), the e-government essential role is to transform the relations between government, citizens and businesses and improve their interactions. The three main e-government dimensions are: (i) Government to Government – G2G which reflects the nature of interconnectivity within the governments' entities, between local, regional and national governments' authorities as well as at the international level with other countries' governmental agencies (Jaeger, 2003), (ii) Government to Business – G2B which reflects the relationship between the government and the private sector especially for the activities related to the supply and purchase of products, including goods and services to and from the government (Jaeger, 2003) and (iii) Government to Citizens – G2C that aims to provide better governmental

services to the citizens, such as income taxes, job search, social security, and simplify the communication between government authorities and the public (Fang, 2002; Bonham *et al.*, 2001). Some additional special dimensions were also defined such as Government-to-Nonprofit – G2N & Government-to-Employee – G2E (Fang, 2002) and Government-to-Civil Societal Organizations – G2CS & Citizen-to-Citizen – C2C (Yildiz, 2003). In this research, we focused on the G2C dimension as part of the required reviews on the e-government citizen adoption.

Moreover, the assessment of the e-government evolution in any country requires an understanding of its implementation maturity according to a well-defined stage based model that identifies the current level of the e-government implementation within the overall maturity model to avoid future failures and propose preventive solutions in order to reach out the highest maturity stage (Irani *et al.*, 2006; Gupta and Jana, 2003; Layne and Lee, 2001). Accordingly, multiple e-government stage models have been proposed by governments, consultants, researchers and academics. All the well-known maturity models vary from 2 to 6 stages and most of them focus on the four distinct main stages: presence, interaction, transaction and integration (Fath-Allah *et al.*, 2014). With the release of Web 2.0 in 2004 – 2005, it appears clearly that many of the e-government maturity models' researchers considered this new innovative communication factor and developed or reviewed the models' stages accordingly where new terms were being used to reflect the added value of the Web 2.0 Emerging/Enhanced Information services (UN, 2012), Open Participation/collaboration (Lee and Kwak, 2012), Connected Services (Alhomod *et al.*, 2012; UN, 2012). Accordingly, any e-government implementation should be based on a maturity or stage models. Each stage, regardless of the model applied and based on its output achieved after implementation, will provide some benefits where, according to Brown (2007), early stages of maturity models offer minor benefits whereas the latter or

advanced stages offer larger and significant benefits. The e-government benefits can be categorized under efficiency and cost reduction, accountability and transparency, citizen centric focus, economic development, accessibility and availability, technology awareness and usage, and government reform and democracy. Each of those benefits' categories has its own impact on the e-government provider or the end user beneficiary that includes government, citizens or businesses. Furthermore, as the e-government is considered as a multidimensional and complex technology, the existence of challenges is also expected, blocking the e-government successful implementation and management (Ndou, 2004). The challenges are not limited or completely defined (Aldrich *et al.*, 2002; Gil-García and Pardo, 2005; Layne and Lee, 2001) since most of the reported challenges are findings from previous experience on e-government implementations or researchers' findings on challenges to e-government initiatives in different disciplines (Al-Shafi, 2009). However, many researchers and academics have categorized e-government challenges into groups, taking into consideration the common themes identified through the different exercises and research findings, including information & data, information technology, organizational & managerial, legal, policy & regulatory, institutional & environmental, social, operational, financial and strategic barriers and challenges.

1.3 Overview of Adoption Theories

As the e-government G2C dimension is within our area of interest, mainly the citizens' adoption part of the government to citizens relation, the author explored and studied in depth the technology and e-government adoption theories in chapter 2 in order to understand, clarify and foresee how, why, and to what level the public and society, either through individuals or organizations and communities, will have the intention to adopt a technology in general and an e-government service, as in our research case, in particular, and which factors or variables have the

most influential role. The adoption theory is the fact of the first or minimal level of behavioural utilization of a concept or scheme (Rogers, 1995). The author introduced in his literature review some key adoption theories used in the IS/technology such as Technology Adoption Model – TAM (Rogers, 1995), Diffusion of Innovation – DOI (Davis, 1985), Unified Theory of Acceptance and Use of Technology – UTAUT (Venkatesh et al., 2003), Trustworthiness (Pavlou, 2003) and others. TAM model, for example, is defined by Venkatesh and Davis (2000) as the most well-established, well-tested, powerful, robust and parsimonious model for predicting user acceptance of technology and the most popular amongst all the existing technology adoption models (Chuttur, 2009; Gefen and Straub, 2000; Taylor and Todd, 1995) which tests the adoption of technology at the individual level (Chong et al., 2009). DOI model, on the other hand, is considered by Lu et al. (2003) as the most used since 1960s for innovations' assessment, including Information System tools, where many other researchers described the DOI as the second most popular technology adoption model (Lyytinen and Damsgaard, 2001; Prescott and Conger, 1995) which tests the adoption and diffusion of technology at the organization and community levels (Chong et al., 2009).

Based on those general technology adoption theories, IS and technology researchers were able to study and analyse the factors influencing the citizens and overall society adoption of the e-government technology, defined by Carter and Bélanger (2005) and Warkentin et al. (2002) as the “intention” and by Gilbert et al. (2004) as the “willingness” of the citizens to use e-government. Accordingly, they have developed various adoption models as an outcome of a deep literature review on technology adoption and use case studies to verify the reliability and validity of the proposed models. Hence, the author explored and identified many of the existing and latest e-government citizen's adoption models, tested and validated in either developing or developed

countries, focusing on those developed after 2005, the period where the Web 2.0 was launched officially raising the capabilities of the online/internet based tools and technologies (O'reilly, 2005) including e-government. The identification of those e-government citizens' adoption models/frameworks will support the author in (i) identifying the most common factors influencing the e-government citizens' adoption and the technology adoption theories applied in those frameworks, (ii) exploring the existence of any framework that has already considered the GI as a potential influential factor over the e-government citizens' adoption and (iii) comparing those models' context with our research context to extract the similarities and assess their applicability, thus creating an overall understanding and clear picture around the topic in order to develop and propose a conceptual GE-government citizens' adoption framework ready for testing.

1.4 Overview of Geographic Information

The Geographic Information (GI) has two main components as per Maguire (2010): The Geographical Information System (GIS) and the Geographic Information Science (GIScience). GI with its relevant tools will play a growing and major role in the society over the time (Goodchild and Palladino, 1995). The GI benefits, as identified by many researchers (Behr, 1994; Webb, 1994; Grimshaw, 1994), can be categorized under four main categories including efficiency & effectiveness, operational (OPR) such as enhanced data quality, user friendliness, strategic (STR) such as technological changes, optimization of business processes, job satisfaction, and external (EXT) like benefits to local governments, citizens, businesses and communities.

Nowadays, there is a wide range of e-government applications geo-enabled such the Disaster Management Systems (DMS) and Crowd-Sourced Emergency Services currently used to

improve the response of the government to an incident, critical event or disaster. Through such systems, citizens collaborate dynamically, employ geospatial e-government services, and ultimately support the governmental disaster/emergency agencies through a variety of means. It is worth noting that situational awareness is improved by the assimilation of accurate real-time geo-information via the DMS's interactive map that extends incidents' location with all relevant and supportive spatial and non-spatial information so as to enhance the on-event decision making, improve the future analysis of the government's response to disasters and incidents, and support the proper development of a preventive disaster management plans (Bott and Young, 2012, Grant et al. 2012). Another interesting GI-based e-service is the Complaints Management System that increased the response efficiency of the local government. A case study that demonstrates such potentials is the adoption of a Complaints Management System in Amsterdam in 2007; citizens' complaints were addressed within two working days for 80% of the reported incidents. The improved throughout was attributed to the accurate pinpointing of the relevant location in the incident or complaint that significantly affected the operational response process (Hickel and Blankenbach, 2012, Hassan, 2010, Stachowicz, 2004). The e-participation application is another Web GI based e-government application is usually launched by local governments and municipalities to offer their citizens expected capabilities; for example, citizens have the ability to visualize the urban planning of any new development, submit their feedback and reactions to what is proposed, as well as chat and communicate with local government decision makers and thus improving the citizens' participation in all governments' future policy making and service delivery (Ijeh, 2014, Moody, 2007, Stachowicz, 2004, OECD, 2001). E-government services are expected to be of major importance in the tourism sector in many countries. A variety of GI-based e-tourism applications exist and some are included in e-

governmental platforms dedicated to tourism. These services offer tourists the opportunity to look for touristic activities in a specific place with a variety of options accessible through advanced querying capabilities like the nearest facilities, search by address, way finding or shortest path, and develop a tour plan with multiple scenarios (html5). Very recently, those applications support 3D displaying of the touristic sites in order to offer more attractions to tourists as well as increase their familiarity with the sites to be visited. As part of the experience of sharing, those applications support the insertion of blogs or reviews on each visited site as a kind of sharing the travellers' experience (Marson et al., 2015, Shah and Wani 2015, Pandagale et al., 2014, Yan and Wang, 2012). Lately, many countries have started the adoption of the GI-based E-elections management application, a geospatial based e-government application that offers services for the pre-election period, as well as after the electoral process is finished. Some indicative pre-election services include the online registration of voters, retrieval of information about the election process or procedure such as the voters' (citizens') location, the polling station, the shortest path to the polling station with directions, location of the voters' assemblies, and location of the buses, taxis or any available transportation system with schedules and routes, etc. Situation analysis is also supported and the results may be visualised in maps, plots and reports in real time. Such visual representation enhances the citizens' capability of sharing their observations and opinions about the overall election procedure and execution directly on the application or through the integration with the social media apps (Aphane, 2015, Gupta et al., 2014, Everton et al., 2013, International IDEA, 2013).

Through the cases mentioned above, it is evident that the impact of the GI enabled e-services on citizens' adoption of such services should be examined in more detail. There is evidence that suggests the need to exercise the impact of the GI- e-services and applications on the adoption of

e-government services among citizens and, therefore, it is interesting to develop a framework for examining such adoption influences more thoroughly. Therefore, the author studied in chapter 2 – literature review– the benefits of the geographic information according to the e-government beneficiaries' categories which includes government, businesses and citizens. The author identified also many of the e-services that incorporate GI technologies and are used widely by citizens.

1.5 Research Aim and Objectives

The main question in our research is about how **influential is the Geographic Information (GI) to enhance the e-services citizens' adoption** mainly the e-government. Accordingly, the aim of this research is to investigate the importance of Geographic Information (GI) as an influential and significant factor enriching the government e-services adoption by citizens.

The research assesses the significant and influential role of the GI and other factors, identified in chapter 2, on the E-government citizens' adoption as well as the significant and influential role of the Geographic Information factor on those identified factors. Furthermore, the research proposed a conceptual GE-government citizens' adoption framework comprising all those identified factors including GI. This framework was tested and validated within the Lebanese context and thus finalized to be the first e-government citizens' adoption framework GI enabled named as GE-government citizens' adoption.

Hence, the following research objectives will be pursued:

1. To identify the factors influencing the e-government citizens' adoption.
2. To address the potential role of GI as an influential factor on the adoption of e-government services and validate the identified gap.

3. To explore all the GI related components that reflect on the GI influence on the e-government services adoption.
4. To develop, test, validate and finalize the GI-based e-government (GE-government) citizens' adoption framework.
5. To study the GI direct impact on the e-government citizens' adoption.
6. To study the GI direct impact on some of the identified e-government citizens' adoption influential factors.

1.6 Context of the study (Lebanon Context)

The research study explored the e-government adoption and assessed the GI role in the citizens' adoption of the e-services based on the Lebanese context. Lebanon is defined by the World Bank (2016) as a developing country, situated in the Eastern Coast of the Mediterranean Sea in the centre of the Middle East region – Western Asia. The population in Lebanon is around 6 million, including Syrian and Palestinian refugees, according to World Population Review (2017) where around 4.5 million are Lebanese citizens. Lebanon has taken the initiative to develop its e-government platform since 2002 with the first Lebanese e-government strategy, updated in 2008, which considered “the people and their communities at the core of a new knowledge-based and connected government” as the first priority (OMSAR, 2008). Several e-services have been launched by the Lebanese government since 2002, such as e-government portal (DAWLATI), financial e-services, e-procurement, e-participation, e-administration, e-tourism, e-License, etc... where some of them are at the interaction maturity level and the rest have reached the transaction maturity level. Recently, in June 2017, the government has launched a new e-government program named “Lebanese Digital Government” looking to have a full digital government within 5 years.

In this research, we applied the quantitative research approach – questionnaire survey method– in order to test the proposed GE-government citizens’ adoption conceptual framework and performed all the needed analysis related to the factors influencing the e-government adoption in general and the GI role, in particular. We have applied the convenient sampling method where the targeted population for our sample was the employees from the public and private sectors, considered as major e-government services’ users worldwide (57%) as per Gil-Garcia (2012), and based our selection of the participants on the agencies that we have access to.

1.7 Expected Contributions

This research offers a number of important theoretical and practical contributions to the e-government. As for the theoretical contributions, the first contribution of our research is about the design, development and introduction of a new e-government adoption framework covering the technology adoption theory (TAM), social and demographic factors identified in the literature review, in addition to the main targeted GI factor considered as the new identified influential factor introduced for the first time in an e-government adoption framework. The research gap, identified in the literature review, related to the non-consideration of the GI in any existing e-government framework as a main influential factor introduced the second theoretical contribution which relies on the GI essential influential role in the e-government adoption process through its various direct and moderate roles in the e-government adoption. In the practice, the research has a main practical contribution which is about the availability of a new GE-government framework ready to be tested in developed and developing countries to evaluate the impact of various factors, mainly the GI, in order to build an e-government implementation plan before executing any new e-services’ implementations or upgrades that guarantee citizens’ adoption. In addition, the research helped identify the group of people the government should

target when promoting its services or preparing its e-government's awareness marketing roadmap and campaigns.

1.8 Research outline or structure

The research structure includes 6 chapters that describe the whole research study approach starting with Chapter 1 “Introduction” and five subsequent chapters distributed into two parts, the “Theoretical Approach” part which includes the chapters 2, 3 and 4 and the “Analytical Approach” part which includes the chapters 5 and 6. The Figure 1 outlines the research structure.

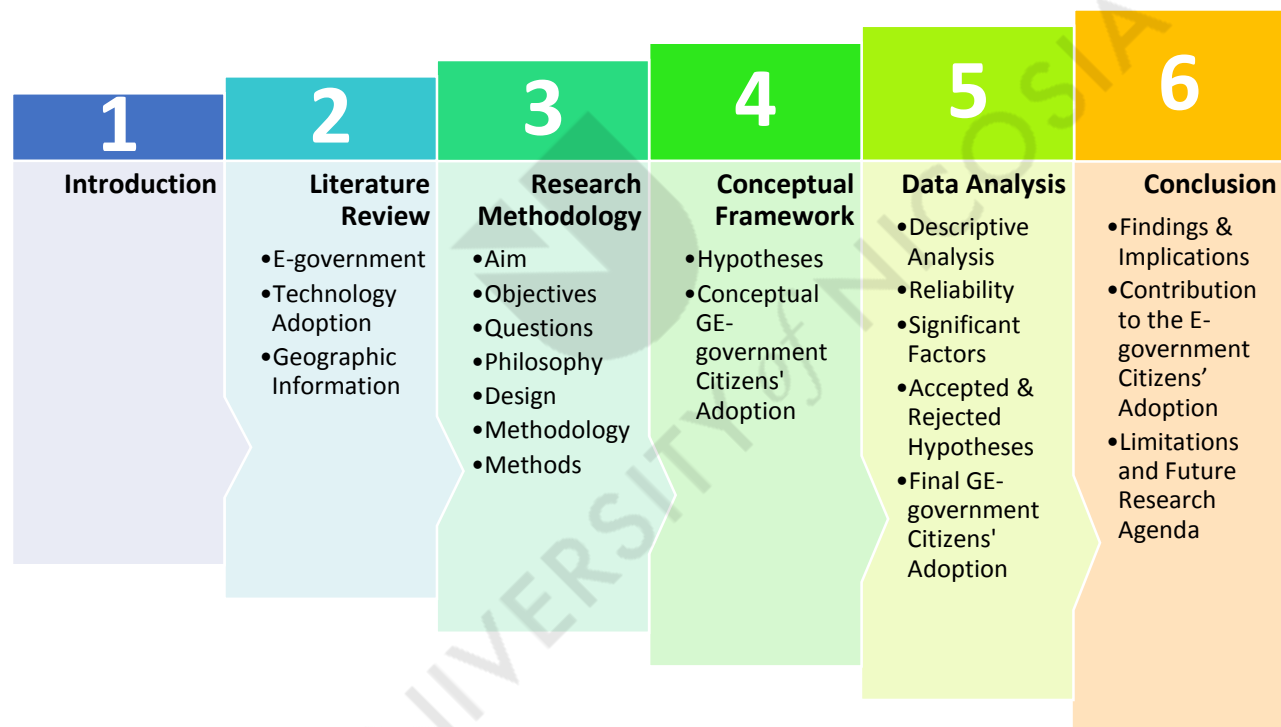


Figure 1.1: Research Structure

Chapter one highlights in brief the e-government, technology adoption and geographic information. A research background has been provided showing the importance of understanding the causes, conditions and factors that affect the citizens' intention to adopt the e-government

services. We described briefly what potential effect the GI could have on the e-government adoption process. We described in brief Lebanon as a case study of our research.

Chapter two provides an extensive secondary data research – systematic literature review on various topics related to our research including e-government, main technology adoption theories, various existing mature and tested e-government citizens' adoption models, geographical information (GI) and finally the GI adoption as an enabler of many e-government services.

Chapter three describes the research philosophy, design, methodology and methods of the study work that have been followed where the positivist research paradigm, the descriptive research type, the deductive with an initial inductive research approach, along with quantitative primary data research – structured questionnaire survey – have been applied.

Chapter four introduces the conceptual GI based e-government (GE-government) citizens' adoption framework along with a description of all TAM, social, demographic and GI factors, and all their relevant hypotheses, in addition to the relation between the proposed hypotheses and the proposed dependent and independent factors as well as the relation between the research questions, research objectives, research hypotheses and the selected methodology and methods.

Chapter five describes the data analysis methodology and methods applied to test the proposed conceptual GI based e-government (GE-government) citizens' adoption framework including descriptive statistics, reliability and validity, exploratory factor analysis, Binary Logistic Regression Modelling and Pearson Chi-square analysis. Thus, the chapter provides answers to the research question and objectives, highlights the accepted hypotheses and shows the significance and correlation strength between multiple identified dependent and independent

variables. As a result, a final GI based E-government (GE-government) citizens' adoption framework is presented.

Chapter six summarizes the overall research findings and implications along with their theoretical and practical contribution to the e-government citizens' adoption, and highlights some of the research limitations, hence proposing a future research agenda.

1.9 Conclusion

E-government citizens' adoption has been studied by many researchers in the last three decades. New influential factors has also been identified including social, demographic, behavioural and technical factors. In our research, we could identify a gap in finding no evidence of existing e-government adoption framework that considered the geographical information as a potential factor having impact over the citizens' intention to adopt the e-government services. Accordingly, this research introduces a new factor to the e-government adoption theory era that can be further studied in the future in various contexts. This research offers a new conceptual GE-government citizens' adoption framework that extends the well-known technology adoption (TAM), social and demographic influential factors by a new potential factor showing a high significant impact on the citizens' adoption as well as on influential factors such as the website design, easiness and usefulness. This conceptual framework will be a reference for any future studies looking to have better understanding of the growing role of the mapping and location services in improving the adoption of the electronic and digital services, whether governmental or commercial. This chapter presents the study gap and background, and describes in brief the research gap, aim, questions, objectives and significance with a brief about the Lebanese context chosen as the case study of our research. In the next chapter, we will cover the E-government, adoption theories and the geographical information & its applications topics through an extensive

systematic literature review to have a full understanding of the targeted topics and identify the research gap.



THEORETICAL APPROACH



Chapter 2: Literature Review

The literature review chapter of this doctoral thesis has a set of three purposes: initially, to survey the current state of literature in the relevant fields including e-government, technology adoption and geographic information, secondly to identify the key authors, articles, theories, and findings pertinent to the topic investigated, thirdly to present the key findings from the preliminary research conducted in order to identify the research gaps in knowledge. Therefore, the objective of this chapter is to provide an overview of the relevant literature to the thesis in an organized and critical way as well as to present identified issues stemming from the practice.

2.1 Introduction

The first initiative of digital government started with the implementation of computer processing systems to enhance the government operations (Smith, 1985; Toth, 1984). Later on, the fast growth of the IT sector was reflected on developments onto the digital government. With the Web expansion in the early 90s, the term evolved into electronic government. Grönlund identified that it was also the period that introduced the new digital online services (Grönlund *et al.*, 2005; Grönlund, 2001). In the early 90s, many governments in the developed countries started investing in the ICT era by developing IT based solutions internally within the government agencies and then externally using IT based or electronic services to the citizens (Ho, 2002). Unlike the developed countries and with the enormous evolution in the telecommunication and IT sectors (O'reilly, 2005; Siau and Long, 2005; Frank, 2004; Siau and Tian, 2004; Davidrajuh, 2003), most of the developing countries started the implementation of some forms of e-government in the 21st Century (Kurunananda and Weerakkody, 2006; Heeks, 2002).

In this chapter, our aim is to provide a deep review on the government e-services, following a chronological viewpoint, and include an overview of the main technology adoption theories, e-government systems, e-government implementations/adoptions, geographical information and finally focus on the implementation and adoption of GI in the government e-services. Thus, the chapter will be spread in 5 sections that are described in the following paragraphs and are depicted in Figure 2. 1.

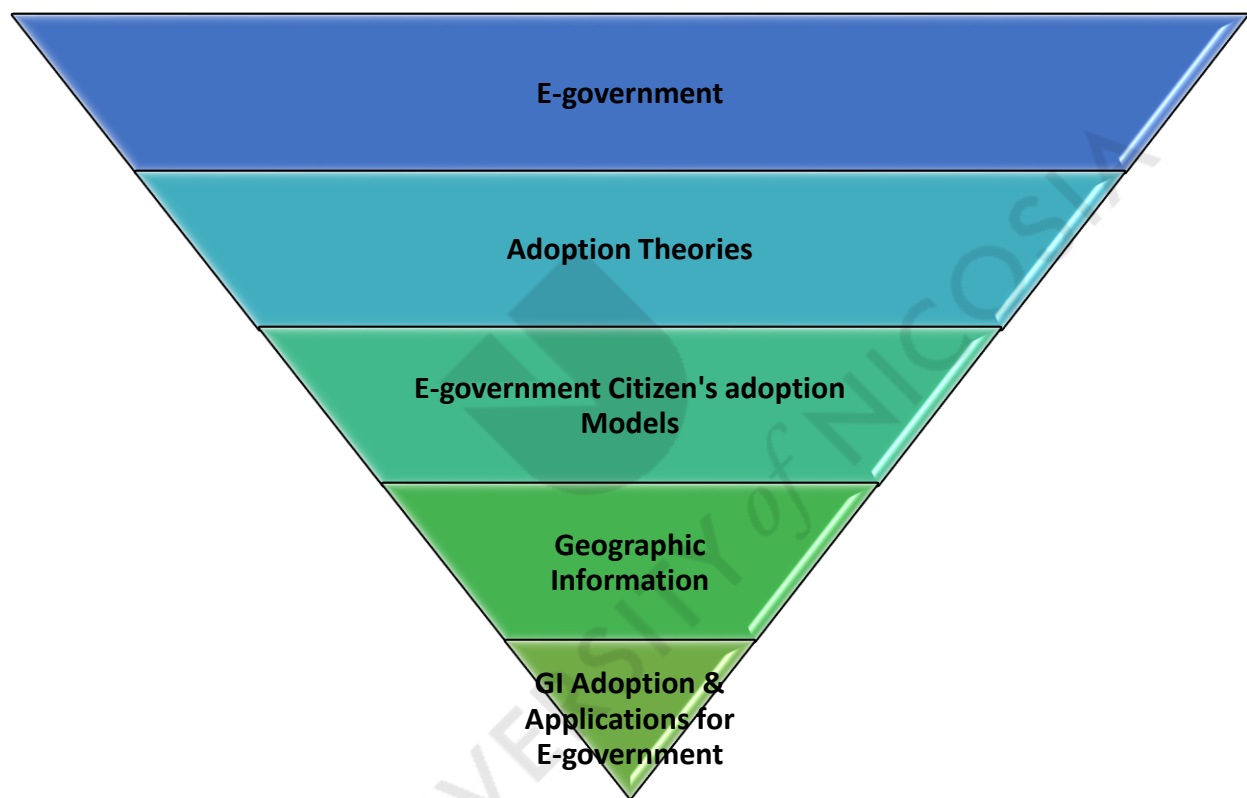


Figure 2. 1: Literature Review Topics

Section 1 focuses on the e-government system including its definitions, dimensions, staging theories and maturity models, benefits and barriers/challenges.

Section 2 provides an overview of the main adoption theories including the technology adoption ones Diffusion of Innovations (Rogers, 1995) and The Diffusion and Rejection of Innovations (Abrahamson, 1991), Technology Acceptance Model – TAM (Davis, 1985), Unified Theory of

Acceptance and Use of Technology – UTAUT (Venkatesh *et al.*, 2003), and Technology Organization and Environment Framework – TOE (Tornatzky and Fleischer, 1990) ...

A thorough review on the e-government technology adoption is included in section 3. Relevant topics cover detailing e-government citizen's adoption models that should cover the technology adoption theories relevant to e-government as well as citizen's e-government adoption models and success factors.

Section 4 covers the geographical information (GI) definition and its applications, including the Geographical Information System (GIS) as a tool and the Geographical Information Science (GIScience) as a Science, in addition to the GI implementation's benefits.

A detailed overview of the GI adoption as an enabler of the e-government services will be presented in section 5. GI Applications and some remarks on the potential expansion of e-services adoption through the GI factor (g-factor) will be discussed. In this section, the author will be able to define some e-government gaps and highlight the related and potential e-government components that could be affected or enhanced by the g-factor.

At the end of this chapter, a summary of the most relevant topics to this thesis will be drafted, emerging research gaps will be discussed to end up with a preliminary Citizen's GE-government Adoption Conceptual Model.

2.2 Methodology of Literature Review

In order to cover all the above defined topics, a thorough and continuous literature review was conducted in order to guarantee an up to date literature review. To accomplish this, all relevant publications were identified based on a well-defined methodology. First, the keywords to be used in the literature review were defined; these include the most relevant ones like e-government, digital government, e-governance, e-services, e-government challenges, e-government benefits,

information system, MIS, geographic information, geospatial technology, GI Science, GIS, technology adoption, adoption theories, innovation theories, technology adoption, citizens adoption, GIS adoption,... thus at the end of the stage 1, a list of keywords was developed and updated with time and through the progressively advancement of literature review. In stage 2, the author performed a keyword search on the top ranked IS Journals (ranking based on the AIS basket of 8 and Harzing list of journals) such as Association for Information Systems Research, Communications of the Association for Information Systems, Government Information Quarterly, Communications of the ACM, Academy of Management Review, American Review for Public Administration, Harvard Business Review, Information Systems Journal, MIS Quarterly, Journal of American Academy of Business, The Journal of Systems and Software , ESRI, etc..., or International Press Offices and International Publishers like New York Academic Press, Dorsey Press, MIT Press, Oxford University Press, ESRI Press, Wiley Publisher, Prentice Hall Publisher etc... or International Conferences such as European Conference on Information System (ECIS), EuroMed Research Business Institute (EMRBI), Americas Conference on Information Systems (ACIS), In Management of e-Commerce and e-Government (ICMeCG), European Conference on E-government (ECEG), European and Mediterranean Conference on Information Systems (EMCIS), International Information Technology, Politics and Information systems: Technologies and Applications, Hawaii International Conference on System Science, European Conference on E-Government, etc... or reports like United Nations, UNDP, UNASPA, Commission of the European Committee, World Bank, Accenture, Deloitte, IBM, The economist, Esri, etc... or databases like AIS electronic Library (AISEL), Emerald 150, Emerald Management 200, IEEE, Oxford, SAGE Premier, ProQuest, Hoover's, ABI/INFORM, etc... in order to find and select articles, proceedings and

books related to the keywords identified previously and relevant to the topics listed above as well as the selection criterion (Webster and Watson, 2002). The research was selective based on relevance to the topics examined; priority was also given on recent publications. The review selection criteria was based on the researchers' references and citations on e-government & GIS adoption and implementation where we emphasized on the ones which highlighted the e-government adoption and implementation's best practices, after the huge improvement in Information Technology in the 21st Century, mainly in the U.S., Europe, Middle East and the developing countries (Frank, 2004; Siau and Tian, 2004; Davidrajuh, 2003; Siau, 1995). That selection criteria did not bound our research where in some cases the author referred to some widely referenced publications that came out in the year prior to 1999.

A forward search was executed to explore additional sources and publications that have cited the articles selected from the keywords. A backward search was simultaneously executed (Webster and Watson, 2002) in an iterative mode. This iterative mode was performed on all articles extracted from the previous iterations and inserted in a database. At the end of stage 2, a full database was developed including all search findings during the full thesis period.

The developed database is simply a research publications' database that summarizes the literature review findings and includes all the selected and reviewed articles, books, proceedings, etc.... where more than 500 references were used from more than 100 source of data (journals, publishers, and conferences).

The diagram shown in Figure 2.2 summarizes the literature review methodology.

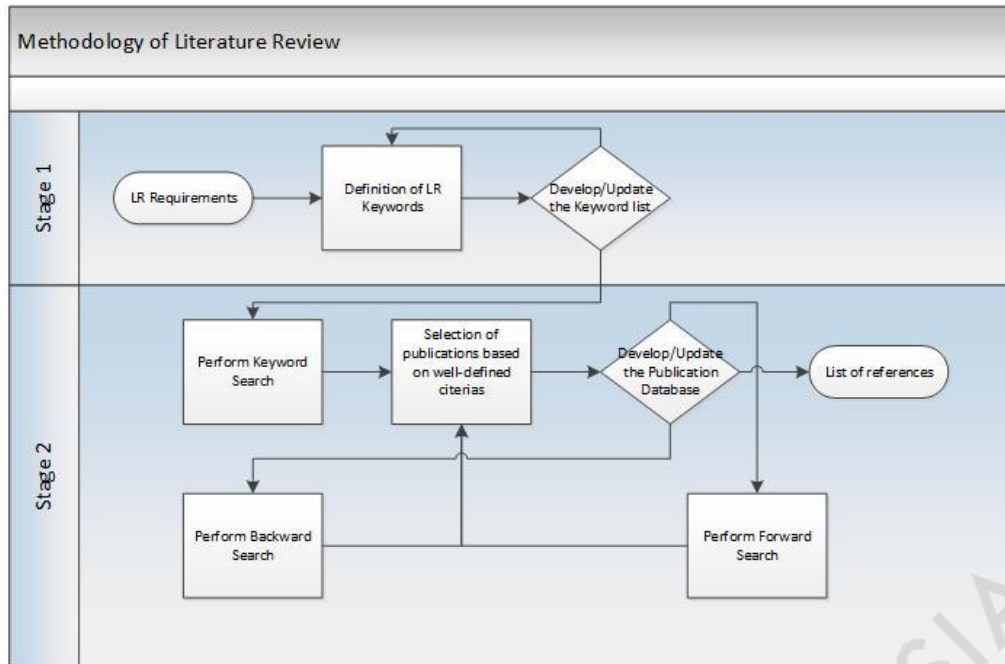


Figure 2.2: Literature Review Methodology

The Figure 2.3 summarizes the articles, proceedings and books stored in the research publications' database according to their relevance to each of the 5 sections shown in Figure 2. 1 and distributed according to the year of publishing as before and after 1999.

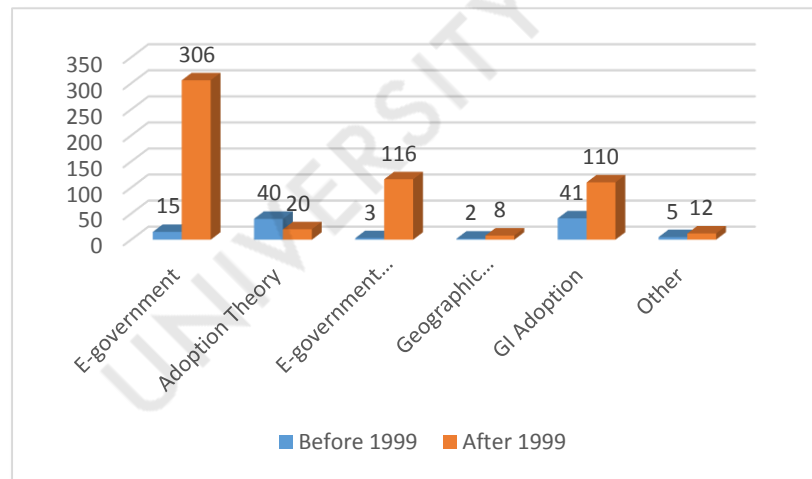


Figure 2.3: Research Publications' database summary

As shown above in the Figure 2.3, the total number of references is more than 500 where the majority are published after 1999, around 450 references, and the rest are published before 1999,

around 50 references, with some references belonging simultaneously to multiple sections in the literature review. The majority of the references belonging to the “before 1999” period are related to the adoption theories, technology adoption theories, innovation theories and geographic information adoption & implementation, which shows the early interest of the researchers to study the innovation and technology adoptions even before having a mature concept or model of e-government.

2.3 E-Government

2.3.1 E-Government Definition

E-government definition is not unique as it always reflects one or many perspectives of the researcher as well as projects’ purposes at one time. Meng Seng et al. (2011) noted that although e-government as a term has become well known worldwide, there is no evidence of a unique agreement on its meaning, in particular regarding the main components and functions of e-government where e-government can be defined in different ways. Also, Peristeras et al. (2003) as well as Al-Sebie and Irani (2005) stated the non-existence of a unique e-government definition. Grönlund and Horan (2005) stated that the existence of a set of different e-government definitions is influenced by some project or research purposes, and also by some government classifications determined by international firms, expertise in development, research, or international cooperation. Less deviation is observed with regards to the stated goals and objectives which can be summarized as following:

- More efficient government
- Better services to citizens
- Improved democratic processes

Thus, all e-government definitions are designed to reflect the relevant perspective.

Al-Shafi (2009) cited several perspectives for e-government definitions extracted from multiple authors and researchers, summarized as following:

- Benefits – Whitson and Davis (2001), Katzen (2000)
- Process – Bonham *et al.* (2001)
- Phenomenon – Riley (2001)
- Citizen Focus – Burn and Robins (2003)
- Information Technology – Lambrinoudakis *et al.* (2003)
- Single Point Access – Ke and Wei (2004), UNDPEPA/ASPA (2002)

Al-Shehry *et al.* (2006) identified additional perspectives list that have some similarities with Al-Shafi (2009) list:

- Relationships with partners – Layne and Lee (2001)
- Technology – United Nations (2003)
- E-government dimensions – Perri (2004)
- Reforming public sector – World Bank Group (2004)
- Political – OECD (2004), Dunleavy (2002), Caldow (1999)
- Change Management – European Information Society (2004)

In the

Perspective	Definition	Authors
Information Technology/Benefits/E-government dimensions/Relation with Partners	“E-government is defined as a matrix of stakeholders: government to government, government to business and government to citizens, using information and communications technology to deliver and consume services.”	Alateyah <i>et al.</i> (2013)
Information Technology/Benefits/ E-government dimensions/	“The application of information and communications technology to improve government services delivery and promote	Altaany and Al-Zoubi (2013)

Perspective	Definition	Authors
Relation with Partners	transparency and accountability in dealing with citizens, government, employees and businesses.”	
Information Technology/Reforming Public Sector	“E-government is using the internet as a tool for information and communications technology (ICT) to accomplish better government.”	Alghamdi <i>et al.</i> (2011)
Information Technology/Reforming Public Sector	“E-government is defined as the use of ICT to make government more accessible, effective, and accountable.”	Wangpipatwong (2009), InfoDev and CDT (2002)
Information Technology	“E-government refers to the delivery of [government] information and services online through the internet or other digital means.”	Bwalya (2009), Kumar <i>et al.</i> (2007), Muir and Oppenheim (2002)
Process/Information Technology/E-government dimensions / Reforming Public Sector/ Relation with Partners	“E-government refers to strategies, organizational forms and processes, as well as information technology employed so as to enhance access to and delivery of government information and services to citizens, businesses, government employees and other agencies.”	Kefallinos <i>et al.</i> (2009)
Information Technology/Process/ Political Reasons	“Government is the use of ICTs in public administrations combined with organizational change and new skills in order to improve public services and democratic processes and strengthen support to public policies.”	Akesson <i>et al.</i> (2009), commission of the European communities (2003)
Information Technology/Reforming Public Sector/Dimensions	“E-government is defined as the combination e-administration and e-democracy to achieve the objective of balanced e-government.”	Bwalya (2009), Coleman (2006)
Benefits/ E-government dimensions/Relation with Partners	“E-government is the delivery of fast services to citizens, businesses, and other members of the society.”	Bwalya (2009), Kumar <i>et al.</i> (2007)
Process/Information Technology/E-government dimensions /	“E-government is the process whereby the use of information and communication technology (ICT) and services is deployed and employed by the government in the delivery of services to members of the public and the use of same in the internal running and linkages among different governmental agencies.”	Otubu (2009)
Information Technology/Citizens Focus	“E-government refers to the use by state authorities of ICT, in particular, the Internet and web-based technology, to	Luk (2008)

Perspective	Definition	Authors
	deliver information and services and to encourage civic participation.”	
Information Technology/ E-government dimensions	“E-government is simply a facility using Information Technology (IT) to deliver public services directly to the customer, where the customers are citizens, business or other government entity.”	Ghapanchi <i>et al.</i> (2008), Metaxiotis and Psarras (2005)
Information Technology/Citizens Focus	“Utilizing the internet and the world-wide web for delivering government information and services to citizens.”	Al-Shafi and Weerakkody (2007), United Nations (2003)
Information Technology/Reforming Public Sector	“The use of information and communication techniques to improve the activities of public sector organizations, of course impacts on the strategy and operations of our agency.”	Van Der Molen and Wubbe (2007)
Phenomena/ Reforming Public Sector/ Citizens Focus/ Relation with Partners	“E-government offers an opportunity for governments to re-organize themselves, get closer to the citizen and co-operate with a variety of societies.”	Margetts and Dunleavy (2002), Al-Shehry <i>et al.</i> (2006), Caldow (1999)
Dimensions	“E-government should be divided into four distinct areas of activity, namely e-democracy, e-service provision, e-management and e-governance.”	Perri (2004), Al-Shehry <i>et al.</i> (2006)
Process	“E-government is the process of offering better government service to the public.”	Sridhar (2005)
Information Technology /Benefits/Relation with Partners/Dimensions	“E-Government refers to the strategic application of ICT to “provide citizens and organizations with more convenient access to government information and services; and to provide delivery of public services to citizens, business partners and suppliers, and those working in the public sector”.	Phang <i>et al.</i> (2005), Turban <i>et al.</i> (2002), Gronlund (2001)
Information Technology/Reforming Public Sector/Relationship with partners/ Benefits/ Dimensions/ Political Reasons/Citizens Focus	“E-government refers to the use of IT by government agencies (such as wide area networks, the internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of 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	World Bank Group (2004)

Perspective	Definition	Authors
	information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions.”	
Information Technology/ Benefits	“E-government involves access to government information and services 24 hours a day, 7 days a week, in a way that is focused on the needs of our citizens and businesses. E-government relies heavily on agency use of the internet and other emerging technologies to receive and deliver information and services easily, quickly, efficiently and inexpensively.”	Ke and Wei (2004)
Information Technology/Change Management/ Political Reasons	“E-government is the use of information and communication technologies in public administrations combined with organizational change and new skills in order to improve public services and democratic processes.”	EU (2004)
Information Technology/ Citizen Focus	“E-government as seamless service delivery to citizens or governments’ efforts to provide citizens with the information and services they need by using a range of technological solutions.”	Burn and Robins (2003)
Information Technology/ Relationship with partners/ Political reasons/ Dimensions	“E-government is the term used to reflect the use of ICT in public administration in an attempt to ease access to governmental information and services for citizens, business and government agencies. Furthermore, there is always a target to improve the quality of the services and to provide greater opportunities for participating in democratic institutions and processes.”	Lambrinoudakis <i>et al.</i> (2003)
Information Technology/ Benefits	“Electronic government is the use of information technology to support government operations, engage citizens, and provide government services.”	Scholl (2003)
Information Technology/ Reforming Public Sector/ Benefits	“The use of ICTs, and particularly the internet, as a tool to achieve better government.”	OECD (2003)
Benefits/ Citizens Focus	“E-government is the continuous optimization of service delivery channel, citizen’s participation and governance.”	Fang (2002), Baum and Di Maio (2000)

Perspective	Definition	Authors
Information Technology/ Benefits/Relation with Partners/ Political reasons	“E-government can be defined as a way for governments to use the most innovative information and communication technologies, 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.”	Fang (2002)
Information Technology/ Relationship with partners/ Benefits	“E-government is the use of Information Technology to support government operations, engage citizens, and provide government services.”	Cook <i>et al.</i> (2002)
Information Technology/ Relationship with partners/ Process/ Benefits	“the use by the Government of web-based Internet applications and other information technologies, combined with processes that implement these technologies, to a) enhance the access to and delivery of government information and services to the public, other agencies, and other government entities or b) bring about improvements in Government operations that may include effectiveness, efficiency, service quality, or transformation.”	U.S. Congress (2002)
Relationship with Partners/ Benefits	“E-government means exploiting the power of information to help transform the accessibility, quality and cost-effectiveness of public services and to help revitalize the relationship between customers and citizens and public bodies who work on their behalf.”	Aldrich <i>et al.</i> (2002)
Information Technology/ Relationship with partners/ Benefits/ Dimensions	“E-government encompasses applications of various technologies to provide citizens and organizations with more convenient access to government information and services; and to provide delivery of public services to citizens, business partners and suppliers, and those working in the public sector.”	Turban <i>et al.</i> (2002)
Information Technology/ Citizens Focus/ Political	“Although governments use a variety of information technologies, the use of the	Gant and Gant (2002)

Perspective	Definition	Authors
reasons/ Benefits	internet has become a key component of enhanced service delivery. E-government, the delivery of government services online, provides the opportunity to increase citizens' access to government, reduce government bureaucracy, increase citizen participation in democracy, and enhance agency responsiveness to citizens' needs."	
Information Technology/ Citizen Focus	"Utilizing the internet and the world wide web for delivering government information and services to citizens."	UNDPEPA/ASPA (2002)
Information Technology/ Relationships with partners/ Benefits/ Dimensions/ Citizens Focus	"Electronic government refers to government's use of technology, particularly web-based Internet applications to enhance the access to and delivery of government information and service to citizens, business partners, employees, other agencies, and government entities. It has the potential to help build better relationships between government and the public by making interaction with citizens smoother, easier, and more efficient."	Layne and Lee (2001)
Information Technology/ Single Point Access	"E-government is usually explained as a way of improving the delivery of government services by making them available through a single point of access on the internet, i.e. also called as one stop shop' shopping."	Mitchinson (2001)
Phenomena/ Reforming Public Sector	"Indeed, e-government is a concept that exists without a firm definition. To some, it represents traditional government "with an 'e' ", providing an alternative delivery method for government services. For others, it is a social, economic and political phenomenon, which promises to re-engineer the nature of democratic government itself."	Riley (2001)
Information technology/ Citizen Focus	"An e-government is a government that makes full use of the potential of technology to help put its citizens at the centre of everything it does, and which makes its citizens its purpose."	Waller <i>et al.</i> (2001)
Information Technology/	"E-government includes the employment	UNASPA (2001)

Perspective	Definition	Authors
Benefits	of all information and communication technologies from fax machines to wireless palm pilots, to facilitate the daily administration of government.”	
Information Technology/ Relationship with partners/ Benefits/ Dimensions	“E-government is the use of technology to enhance the access to, and delivery of, government services to benefit citizens, business partners and employees.”	Silcock (2001)
Information Technology/ Process	“Electronic government, or (e-government), is the process of transacting business between the public and government through the use of automated systems and the internet network, more commonly referred to as the world wide web.”	Legislative Analyst's Office (2001)
Process	“Electronic government refers to the processes and structures pertinent to the electronic delivery of government services to the public.”	Okot-Uma (2001)
Information Technology/ Benefits/ Dimensions/ Relationship with partners	“E-government is defined as the implementation of cost-effective models for citizens, industry, federal employees, and other stakeholders to conduct business transactions online. The concept integrates strategy, process, organization and technology.”	Whitson and Davis (2001)
Information Technology/ Dimensions	“E-government is simply using Information Technology to deliver government services directly to the customer at any time. The customer can be a citizen, a business or even another government entity.”	Duffy (2000)

Table 2. 5 (see Appendix B), we will address some of the e-government definitions by perspective with references following the table structure of Al-Shehry *et al.* (2006).

According to

Perspective	Definition	Authors
Information Technology/Benefits/E-government dimensions/ Relation with Partners	“E-government is defined as a matrix of stakeholders: government to government, government to business and government to citizens, using information and communications technology to deliver and consume services.”	Alateyah <i>et al.</i> (2013)

Perspective	Definition	Authors
Information Technology/Benefits/ E-government dimensions/ Relation with Partners	“The application of information and communications technology to improve government services delivery and promote transparency and accountability in dealing with citizens, government, employees and businesses.”	Altaany and Al-Zoubi (2013)
Information Technology/Reforming Public Sector	“E-government is using the internet as a tool for information and communications technology (ICT) to accomplish better government.”	Alghamdi <i>et al.</i> (2011)
Information Technology/Reforming Public Sector	“E-government is defined as the use of ICT to make government more accessible, effective, and accountable.”	Wangpipatwong (2009), InfoDev and CDT (2002)
Information Technology	“E-government refers to the delivery of [government] information and services online through the internet or other digital means.”	Bwalya (2009), Kumar <i>et al.</i> (2007), Muir and Oppenheim (2002)
Process/Information Technology/E-government dimensions / Reforming Public Sector/ Relation with Partners	“E-government refers to strategies, organizational forms and processes, as well as information technology employed so as to enhance access to and delivery of government information and services to citizens, businesses, government employees and other agencies.”	Kefallinos <i>et al.</i> (2009)
Information Technology/Process/ Political Reasons	“Government is the use of ICTs in public administrations combined with organizational change and new skills in order to improve public services and democratic processes and strengthen support to public policies.”	Akesson <i>et al.</i> (2009), commission of the European communities (2003)
Information Technology/Reforming Public Sector/Dimensions	“E-government is defined as the combination e-administration and e-democracy to achieve the objective of balanced e-government.”	Bwalya (2009), Coleman (2006)
Benefits/ E-government dimensions/Relation with Partners	“E-government is the delivery of fast services to citizens, businesses, and other members of the society.”	Bwalya (2009), Kumar <i>et al.</i> (2007)
Process/Information Technology/E-government dimensions /	“E-government is the process whereby the use of information and communication technology (ICT) and services is deployed and employed by the government in the delivery of services to members of the public and the use of same in the internal running and linkages among different governmental agencies.”	Otubu (2009)

Perspective	Definition	Authors
Information Technology/Citizens Focus	"E-government refers to the use by state authorities of ICT, in particular, the Internet and web-based technology, to deliver information and services and to encourage civic participation."	Luk (2008)
Information Technology/ E-government dimensions	"E-government is simply a facility using Information Technology (IT) to deliver public services directly to the customer, where the customers are citizens, business or other government entity."	Ghapanchi <i>et al.</i> (2008), Metaxiotis and Psarras (2005)
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Information Technology/Reforming Public Sector	"The use of information and communication techniques to improve the activities of public sector organizations, of course impacts on the strategy and operations of our agency."	Van Der Molen and Wubbe (2007)
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Dimensions	"E-government should be divided into four distinct areas of activity, namely e-democracy, e-service provision, e-management and e-governance."	Perri (2004), Al-Shehry <i>et al.</i> (2006)
Process	"E-government is the process of offering better government service to the public."	Sridhar (2005)
Information Technology /Benefits/Relation with Partners/Dimensions	"E-Government refers to the strategic application of ICT to "provide citizens and organizations with more convenient access to government information and services; and to provide delivery of public services to citizens, business partners and suppliers, and those working in the public sector".	Phang <i>et al.</i> (2005), Turban <i>et al.</i> (2002), Gronlund (2001)
Information Technology/Reforming Public Sector/Relationship with partners/ Benefits/ Dimensions/ Political Reasons/Citizens Focus	"E-government refers to the use of IT by government agencies (such as wide area networks, the internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of	World Bank Group (2004)

Perspective	Definition	Authors
	government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions.”	
Information Technology/ Benefits	“E-government involves access to government information and services 24 hours a day, 7 days a week, in a way that is focused on the needs of our citizens and businesses. E-government relies heavily on agency use of the internet and other emerging technologies to receive and deliver information and services easily, quickly, efficiently and inexpensively.”	Ke and Wei (2004)
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Information Technology/ Citizen Focus	“E-government as seamless service delivery to citizens or governments’ efforts to provide citizens with the information and services they need by using a range of technological solutions.”	Burn and Robins (2003)
Information Technology/ Relationship with partners/ Political reasons/ Dimensions	“E-government is the term used to reflect the use of ICT in public administration in an attempt to ease access to governmental information and services for citizens, business and government agencies. Furthermore, there is always a target to improve the quality of the services and to provide greater opportunities for participating in democratic institutions and processes.”	Lambrinoudakis <i>et al.</i> (2003)
Information Technology/ Benefits	“Electronic government is the use of information technology to support government operations, engage citizens, and provide government services.”	Scholl (2003)
Information Technology/ Reforming Public Sector/ Benefits	“The use of ICTs, and particularly the internet, as a tool to achieve better government.”	OECD (2003)

Perspective	Definition	Authors
Benefits/ Citizens Focus	“E-government is the continuous optimization of service delivery channel, citizen’s participation and governance.”	Fang (2002), Baum and Di Maio (2000)
Information Technology/ Benefits/Relation with Partners/ Political reasons	“E-government can be defined as a way for governments to use the most innovative information and communication technologies, 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.”	Fang (2002)
Information Technology/ Relationship with partners/ Benefits	“E-government is the use of Information Technology to support government operations, engage citizens, and provide government services.”	Cook <i>et al.</i> (2002)
Information Technology/ Relationship with partners/ Process/ Benefits	“the use by the Government of web-based Internet applications and other information technologies, combined with processes that implement these technologies, to a) enhance the access to and delivery of government information and services to the public, other agencies, and other government entities or b) bring about improvements in Government operations that may include effectiveness, efficiency, service quality, or transformation.”	U.S. Congress (2002)
Relationship with Partners/ Benefits	“E-government means exploiting the power of information to help transform the accessibility, quality and cost-effectiveness of public services and to help revitalize the relationship between customers and citizens and public bodies who work on their behalf.”	Aldrich <i>et al.</i> (2002)
Information Technology/ Relationship with partners/ Benefits/ Dimensions	“E-government encompasses applications of various technologies to provide citizens and organizations with more convenient access to government information and services; and to provide delivery of public services to citizens, business partners and suppliers, and those working in the public	Turban <i>et al.</i> (2002)

Perspective	Definition	Authors
	sector.”	
Information Technology/ Citizens Focus/ Political reasons/ Benefits	“Although governments use a variety of information technologies, the use of the internet has become a key component of enhanced service delivery. E-government, the delivery of government services online, provides the opportunity to increase citizens’ access to government, reduce government bureaucracy, increase citizen participation in democracy, and enhance agency responsiveness to citizens’ needs.”	Gant and Gant (2002)
Information Technology/ Citizen Focus	“Utilizing the internet and the world wide web for delivering government information and services to citizens.”	UNDPEPA/ASPA (2002)
Information Technology/ Relationships with partners/ Benefits/ Dimensions/ Citizens Focus	“Electronic government refers to government’s use of technology, particularly web-based Internet applications to enhance the access to and delivery of government information and service to citizens, business partners, employees, other agencies, and government entities. It has the potential to help build better relationships between government and the public by making interaction with citizens smoother, easier, and more efficient.”	Layne and Lee (2001)
Information Technology/ Single Point Access	“E-government is usually explained as a way of improving the delivery of government services by making them available through a single point of access on the internet, i.e. also called as one stop shop’ shopping.”	Mitchinson (2001)
Phenomena/ Reforming Public Sector	“Indeed, e-government is a concept that exists without a firm definition. To some, it represents traditional government “with an ‘e’ “, providing an alternative delivery method for government services. For others, it is a social, economic and political phenomenon, which promises to re-engineer the nature of democratic government itself.”	Riley (2001)
Information technology/ Citizen Focus	“An e-government is a government that makes full use of the potential of technology to help put its citizens at the	Waller <i>et al.</i> (2001)

Perspective	Definition	Authors
	centre of everything it does, and which makes its citizens its purpose.”	
Information Technology/ Benefits	“E-government includes the employment of all information and communication technologies from fax machines to wireless palm pilots, to facilitate the daily administration of government.”	UNASPA (2001)
Information Technology/ Relationship with partners/ Benefits/ Dimensions	“E-government is the use of technology to enhance the access to, and delivery of, government services to benefit citizens, business partners and employees.”	Silcock (2001)
Information Technology/ Process	“Electronic government, or (e-government), is the process of transacting business between the public and government through the use of automated systems and the internet network, more commonly referred to as the world wide web.”	Legislative Analyst's Office (2001)
Process	“Electronic government refers to the processes and structures pertinent to the electronic delivery of government services to the public.”	Okot-Uma (2001)
Information Technology/ Benefits/ Dimensions/ Relationship with partners	“E-government is defined as the implementation of cost-effective models for citizens, industry, federal employees, and other stakeholders to conduct business transactions online. The concept integrates strategy, process, organization and technology.”	Whitson and Davis (2001)
Information Technology/ Dimensions	“E-government is simply using Information Technology to deliver government services directly to the customer at any time. The customer can be a citizen, a business or even another government entity.”	Duffy (2000)

Table 2. 5, 43 different definitions were identified between 1999 (Caldow, 1999), with the initiation of the e-government concept, and 2013 (Alateyah *et al.*, 2013; Altaany and Al-Zoubi, 2013). Each definition has one or multiple perspectives and this is normal due to the researcher or organization’s need to highlight a particular element of the E-government.

The Figure 2.4 shows the distribution of the different perspectives across the identified definitions:

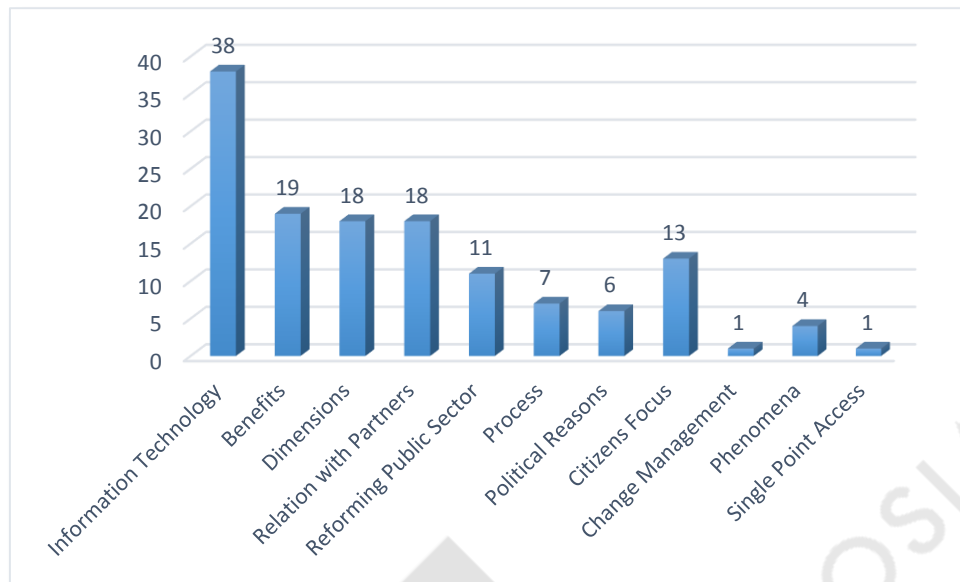


Figure 2.4: E-Government Definitions' Perspective

The Figure 2.5 shows the distribution of definitions by perspective between two periods: Before 2005 and after 2005. We chose the 2005 as the breaking point between those periods since it was the period of the Web 2.0 booming that added new concepts and capabilities to the online/internet based tools and technologies (O'reilly, 2005):

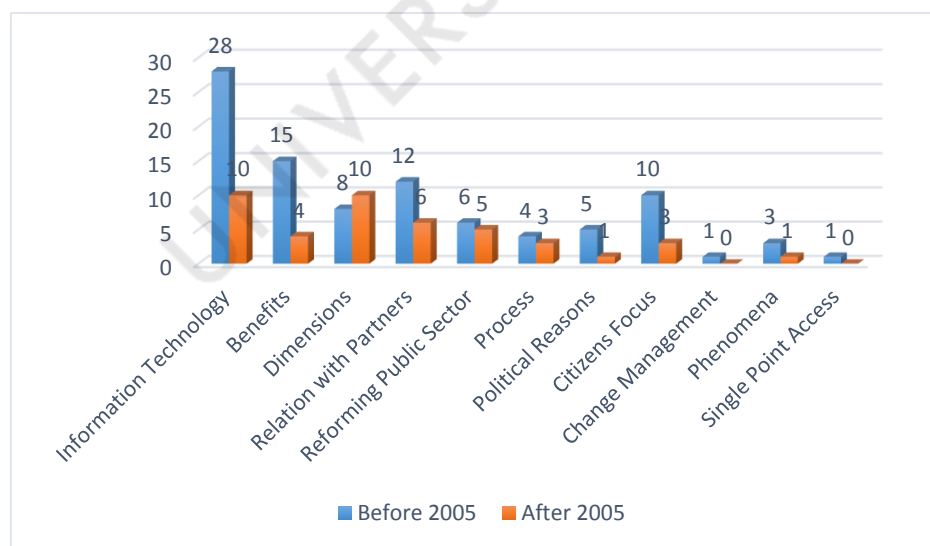


Figure 2.5: E-Government Definitions' Perspective distribution by period

As expected, most of the definitions (38 out of 43 definitions) cover the Information Technology perspective. Many of the definitions highlight the e-government's benefits, dimensions and relation with partners perspectives, whereas a minority of scholars mentioned e-government's citizens focus and reforming public sector perspectives. Those perspectives explain directly or indirectly the perceived purpose of the e-government.

From a chronological perspective, the Information Technology's presence in e-government definition was considered as essential component in almost all the e-government definitions since the beginning of the 21st Century (Duffy, 2000) until currently. This is also similar with regards to the benefits' perspective of e-government definition. Many definitions emphasize the added value of the e-government implementation starting by Baum and Di Maio (2000) until today. It must be noted that most of those definitions were concentrated before 2005 (15 out of 19) which could be perceived of as an intention of promoting the e-government in its early development stages by showing its added value to enhance the government services.

The same applies to the relation with partners' perspective of e-government definition where many definitions describe the type of relation between the government and the stakeholders first initiated by Caldow (1999) and still under continuous review. Focus on this perspective was intense before 2005 (12 out of 18) which may be attributed to the need to explain to the stakeholders/users, from the early development stages of e-government, how it can strengthen their relation with the government, thus ensuring their support and increasing the chance of successful implementation.

With respect to the dimensions perspective of e-government definition, it appears that this perspective was not concentrated over a specific period like the benefits and relation with partners perspectives, however it is distributed over the whole period of before and after 2005

which shows the importance of the e-government dimensions' identification from the early stages of e-government development till today in almost all e-government studies.

The three previous perspectives –benefits relation with partners, dimensions– are somehow interconnected where they appear together in 10 definitions; this is expected since the e-government dimensions are practically the partners and the strengthening of the relation between the government and the partners is one of the main benefits of e-government. Moreover, according to the Figure 2.4 and the related information in Table 2. 5, the citizen focus perspective definitions appear 12 times mainly before 2005 (10 out of 13) and reforming of public sector perspective definitions appear 11 times distributed over the two periods of before and after 2005. Those findings show the high importance of the e-government citizen and government dimensions as identified and highlighted explicitly from the beginning by Caldw (1999) which is fully aligned with the benefits – relation with partners – dimensions perspectives stressing on the need to provide mainly a beneficial relation between the government and its citizens, considered as main adopters of the future e-government services.

In this research, The World Bank Group (2004) definition of e-government will be chosen as the main e-government definition since it covers multiple perspectives (Information Technology, reforming public sector, relationship with partners, benefits, dimensions, political reasons, citizens focus) and thus considered as totally aligned with the author objective to study the e-government citizens' adoption models and then study the importance of using the Geospatial Technology to enhance the citizens adoption of the e-government services and fortify the G2C relation.

2.3.2 E-Government Dimensions

As per the definition of the World Bank Group (2004), the essential role of e-government is to transform the relations between government, citizens and businesses and improve its interactions. Many researches, Bonham *et al.* (2001), Reddick (2004), Ramaswamy and Selian (2007), Turban *et al.* (2008), ITU (2009), Ashaye and Irani (2014) and others considered three main e-government dimensions that are totally in alignment with the above e-government definition and grouped as “E-governance Cube” (Ramaswamy and Selian, 2007). The three main e-government dimensions are:

- Government to Government – G2G: The backbone of the e-government initiatives (Bonham *et al.*, 2003), G2G dimension reflects the nature of interconnectivity within the governments’ entities, between local, regional and national governments’ authorities as well as at the international level with other countries’ governmental agencies. This interconnectivity includes e-transactions and sharing and exchanging of information within the government at all levels – local, regional and national (Jaeger, 2003).

Government to Businesses – G2B: It is a pool of e-government initiatives providing administrative and business transactions (Chavan and Rathod, 2009) and procurement facilities for government purchases and call for tenders (Safeena and Kammani, 2013). The transactions consist of multiple types of services such as publishing of government’s related policies and regulations (Chavan and Rathod, 2009), offering online application forms (renewal of licenses, business registration, and request for permits, and payment of taxes). Those initiatives are very useful for the existing businesses in executing their traditional governmental obligations and transactions smoothly as well as for the business development, by facilitating the expansion of small to mid-size enterprises (Chavan and

Rathod, 2009). G2B can help in the establishment of a strong relationship between the government and the private sector especially for the activities related to the supply and purchase of products, including goods and services, to and from the government (Jaeger, 2003)

- Government to Citizens – G2C: The purpose of the G2C dimensions aims to provide better governmental services to the citizens such as income taxes, job search, social security, etc... and simplify the communication between government authorities and the public (Fang, 2002; Bonham *et al.*, 2001). Some researchers (Seifert, 2008; Carter and Bélanger, 2005) believe that the main purpose of any e-government project is to improve the communication between the government and citizens by the exchange of information with the public transparently and delivery of all possible governmental services to the citizens according to “one stop shop” and “citizen centric” model (Al-Khoury, 2011; Chhabra and Kumar, 2009; Abhichandani, 2008; Hewson *et al.*, 2004). Moreover, the G2C can enhance the interaction between citizens (Seifert and Petersen, 2002), citizens and government (Kakabadse *et al.*, 2003), citizens and businesses as well as increase the awareness of the citizens on government rules and regulations (Muir and Oppenheim, 2002).

Some academics stated that the above “governance cube” dimensions cover the majority of the e-government stakeholders (government, business, citizens) but there is some additional special dimensions or cases that should be treated separately.

Fang (2002) defined also two additional dimensions:

- Government-to-Nonprofit (G2N): The government interaction will be with the non-profit organizations or NGOs, political parties and social organizations, legislature, and so on.

The interaction will focus on the “*exchange of information regarding administrative acts, administrative policy, data, registers, laws, political programs, background information to decisions etc.*” (Fang, 2002: 7).

- Government-to-Employee (G2E): Chavan & Rathod (2009) and Fang (2002) stated that G2E focuses on initiatives that maintain and enhance the interrelationship with governmental employees and allow them to respond the citizens’ request in an efficient way. The interaction will guarantee an accurate and reliable monitoring of the government’s employees daily operations and their overall performance to provide the government higher management tools and information needed to create and update the employees’ development plans.

Yildiz (2003) defined two other dimensions:

- Government-to-Civil Societal Organizations (G2CS): An example of such interaction is the electronic communication and coordination efforts after a disaster.
- Citizen-to-Citizen (C2C): Such dimension can be considered if the interaction among citizens is related to the other three categories of e-government. An example of such interaction is the electronic discussion groups on civic issues.

According to many researchers (20 out of 23) who did a review and deep exploration of the e-government dimensions in addition to all the e-government dimensions’ perspective definitions stated in the previous section (18 definitions), the “e-governance cube” dimensions represents the core participants of any e-government development and the additional dimensions proposed for example by Fang (2002), Yildiz (2003) and Chavan and Rathod (2009) can be considered as peripherals belonging directly or indirectly to the three main dimensions. For example, the G2E dimension can be defined as an intra-connection e-service within the G2G dimension. The C2C

dimension is a conditional output related to the existence of the G2C or G2B communications media, thus C2C is part of either G2C or G2B dimensions. The G2N dimension can be considered as sub-dimension of the G2B dimension regardless of the non-profitability of those NGOs since they are performing like free of charge businesses. The G2CS dimension is definitely a sub-dimension of the G2C where civil societal organizations are considered as groups' representative of citizens and communities. In this research, we focus on the G2C dimension as part of the required reviews on the e-government citizen adoption. Figure 2.6 presents the e-government dimensions:

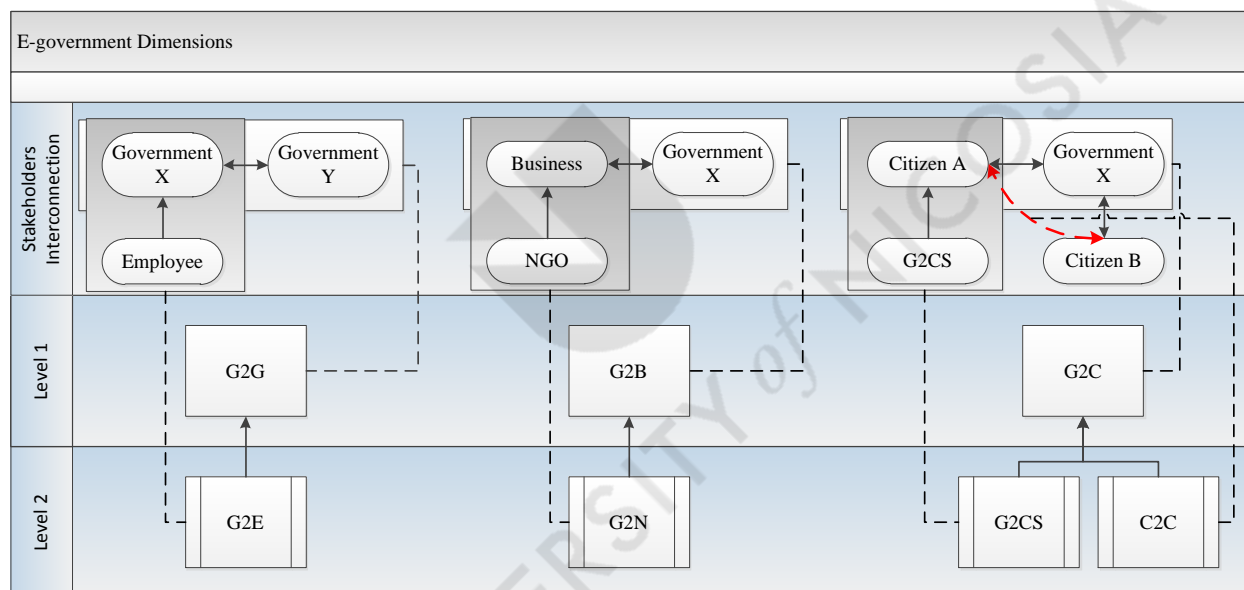


Figure 2.6: E-Government Dimensions

A comparison between the e-government dimensions researchers' reviews and dimensions' perspective definitions distribution over the period of before and after 2005, as shown in Figure 2.7, supports the opinion of non-concentration of the e-government dimensions' studies over a specific period stated in the previous section where both appear fully aligned and almost distributed equally over the two selected periods. It also shows the importance of identifying the

e-government dimensions from the early stages of the e-government development till today in almost all e-government studies.

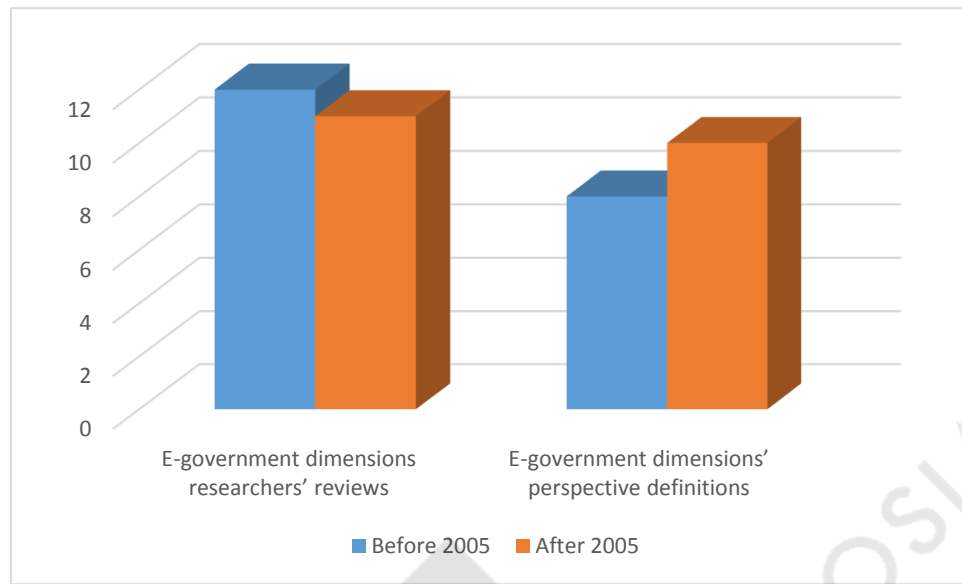


Figure 2.7: E-Government dimensions researchers' review and dimensions' Perspective definitions distribution over two periods

2.3.3 E-Government Maturity Models: Staging Models

Developed countries, like the United States of America, can be considered as the early investors in the e-government. E-government evolution is steady and continuous demonstrating different maturity levels in different countries. Some are advanced and have reached the transaction and interaction level of communication within the government entities and with the external stakeholders like citizens and businesses, whereas some others are still in their early stages relying on the one-way or two-way of communication (Al-Shehry *et al.*, 2006; Weerakkody *et al.*, 2006).

The e-government maturity implementation encouraged many researchers in the domain to analyze the e-government phenomenon. They came up with a normative literature and

conclusion of the need to model and define steps or stages by applying a level process management to avoid failure in information system implementations (Booty, 1998; Remenyi, 1991) and ensure an e-government evolution reaching out a vital e-government infrastructure (Moon, 2002; Deloitte and Touche, 2001; Layne and Lee, 2001). Accordingly, any e-government implementation, according to the staged approach defined by those researchers, can be assessed and categorized into one of those levels, starting from basic or lower maturity level along to the highest maturity level (Anderson and Henriksen, 2006; Irani *et al.*, 2006; Ebrahim and Irani, 2005).

The assessment of any e-government implementation will be based on multiple measures that could be qualitative or/and quantitative to discover the level or degree of maturity reached (Andersen and Henriksen, 2006). Those parameters are related to the human, organizational and technical issues (Irani and Love, 2001; Traunmuller and Lenk, 2002; Irani *et al.*, 2005). As per Irani *et al.* (2006), the advantage of applying a staged approach will help generate a momentum that can be maintained, allowing public to attract more citizens to use e-services as well as businesses trust to use government portals.

Furthermore, Irani *et al.* (2006), Gupta and Jana (2003), and Layne and Lee (2001) stated that the process of implementing an e-government system passes through different stages until it reaches its highest potential stage or maturity level, targeting the full integration of government information and services in different departments for different functions and at different levels of the government system. It also enables customers to obtain government services and information online from a single point of access.

Accordingly, multiple e-government stage models have been proposed by governments, consultants, researchers and academics. However, they lack the consensus on the number of

stages needed for an e-government system to reach the maturity. The Table 2. 6 (see Appendix B) illustrates most of the proposed models of the stages and their perception following the table structure of Al-Shafi (2009).

According to

Stage	Perception	Reference
2 Stage Model		
Stage 1: Cataloguing Stage 2: Transactions	<ul style="list-style-type: none"> Information about the government and its activities is presented on the web. Citizens can make transactions over the web. Furthermore, one stop shops are considered as a desired feature at this stage of maturity. 	Reddick (2004)
3 Stage Model		
Stage 1: Publish Stage 2: Interact Stage 3: Transact	<ul style="list-style-type: none"> Information about activities of government available online. Enables citizens to have simple interactions with their governments such as sending e-mail or 'chat rooms'. Provides citizens with full benefits from transactions over the internet, such as applying for programs and services, purchasing licenses and permits, etc. 	Howard (2001)
Stage 1: Publishing Stage 2: Interactivity Stage 3: Completing Transaction	<ul style="list-style-type: none"> Government disseminates information to citizen through website. Government interacts with citizen. Citizen/users can use the opportunity of the available technically enhanced website to conduct complete and secure transactions on-line. 	World Bank (2003)
Stage 1: Information interaction Stage 2: Transaction efficiency Stage 3: Transformation Citizen Centric	<ul style="list-style-type: none"> It features departmental Web sites, legislative posting, public notices, online forms, webcasting and personalized e-portals. It is a citizen self-service e-portal that can include electronic payments like online taxes and e-procurement. The administrative services at this stage are consolidated and shared across various government jurisdictions. 	Cisco (2007)

Stage	Perception	Reference
Stage 1: Catalogue Stage 2: Transaction Stage 3: Vertical Integration	<ul style="list-style-type: none"> • There is an online presence on the web. It features presentation catalogue and downloadable forms. • Features working databases supporting online transactions. Services and online forms are also made available. • Features vertical integration with higher levels within similar jurisdictions. 	Chen (2011)
4 Stage Model		
Stage 1: Web Presence Stage 2: Interaction Stage 3: Transaction Stage 4: Transformation	<ul style="list-style-type: none"> • Website to share governmental information to the public. • Users can interact with governmental authorities through websites, for example e-mails, downloadable documents, ... • Users can execute many online transactions like procurement or license application. • Government operational processes transformation for an effective, incorporated, and tailored service. 	Baum and Di Maio (2000)
Stage 1: Billboard Stage 2: Partial Service Delivery Stage 3: Full Integrated Service Delivery Stage 4: Interactive democracy with public outreach and accountability	<ul style="list-style-type: none"> • Focuses on functionality and citizen-centric. • Gives fairly little consideration security (technical and non-technical) as a specific issue. • Considers the potential benefit of political changes at its highest stage 	West (2004)
Stage 1: Cataloguing Stage 2: Transaction Stage 3: Vertical Integration Stage 4: Horizontal Integration	<ul style="list-style-type: none"> • Creating websites and making government information and services available online. • Enables citizens to interact with their governments electronically. • Focuses on integrating, disparate at different levels. • Focuses on integration of government services for different functions horizontally. 	Layne and Lee (2001)
Stage 1: Information Stage 2: Interaction Stage 3: Transaction	<ul style="list-style-type: none"> • Delivery of government services online. One-way communication between government and citizens. 	Chandler and Emanuel (2002)

Stage	Perception	Reference
Stage 4: Integration	<ul style="list-style-type: none"> • Simple interaction between citizens and governments. • Services that enable transactions of value between citizens and government. • Integration of services across the agencies and departments of government. 	
Stage 1: Simple Web site Stage 2: Online government Stage 3: Integrated government Stage 4: Transformed government	<ul style="list-style-type: none"> • Features static pages with downloadable forms. • Features interaction mechanisms such as emails, Web forms, help and FAQs. • Features end to end transactions. Moreover, information is shared between departments at this stage. • The services are customer centric and organized according to citizens' needs and segmented according to population groups and life events. Vertical and horizontal integration is also present at this stage. 	Windley (2002)
Stage 1: Promote Access and Connectivity Stage 2: Provide Service Online Stage 3: Transform the Enterprise Stage 4: Next Generation Government	<ul style="list-style-type: none"> • Focusing on developing infrastructure. • Implementing simple services that enhance the E-government presence to the existing services. • Increasing the importance of having an automated back office processes and improve the integration within and between services. • Highlighting on the next government generation, where we need to do business process re-engineering and IS/IT systems collaboration over organisation. 	Murphy (2005).
Stage 1: Cultivation Stage 2: Extension Stage 3: Maturity Stage 4: Revolution	<ul style="list-style-type: none"> • Horizontal and vertical integration is present along with the use of intranet by governments • There is an extensive use of intranet and it features customized Web interfaces and extensive use of intranet. • The organization is mature and the processes are transparent. 	Anderson and Henriksen (2006)

Stage	Perception	Reference
	<ul style="list-style-type: none"> Data can be shared between organizations and also applications can be shared across vendors. 	
Stage 1: Presence on the web Stage 2: Interaction between the citizen and the government Stage 3: Complete transaction over the web Stage 4: Integration of services	<ul style="list-style-type: none"> The e-portal provides only information. The user can download and email forms to the concerned authority. The citizens are able to complete entire tasks over the internet. Various departments share information with each other. 	Alhomod <i>et al.</i> (2012)
Stage 1: Emerging information services Stage 2: Enhanced information services Stage 3: Transactional services Stage 4: Connected services	<ul style="list-style-type: none"> E-government websites provide static information. The presence is enhanced with one way or simple two way communication. A two-way interaction with citizens is possible. Web sites are proactive in requesting Citizens' feedback via Web 2.0 tools. Government agencies are citizen centric and services are customer centric. 	UN (2012)
5 Stage Model		
Stage 1: Simple Information Age Stage 2: Request and Response Stage 3: Service and Financial Stage 4: Integration Stage 5: Political Participation	<ul style="list-style-type: none"> Representing a basic form of e-government uses e.g. disseminating information by posting it on the web sites. Facilitation of citizen and government interaction. Transactions occur both between governments and individuals (e.g. obtaining visa), and between governments and businesses (i.e. ordering office facilities). This is similar to the last two stages in the Layne and Lee (2001) four-stage model. This stage refers to integrating separate systems at different levels (vertical) and from different departments (horizontal). Promotion of political participation 	Hiller and Bélanger (2001)

Stage	Perception	Reference
	through services such as online voting and surveys.	
Stage 1: One way communication Stage 2: Two way communication Stage 3: Transformation Stage 4: Vertical and Horizontal Integration Stage 5: Political Participation	<ul style="list-style-type: none"> • Similar to Hiller and Bélanger model with only one difference in the stage one 	Moon (2002)
Stage 1: Basic site Stage 2: Electronic publishing Stage 3: e-publishing Stage 4: Transactional Stage 5: Joined e-governance	<ul style="list-style-type: none"> • Few pages are available in the Web site which give basic information about the agency. • The Web site contains many pages. • Features personalization options and customizable search tools. Some forms can be submitted online and others can be downloaded. Moreover, there is an extensive use of emails and the responses are timely. Besides that, email alerts to notify the users about new content is an offered functionality. • The users make secure transactions over the web. • Features one stop shops and joined up governments (vertical and horizontal integration). 	Dunleavy (2002)
	<ul style="list-style-type: none"> • The 1st stage features online websites with department information. • The 2nd stage features FAQs and email systems. • The 3rd stage features forums and opinion surveys. • The 4th stage features online services such as: license renewals and payment of fines. • The 5th stage features one stop shops. The citizens can vote, contribute in online discussions and make comments on policy and legislation proposals. 	Netchaeva (2002)
Stage 1: Online Presence Stage 2: Basic Capability	<ul style="list-style-type: none"> • Information is published online. • Security and certification is developed. The online presence is broad. 	Accenture (2003)

Stage	Perception	Reference
Stage 3: Service availability Stage 4: Mature delivery Stage 5: Service transformation	<ul style="list-style-type: none"> Many services are available in the e-portal. It features cross agency cooperation. Moreover, the services are designed to meet customer needs. The services are clustered. There is a clear ownership and authority – CIO (Chief Information Officer) or central agency. The customer is involved in the process of e-government and the services are marketed. Improved customer service delivery is the target. This stage also features multichannel integration. 	
Stage 1: Web Presence Stage 2: Interaction Stage 3: Transaction Stage 4: Transformation Stage 5: e-democracy	<ul style="list-style-type: none"> Websites contain only static information. Provides a simple interaction like forms download and features basic search engines and email systems. The users can perform complete transactions over the web. Includes vertical and horizontal integration. The governments provide a single unified e-portal. It features tools for online voting, polling and surveys to enable political participation and citizen engagement. 	Siau and Long (2005)
Stage 1: Online presence Stage 2: Interaction Stage 3: Transaction Stage 4: Fully integrated and transformed E-government Stage 5: Digital democracy	<ul style="list-style-type: none"> Information is published online. Citizens can interact with governments by emailing officials and downloading forms. The users at this stage can conduct secure transactions like payments and tax filling. Government services are organized as a single point of contact. It features online voting, public forums and opinion surveys. 	Shahkooh <i>et al.</i> (2008)
Stage 1: Web Presence Stage 2: Interaction Stage 3: Transaction Stage 4: Integration Stage 5: Continuous improvement	<ul style="list-style-type: none"> Features simple and limited information available on the web. Features search engines and downloadable forms. Features online transactions with the possibility of electronic payments. Features horizontal and vertical 	Kim and Grant (2010)

Stage	Perception	Reference
	<p>integration. Moreover, performance can be measured at this stage using statistical techniques.</p> <ul style="list-style-type: none"> • Features political activities. Besides that, there is a great focus on continuous improvements. 	
Stage 1: Initial conditions Stage 2: Data Transparency Stage 3: Open Participation Stage 4: Open collaboration Stage 5: Ubiquitous engagement	<ul style="list-style-type: none"> • One way static interaction with the citizen. It is only used for broadcasting information to the public. • The use of social media is limited. Feedback is get from the public on usefulness and data quality. • It features social media tools to increase open participation. Input from the public is welcomed and used in policy decisions. It includes also e-Voting and e-Petitioning. • It features interagency collaboration by sharing data and public input. Public contests are organized and data is analyzed for obtaining new insights and improving decision-making. • Data is easily accessed by mobile devices and tablets. Data is vertically and horizontally integrated. Besides that, data analytics is used for decision making processes. The agencies are focused on enabling continuous improvements. 	Lee and Kwak (2012)
6 Stage Model		
Stage 1: Information Publish/Dissemination Stage 2: Official Two-way Transaction Stage 3: Multi-purpose Portals Stage 4: Portal Personalization Stage 5: Clustering of Common Services Stage 6: Full Integration/Enterprise Transaction	<ul style="list-style-type: none"> • Increasing users' access to the government information. • Increasing ICT use to facilitate the interaction between governments and users like using the digital signatures and security keys. • Offering a single portal to provide service across departments. • Offering to the users the capability of customising the portals. • Enhancing the collaboration and reducing the mediators between operational processes to deliver a unified and seamless service. 	Deloitte and Touche (2001)

Stage	Perception	Reference
	<ul style="list-style-type: none"> • Provide stylish, unified and tailored services that meets the customer's needs and preferences. 	
Stage 1: Setting up an email system and internal network Stage 2: Enabling inter-organizational and public access to information Stage 3: Allowing 2-way Communication Stage 4: Allowing exchange of value Stage 5: Digital democracy Stage 6: Joined-up government	<ul style="list-style-type: none"> • Government systems focuses on internal processes that supports basic administrative functions such as e-mails and payroll. • Developing systems that will help in managing its workflow from paper based to electronic format (inter-organizational). • Citizen (public) are able to access government information through the use of internet. • Government and the citizen (public) use ICT as enabler for communication. • ICT is used to support development of more flexible and convenient ways for citizens to conduct business with the government. • Citizen use ICT as an enabler that can potentially support participatory and democratic processes. • There is both vertical and horizontal integration of service delivery, a webportal integrates information and services from various government bodies/agencies 	Wescott - Asia Pacific (2001)
Stage 1: Presence Stage 2: Information Stage 3: Interaction Stage 4: Transaction Stage 5: Integration Stage 6: Political Participation	<ul style="list-style-type: none"> • The website contains static and limited information • Information is frequently updated and there is a greater number of available webpages. • The users can download forms and communicate with the government by mail. • It features secure online Web services with the possibility of payments. • It offers a one stop shop to the citizens. • Users can vote and participate in opinion surveys and public forums. 	Almazan and Gil-Garcia (2008)

Table 2. 6, it is obvious that some models are very similar, some others have distinctive differences. The Figure 2.8, developed according to Fath-allah *et al.* (2014), Becker *et al.* (2010)

and Coursey and Norris (2008) Stage model table structure, summarizes the identified existing maturity models.

					Stage	1	2	3	4	5	6
Author	Year	Research Method	Journal	IM	RM						
2 Stage Models											
Reddick	2004	Action Research	Government Information Quarterly		X	Catalogue	Transact				
3 Stage Models											
Howard	2001	Action Research	E-Government	X		Publish	Interact	Transact			
World Bank	2003	Survey Study	World Bank		X	Publish	Interact	Complete Transact			
Cisco	2007	Survey Study	World Bank		X	Information Interaction	Transaction Efficiency	Transformation Citizen			
Chen	2011	Action Research	ICMeCG Conference		X	Catalogue	Transact	Vertical Integration			
4 Stage Models											
Baum and Di Maio	2000	Action Research	Gartner Group	X		Online/Web Presence	Interact	Transact	Transformation		
Layne and Lee	2001	Action Research	Government Information Quarterly	X		Catalogue	Transact	Vertical Integration	Horizontal Integration		
Chandler and Emanuel	2002	Action Research	European Conference on E-government	X		Information	Interact	Transact	Integration		
Windley	2002	Action Research	USA: Windleys' Technolometria	X		Simple/ Basic Website	Online Government	Integrated Government	Transformed Government		
West	2004	Action Research	Public Administration Review	X		Billboard	Partial Service Delivery	Full Integrated Service Delivery	Interactive democracy with public outreach and		
Murphy	2005	Action Research	INSEAD	X		Promote Access and Connectivity	Provide Service Online	Transform the Enterprise	Next Generation Government		
Anderson and Henriks	2006	Action Research	Government Information Quarterly	X		Cultivation	Extension	Maturity	Revolution		
Alhomod et al.	2012	Case Study	International Journal of Electrical & Computer Sciences		X	Online/ Web Presence	Interact	Complete Transact	Connected services		
UN	2012	Survey Study	UN		X	Emerging information services	Enhanced information services	Transactional services	Connected services		

					Stage	1	2	3	4	5	6
Author	Year	Research Method	Journal	IM	RM						
5 Stage Models											
Hiller and Bélanger	2001	Action Research	E-Government	X		Simple Information	Request and Response	Service and Financial	Integration	Political Participation	
Moon	2002	Action Research	Public Administration Review		X	One way communication	Two way communication	Transformation	Vertical/ Horizontal Integration	Political Participation	
Dunleavy	2002	Action Research	National Audit Office Press	X		Simple/Basic Website	Electronic Publishing	e-publishing	Transactional services	Joined e-governance	
Netchaeva	2002	Case Study	International Communication Gazette	X		Online Web sites with department information	Features FAQs and email systems	Forums and opinion surveys	Online services	One stop shops	
Accenture	2003	Action Research	Accenture		X	Online/ Web Presence	Basic Capability	Service availability	Mature delivery	Service transformation	
Siau and Long	2005	Action Research	Industrial Management & Data Systems		X	Online/ Web Presence	Interact	Transact	Transformation	Digital democracy	
Shahkooh et al.	2008	Action Research	ICTTA Conference		X	Online/ Web Presence	Interact	Transact	Fully integrated and transformed e-	Digital democracy	
Kim and Grant	2010	Action Research	Journal of Systems and Information		X	Online/ Web Presence	Interact	Transact	Integration	Continuous Improvement	
Lee and Kwak	2012	Action Research	Government Information Quarterly	X		Initial Conditions	Data Transparency	Open Participation	Open Collaboration	Ubiquitous engagement	
6 Stage Models											
Deloitte and Touche	2001	Action Research	CMA Management	X		Information Publish/ Dissemination	Official Two-way Transaction	Multi-purpose Portals	Portal Personalization	Clustering of Common Services	Full Integration/ Enterprise
Wescott - Asia Pacific	2001	Case Study	Asian Journal of Political Science	X		Setting up an email system and internal network	Enabling inter-organizational and public access to information	Allowing 2-way Communication	Allowing exchange of value	Digital democracy	Joined-up government
Almazan and Gil-Garc	2008	Case Study	IGI Global		X	Online/ Web Presence	Information	Interact	Transact	Integration	Political Participation

Figure 2.8: E-Government Maturity Models

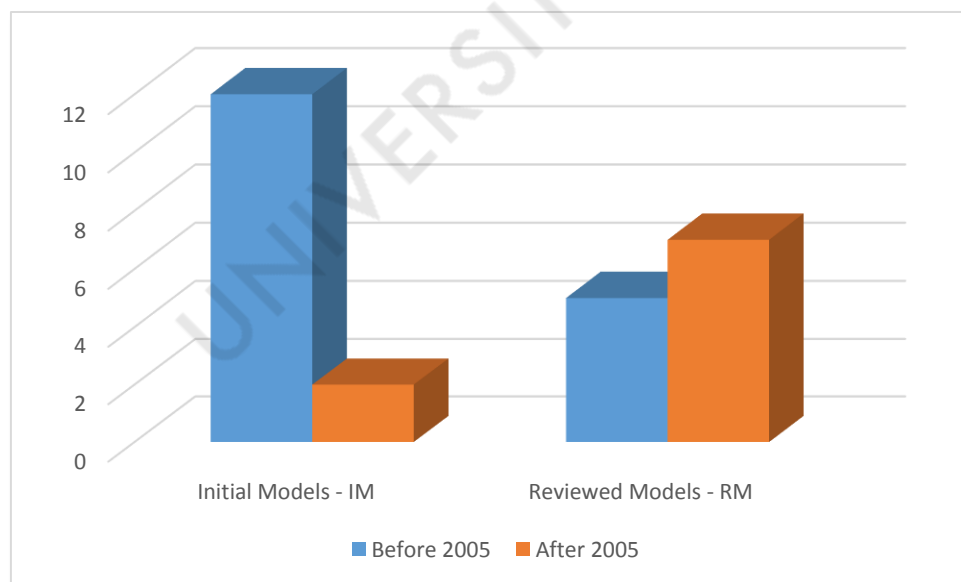


Figure 2.9: E-Government IM and RM Maturity Models over different periods of time

The Figure 2.8 and Figure 2.9 show that almost 50% of the identified stage models are considered as Initial Models – IM (14 out of 26) – and the rest are reviewed models RM developed according to the one or multiple models and thus regarded as enhanced or derived models to represent the new advancement and innovations in the e-government industry. 12 out of the 14 IM classified stage models were initiated between before 2005, however the RM were distributed almost equally between the periods of before and after 2005.

Therefore, according to the above literature review outcomes and the analytical reviews of many bodies of research (Fath-Allah *et al.*, 2014; Lee, 2010; Shafi and Weerakkody, 2009; Coursey and Norris, 2008) on the existing proposed e-government maturity models, we can conclude the following:

1. The maturity models' stages vary from 2 to 6 stages (Fath-Allah *et al.*, 2014).
2. Most of the maturity models' stages focus on four distinct main stages: presence, interaction, transaction and integration (Fath-Allah *et al.*, 2014).
3. The maturity models do not reflect all the e-government perspectives (technological, organizational, and citizen service) not even all the e-government issues (organizational, managerial, and technological) which is not quite easy as the e-government is a new era considered as a complex phenomenon involving various stakeholders and technologies (Lee, 2010)
4. The different models do not show common similarities (Shafi and Weerakkody, 2009).
5. In some models, the e-government have to pass all of the previous stages to proceed to the next stage where others keep it to the public organizations to decide whether to skip certain stages or to provide different services at each stage of maturity model (Shafi and Weerakkody, 2009).

6. 12 IM maturity models and 5 RM maturity models were initiated in the 1999 – 2005 period– which shows the effort invested by the researchers to come out with logical models that can support the governments’ plans to develop e-government systems.
7. 7 maturity models (2 IM and 5 MR) are reflective of real cases (4 case studies and 3 survey studies), hence those 27% identified, considered as synthesis of theoretical thoughts and determined realities, proves the intention of the researchers to understand the stakeholders/end users’ (citizens mainly) needs to guarantee the successful implementation and adoption of the e-government system.
8. 5 big organizations and consultants (World Bank, 2003; Cisco, 2007; UN, 2012; Accenture, 2003; Deloitte and Touche, 2001) invested in developing new maturity models (1 IM and 4 RM) where 3 of them are study based models. This is an additional proof of the continuous commitment of not only individual researchers but also big organizations to enhance maturity models with logical models’ stages.
9. With the release of Web 2.0 in 2004 – 2005, it appears clearly that many e-government maturity models’ researchers considered this new innovative communication factor and developed or reviewed the models’ stages accordingly where new terms were being used to reflect the added value of the Web 2.0 (Emerging/Enhanced Information services (UN, 2012), Open Participation/collaboration (Lee and Kwak, 2012), Connected Services (Alhomod *et al.*, 2012; UN, 2012)

To conclude, it is wide beneficial for the government decision makers to have those maturity models available where the choice of the adoption of any of them will be a matter of best fitting model that respond to the targeted e-government perspective and resolve the challenging issues.

2.3.4 E-Government Benefits

As previously described, e-government implementation is based on maturity or stage models. Each stage, regardless of the model applied and based on its output achieved after implementation, will provide some benefits where, according to Brown (2007), early stages of maturity models offer minor benefits whereas the latter or advanced stages offer larger and significant benefits. Thus, gaining benefits from e-government implementation is an incremental and slow process (Norris and Moon, 2005; Brown, 2007) and can be predicted according to the relevant classified activities (West, 2005; Brown, 2007; Norris and Moon, 2005).

E-government, as demonstrated by many researchers (Gil-García and Pardo, 2005; Edmiston, 2003; Jaeger, 2003; Cook, 2000; Fang, 2002), is as beneficial to citizens, businesses, and governments as the e-business and e-commerce in both developed and developing countries (Ndou, 2004). E-government is not anymore an added value to the government, it is a change or evolvement process from traditional government operations to electronic government operations like government work process, share of information, service delivery, interconnection between government authorities and with citizens and businesses Bhatnagar (2004), serving its internal and external stakeholders/clients (Al Shafi and Weerakkody, 2009). The e-government benefits can be classified according to the e-government advantage perspective and system beneficiary (citizens, businesses, and governments). The

Category	Benefit	Beneficiary	Authors
Efficiency and Cost Reduction	Improve internal efficiency of public administrations, by streamlining information and administrative process management.	Government	Caldow (2001)

Category	Benefit	Beneficiary	Authors
	Offer great benefits regarding economizing and improving of governments service operations, including efficiency and reduced transactional costs.	Government, Businesses, Citizens	Cohen and William (2002)
	Improve the government daily operations in an improved and economic manner.	Government	Edmiston (2003)
	Reduce delivery costs for information and services. Improve work efficiency (shorten delivery times, reduce crowdedness of government agency offices, reduce personnel, decrease the number of complaints and the employee-time devoted to handling them).	Government	Sorin Kertesz (2003)
	Increase the efficiency of public administration.	Government	Haldenwang (2003)
	Reduce the customers and organizations' time, effort and costs.	Businesses, Citizens	Noie (2003)
	Reduce corruption in government functions.	Government, Businesses, Citizens	The Economist (2003)
	Improve efficiency of government agencies in processing of data. Improve services through better understanding of users' requirements.	Government	OECD (2003)

Category	Benefit	Beneficiary	Authors
	Reduce the processing costs of many activities compared to the traditional way of managing operations.	Government	Ndou (2004)
	Overcome administrative obstacles between businesses and government. Reduce transactions' cost for the businesses and government; Increase revenue collection.	Government, Businesses	Bhatnagar (2004)
	Improve the performance of government agencies and deliver the public service effectively and efficiently for all customers.	Government, Businesses, Citizens	Rubin and Wang (2004)
	Improve the efficiency of the governmental services; Deliver precise and effective services; Reduce cost and time for the frequent administrative tasks executed by the government employees.	Government, Businesses, Citizens	Jaeger (2003), Gil-García and Pardo (2005)
	Reduce defects and improve the productivity by offering standardized tasks.	Government, Businesses, Citizens	Carter and Belanger (2005), Gil-García and Pardo (2005), Basu (2004)
	Reduce cost and levels of organizational processes by streamlining and re-organizing operating Procedures.	Government	Seifert (2005)

Category	Benefit	Beneficiary	Authors
	Reduce the government's expenditure by providing a direct communication channel within the government and with the private sector in addition to the integration between multiple government authorities' systems over a single web portal.	Government, Businesses, Citizens	Al-Khourri and Bal (2007)
Accountability and transparency	Deliver improved services to citizens, businesses, and other members of the society through drastically changing the way governments manage information.	Businesses, Citizens	Accenture (2002)
	Increase the transparency and the services for citizen.	Government, Businesses, Citizens	Cohen and William (2002)
	Offer a reputable channel to improve the government transparency and accountability as well as empowering the citizens.	Citizens	Kumar (2003), La Porte <i>et al.</i> (2002)
	Improve service delivery and citizens' satisfaction.	Government, Businesses, Citizens	Noie (2003)
	Improve transparency and decrease government bureaucracy.	Government, Businesses, Citizens	Sorin Kertesz (2003)
	Strengthen the openness and transparency of political processes.	Government, Businesses, Citizens	Haldenwang (2003)
	Improve transparency, accuracy and facilitate information exchange between government	Government, Businesses, Citizens	OECD (2003)

Category	Benefit	Beneficiary	Authors
	and customers. Help in building trust between governments and citizens, an essential factor in good governance by using internet-based strategies to involve citizens in the policy process, illustrating government transparency and accountability.		
	Offer interactive technology to enhance government accountability, so offering better responsiveness to the citizens' needs and demands.	Citizens	Welch and Hinnant (2003), Wong and Welch (2004)
	Increase the transparency and accountability of the decision-making process; Offer better citizens' services.	Government Businesses, Citizens	Jaeger (2003), Ndou (2004)
	Support citizens' participation in the decision-making; citizens can share their recommendations using the forums and the online communities.	Citizens	Ndou (2004)
	Capability of government to answer public clarifications about its services' performance.	Citizens	Wong and Welch (2004)

Category	Benefit	Beneficiary	Authors
	Provide e-government transparency and support the decentralization of the administration in government authorities.	Citizens	Carter and Belanger (2005)
	Increase public satisfaction and improve the offered services to be more accessible and transparent, and thus guarantee the user and the public-private sector collaboration.	Businesses, Citizens	Al-Khouri and Bal (2007)
	Provide flow of information easily to citizens in order to improve the government and allow the citizens to closely inspect the government's performance; The information availability will help citizens to monitor the performance of public organizations.	Citizens	Al Shafi and Weerakkody (2009)
Citizen centric focus	Offer a partnership relationship between government and citizens.	Citizens	Silcock (2001)
	Provision of 24/7 services that improve the level of satisfaction among citizens and enhance their acceptance of the public sector.	Citizens	Stiftung (2002)
	Help in building trust between governments and citizens, an essential factor in good governance by using internet-based strategies	Citizens	OECD (2003)

Category	Benefit	Beneficiary	Authors
	to involve citizens in the policy process, illustrating government transparency and accountability.		
	More self-service; Customer (citizen) satisfaction; Better relationship between government and customer; more interaction and feedback.	Citizens	Sorin Kertesz (2003)
	Enable citizens' incorporation in policy designing processes which facilitate processes acceptance and adoption; Guarantee the management plans implementation; Enhance the relation between management authorities and public administration;	Citizens	Irvin and Stansbury (2004)
	Create the virtual government and citizen's interface.	Citizens	Wong and Welch (2004), Navarra and Cornford (2005)
	Provide citizens more control on how and when they interact with the government.	Citizens	Kumar <i>et al.</i> (2007)
Economic development	Help businesses move online and assist them to use online tools.	Businesses	Reynolds and Regio (2001)
	Assist a government's economic policy objectives by promoting productivity gains inherent in ICT and e-	Businesses, Citizens	OECD (2003)

Category	Benefit	Beneficiary	Authors
	commerce.		
	Support the creation of new business and work opportunities.	Businesses	Noie (2003)
	Create opportunities for new revenues; Offer faster and improved collection of government revenues.	Government, Businesses	Sorin Kertesz (2003)
	Reinforce the government's drive towards efficient governance and improve the transparency to manage effectively the country's social and economic resources for development.	Businesses, Citizens	Basu (2004)
	Promote local economy vitality.	Businesses, Citizens	Ferguson (2005)
	Facilitate the partnership process between government and businesses or private sector.	Government, Businesses	Al-Sebie and Irani (2005), Bertot and Jaeger (2006)
	Support businesses' aim to increase their cost-saving activities by supporting the creation and adoption of a powerful e-government system that provides online services, which helps minimize their routine visits to government authorities required in tradition to undertake the service.	Businesses	Al Shafi and Weerakkody (2009)
Accessibility and Availability	Deliver electronic and integrated public services.	Government Businesses, Citizens	Reynolds & Regio (2001)

Category	Benefit	Beneficiary	Authors
	Provide citizens an increase in government accessibility, decrease in government bureaucracy and increase in citizen participation in democracy.	Citizens	Prins (2001)
	Provide fast and easy access to government information which guarantee a high government availability, and transparency and responsiveness to citizens' needs.	Businesses, Citizens	Halchin (2004), Doty and Erdelez (2002)
	Share information and ideas between all government agencies and departments to build one mega database.	Government	OECD (2003)
	Improve public service delivery.	Businesses, Citizens	Haldenwang (2003)
	Transform services, making them more accessible, more convenient, more responsive and more cost effective.	Government Businesses, Citizens	Fergusson (2005)
	Provide an improved accessibility to public services with higher quality.	Businesses, Citizens	Carter and Belanger (2005)
	Guarantee the availability of online governmental services and an increased governmental availability and accessibility.	Government Businesses, Citizens	Scholl and Klischewski (2007)
	Provide an ease of accessibility of government services.	Businesses, Citizens	Kumar <i>et al.</i> (2007)

Category	Benefit	Beneficiary	Authors
	Provide citizens and businesses a single gateway to access the government services and information that enables the integration of government to citizen and government to business transactions.	Businesses, Citizens	Al Shafi and Weerakkody (2009)
	Allow, by using the e-applications, people, businesses, and government sectors to access to available government information 24 hours a day, 7 days a week, which improves the quality of these services.	Government Businesses, Citizens	Ndou (2004)
Technology Awareness & Usage	Bridge the digital divide;	Citizens	Reynolds and Regio (2001)
	Achieve lifelong learning.		
	Enable through ICT better management of external relations.	Businesses, Citizens	Caldow (2001)
	Increase of users' ICT skills , internet knowledge and computer usage.	Government, Businesses, Citizens	Noie (2003)
	Allow development of new services, integration, and automation; Offer high-value web content to provide additional incentives for people to use the web, leading to an increase in Internet penetration rates.	Government, Businesses, Citizens	Sorin Kertesz (2003)
	Use the technology to personalize a website to	Citizens	Gilber and Balestrini (2004)

Category	Benefit	Beneficiary	Authors
	a point where delivery of services could be tailored to meet the specific needs of an individual, thereby increasing the satisfaction of citizens from government services.		
Government Reform & Democracy	Create a more participative form of government that can lead to direct democracy.	Government, Citizens	Reynolds and Regio (2001)
	Enable levels of democratic participation that were previously unimaginable.	Citizens	Caldow (2001)
	Renew local democracy, by making councils more open, more accountable, more inclusive and better able to lead their communities.	Citizens	Ferguson (2005)

Table 2. 7 (see Appendix B) illustrates the author findings on the E-government's benefits according to categories defined by multiple researchers (Reynolds and Regio, 2001; Caldow, 2001; NOIE, 2003; OECD, 2003; Kertesz, 2003; Ferguson, 2005; Al Shafi and Weerakkody, 2009).

Thus, according to

Category	Benefit	Beneficiary	Authors
Efficiency and Cost Reduction	Improve internal efficiency of public administrations, by streamlining information and administrative process management.	Government	Caldow (2001)

Category	Benefit	Beneficiary	Authors
	Offer great benefits regarding economizing and improving of governments service operations, including efficiency and reduced transactional costs.	Government, Businesses, Citizens	Cohen and William (2002)
	Improve the government daily operations in an improved and economic manner.	Government	Edmiston (2003)
	<p>Reduce delivery costs for information and services.</p> <p>Improve work efficiency (shorten delivery times, reduce crowdedness of government agency offices, reduce personnel, decrease the number of complaints and the employee-time devoted to handling them).</p>	Government	Sorin Kertesz (2003)
	Increase the efficiency of public administration.	Government	Haldenwang (2003)
	Reduce the customers and organizations' time, effort and costs.	Businesses, Citizens	Noie (2003)
	Reduce corruption in government functions.	Government, Businesses, Citizens	The Economist (2003)
	<p>Improve efficiency of government agencies in processing of data.</p> <p>Improve services through better understanding of users' requirements.</p>	Government	OECD (2003)

Category	Benefit	Beneficiary	Authors
	Reduce the processing costs of many activities compared to the traditional way of managing operations.	Government	Ndou (2004)
	Overcome administrative obstacles between businesses and government. Reduce transactions' cost for the businesses and government; Increase revenue collection.	Government, Businesses	Bhatnagar (2004)
	Improve the performance of government agencies and deliver the public service effectively and efficiently for all customers.	Government, Businesses, Citizens	Rubin and Wang (2004)
	Improve the efficiency of the governmental services; Deliver precise and effective services; Reduce cost and time for the frequent administrative tasks executed by the government employees.	Government, Businesses, Citizens	Jaeger (2003), Gil-García and Pardo (2005)
	Reduce defects and improve the productivity by offering standardized tasks.	Government, Businesses, Citizens	Carter and Belanger (2005), Gil-García and Pardo (2005), Basu (2004)
	Reduce cost and levels of organizational processes by streamlining and re-organizing operating Procedures.	Government	Seifert (2005)

Category	Benefit	Beneficiary	Authors
	Reduce the government's expenditure by providing a direct communication channel within the government and with the private sector in addition to the integration between multiple government authorities' systems over a single web portal.	Government, Businesses, Citizens	Al-Khourri and Bal (2007)
Accountability and transparency	Deliver improved services to citizens, businesses, and other members of the society through drastically changing the way governments manage information.	Businesses, Citizens	Accenture (2002)
	Increase the transparency and the services for citizen.	Government, Businesses, Citizens	Cohen and William (2002)
	Offer a reputable channel to improve the government transparency and accountability as well as empowering the citizens.	Citizens	Kumar (2003), La Porte <i>et al.</i> (2002)
	Improve service delivery and citizens' satisfaction.	Government, Businesses, Citizens	Noie (2003)
	Improve transparency and decrease government bureaucracy.	Government, Businesses, Citizens	Sorin Kertesz (2003)
	Strengthen the openness and transparency of political processes.	Government, Businesses, Citizens	Haldenwang (2003)
	Improve transparency, accuracy and facilitate information exchange between government	Government, Businesses, Citizens	OECD (2003)

Category	Benefit	Beneficiary	Authors
	and customers. Help in building trust between governments and citizens, an essential factor in good governance by using internet-based strategies to involve citizens in the policy process, illustrating government transparency and accountability.		
	Offer interactive technology to enhance government accountability, so offering better responsiveness to the citizens' needs and demands.	Citizens	Welch and Hinnant (2003), Wong and Welch (2004)
	Increase the transparency and accountability of the decision-making process; Offer better citizens' services.	Government Businesses, Citizens	Jaeger (2003), Ndou (2004)
	Support citizens' participation in the decision-making; citizens can share their recommendations using the forums and the online communities.	Citizens	Ndou (2004)
	Capability of government to answer public clarifications about its services' performance.	Citizens	Wong and Welch (2004)

Category	Benefit	Beneficiary	Authors
	Provide e-government transparency and support the decentralization of the administration in government authorities.	Citizens	Carter and Belanger (2005)
	Increase public satisfaction and improve the offered services to be more accessible and transparent, and thus guarantee the user and the public-private sector collaboration.	Businesses, Citizens	Al-Khouri and Bal (2007)
	Provide flow of information easily to citizens in order to improve the government and allow the citizens to closely inspect the government's performance; The information availability will help citizens to monitor the performance of public organizations.	Citizens	Al Shafi and Weerakkody (2009)
Citizen centric focus	Offer a partnership relationship between government and citizens.	Citizens	Silcock (2001)
	Provision of 24/7 services that improve the level of satisfaction among citizens and enhance their acceptance of the public sector.	Citizens	Stiftung (2002)
	Help in building trust between governments and citizens, an essential factor in good governance by using internet-based strategies	Citizens	OECD (2003)

Category	Benefit	Beneficiary	Authors
	to involve citizens in the policy process, illustrating government transparency and accountability.		
	More self-service; Customer (citizen) satisfaction; Better relationship between government and customer; more interaction and feedback.	Citizens	Sorin Kertesz (2003)
	Enable citizens' incorporation in policy designing processes which facilitate processes acceptance and adoption; Guarantee the management plans implementation; Enhance the relation between management authorities and public administration;	Citizens	Irvin and Stansbury (2004)
	Create the virtual government and citizen's interface.	Citizens	Wong and Welch (2004), Navarra and Cornford (2005)
	Provide citizens more control on how and when they interact with the government.	Citizens	Kumar <i>et al.</i> (2007)
Economic development	Help businesses move online and assist them to use online tools.	Businesses	Reynolds and Regio (2001)
	Assist a government's economic policy objectives by promoting productivity gains inherent in ICT and e-	Businesses, Citizens	OECD (2003)

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	Reinforce the government's drive towards efficient governance and improve the transparency to manage effectively the country's social and economic resources for development.	Businesses, Citizens	Basu (2004)
	Promote local economy vitality.	Businesses, Citizens	Ferguson (2005)
	Facilitate the partnership process between government and businesses or private sector.	Government, Businesses	Al-Sebie and Irani (2005), Bertot and Jaeger (2006)
	Support businesses' aim to increase their cost-saving activities by supporting the creation and adoption of a powerful e-government system that provides online services, which helps minimize their routine visits to government authorities required in tradition to undertake the service.	Businesses	Al Shafi and Weerakkody (2009)
Accessibility and Availability	Deliver electronic and integrated public services.	Government Businesses, Citizens	Reynolds & Regio (2001)

Category	Benefit	Beneficiary	Authors
	Provide citizens an increase in government accessibility, decrease in government bureaucracy and increase in citizen participation in democracy.	Citizens	Prins (2001)
	Provide fast and easy access to government information which guarantee a high government availability, and transparency and responsiveness to citizens' needs.	Businesses, Citizens	Halchin (2004), Doty and Erdelez (2002)
	Share information and ideas between all government agencies and departments to build one mega database.	Government	OECD (2003)
	Improve public service delivery.	Businesses, Citizens	Haldenwang (2003)
	Transform services, making them more accessible, more convenient, more responsive and more cost effective.	Government Businesses, Citizens	Fergusson (2005)
	Provide an improved accessibility to public services with higher quality.	Businesses, Citizens	Carter and Belanger (2005)
	Guarantee the availability of online governmental services and an increased governmental availability and accessibility.	Government Businesses, Citizens	Scholl and Klischewski (2007)
	Provide an ease accessibility of government services.	Businesses, Citizens	Kumar <i>et al.</i> (2007)

Category	Benefit	Beneficiary	Authors
	Provide citizens and businesses a single gateway to access the government services and information that enables the integration of government to citizen and government to business transactions.	Businesses, Citizens	Al Shafi and Weerakkody (2009)
	Allow, by using the e-applications, people, businesses, and government sectors to access to available government information 24 hours a day, 7 days a week, which improves the quality of these services.	Government Businesses, Citizens	Ndou (2004)
Technology Awareness & Usage	Bridge the digital divide;	Citizens	Reynolds and Regio (2001)
	Achieve lifelong learning.		
	Enable through ICT better management of external relations.	Businesses, Citizens	Caldow (2001)
	Increase of users' ICT skills , internet knowledge and computer usage.	Government, Businesses, Citizens	Noie (2003)
	Allow development of new services, integration, and automation; Offer high-value web content to provide additional incentives for people to use the web, leading to an increase in Internet penetration rates.	Government, Businesses, Citizens	Sorin Kertesz (2003)
	Use the technology to personalize a website to	Citizens	Gilber and Balestrini (2004)

Category	Benefit	Beneficiary	Authors
	a point where delivery of services could be tailored to meet the specific needs of an individual, thereby increasing the satisfaction of citizens from government services.		
Government Reform & Democracy	Create a more participative form of government that can lead to direct democracy.	Government, Citizens	Reynolds and Regio (2001)
	Enable levels of democratic participation that were previously unimaginable.	Citizens	Caldow (2001)
	Renew local democracy, by making councils more open, more accountable, more inclusive and better able to lead their communities.	Citizens	Ferguson (2005)

Table 2. 7, we can summarize the e-government benefits' categories as following: efficiency and cost reduction, accountability and transparency, citizen centric focus, economic development, accessibility and availability, technology awareness & usage and government reform and democracy. Each of those benefits' categories has its own impact on the e-government provider or the end user beneficiary that includes government, citizens or businesses.

The Figure 2.10 shows e-government Benefits classification by Category:

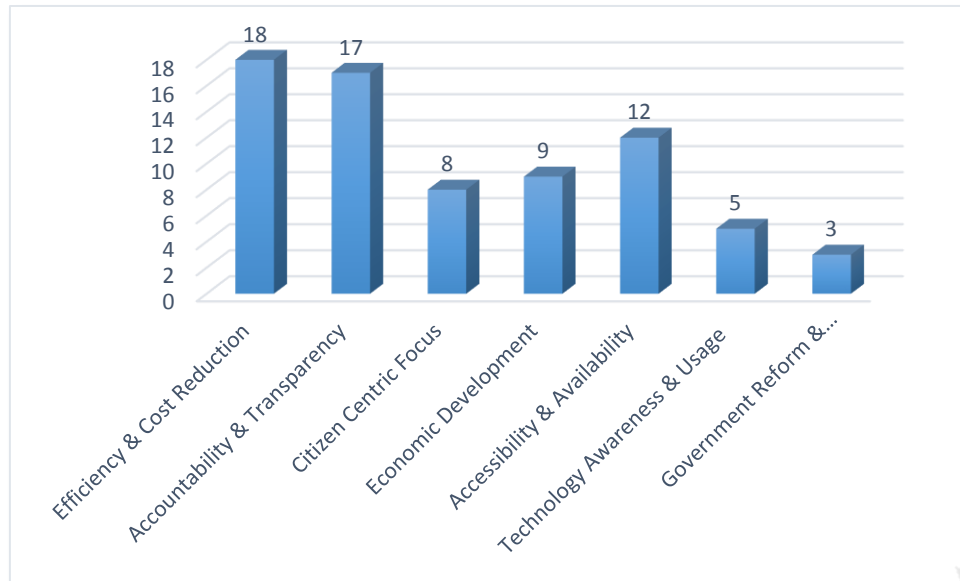


Figure 2.10: E-Government Benefits classification by Category

It is obvious that most of the researchers emphasize the efficiency & cost reduction, accountability & transparency and accessibility & availability benefits. Indeed, this is logical since any government and its stakeholders will not support the implementation or adoption of any new technology unless it guarantees at least the above 3 identified benefits' categories. However, the citizen centric focus category is also of good importance since it was mentioned explicitly in many articles in addition to the study results shown in Figure 2.11 where citizens, as beneficiary of the e-government implementation, are appearing 56 times out of 72 in Table 2. 7 thus you can determine the main focus of all researchers to highlight the citizens as the key e-government stakeholder and bring out the attention of the citizens about the importance of adopting E-government to facilitate their daily interaction with the government.

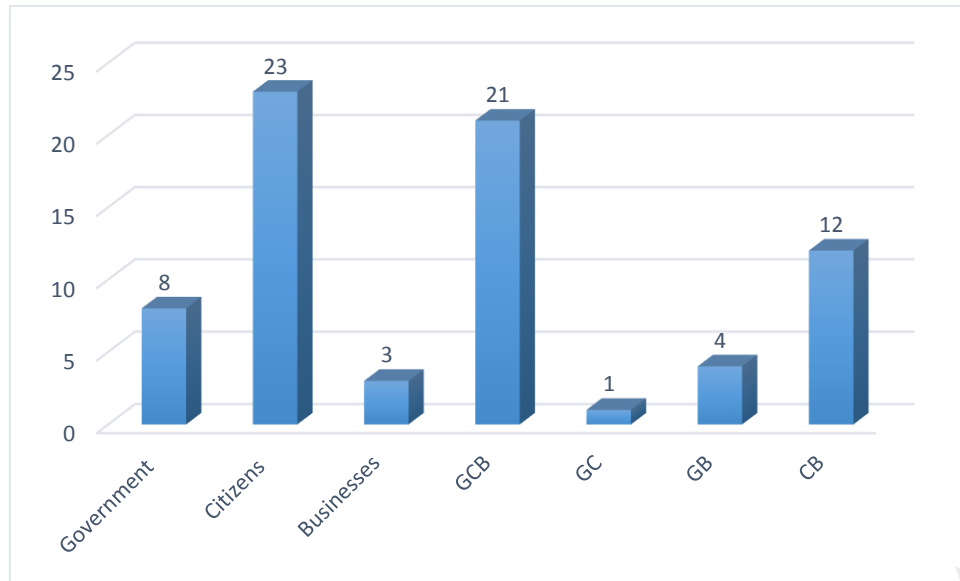


Figure 2.11: E-Government benefits distribution according to end user beneficiary

The Figure 2.12 shows the distribution of the benefits by category between two periods: Before 2005 and after 2005:

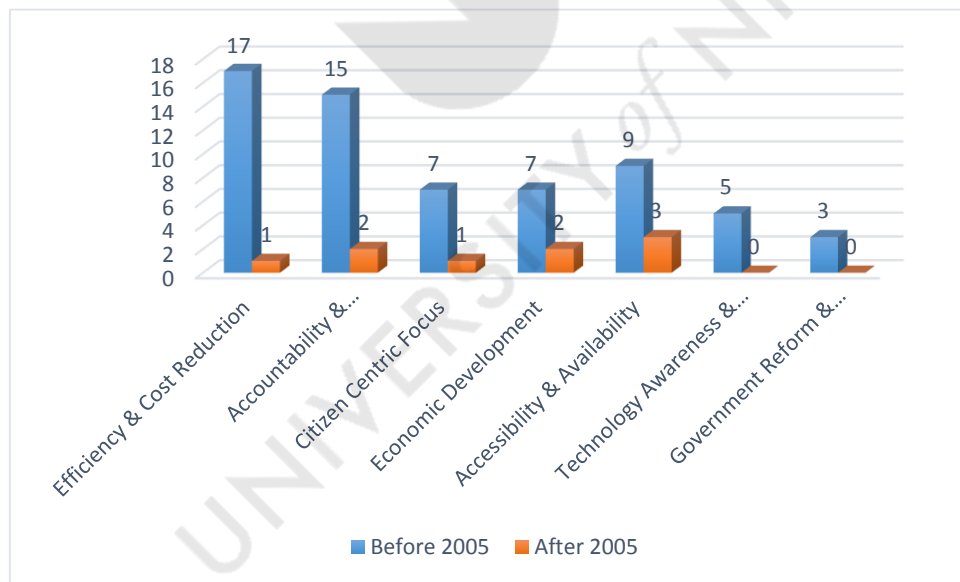


Figure 2.12: E-Government Benefits classification by Category as identified across different periods of time

This distribution of benefits' identification across the two periods, where almost 87% of the benefits (63 out of 72) were identified before 2005, is fully aligned with what we have mentioned in the previous sections about the need of the researchers to promote the E-

government from its early development stages as a revolutionary solution to improve the government services and respond to the citizens and businesses' needs.

2.3.5 E-Government Challenges & Barriers

In the previous section, we identified e-government implementation benefits which, according to many researchers (Jaeger, 2003; Gil-García and Pardo, 2005; Edmiston, 2003; Cook, 2000; Fang, 2002), is so valuable for all e-government stakeholders or end users including citizens, businesses, and governments. However, since e-government is considered as a multidimensional and complex technology, the existence of challenges is expected, impeding the e-government successful implementation and management (Ndou, 2004). According to Ke and Wei (2004), moving from vision and objectives to reality requires tremendous e-governments' efforts that definitely will face various challenges and obstacles.

The challenges are not limited or completely defined (Aldrich *et al.*, 2002; Gil-García and Pardo, 2005; Layne and Lee, 2001) since most of the reported challenges are findings from previous experience on e-government implementations or researchers' findings on challenges to e-government initiatives in different disciplines (Al-Shafi, 2009). However, many researchers and academics have categorized e-government challenges into groups taking into consideration the common themes identified through the different exercises and research findings. Hereunder, Table 2. 8 illustrates the author's findings on the e-government's challenges/barriers distributed by category. The categorization was done according to the reviews of multiple researchers on the existing e-government challenges and their relevancy to some high level well-known challenges:

- Information & Data
- Information Technology
- Organizational & Managerial

- Legal, Policy & Regulatory
- Institutional & Environmental
- Social
- Operational
- Financial
- Strategic

The Table 2. 8 (see Appendix B) follows the structure of Jiang and Klein (2000) and Gil-García and Pardo (2005) which highlights the Challenges' categories referenced and the relevant literature review identified e-government challenges.

Based on the outcomes of Table 2. 8 and the applied reviews and studies, we had multiple observations regarding the identification, importance and evolution of each e-government challenge over the time. The Figure 2.13 illustrates the distribution of the identified e-government challenges per category where the information technology and organizational & managerial challenges have been reviewed extensively in addition to the institutional & environmental and the social ones over the whole period of before and after 2005.

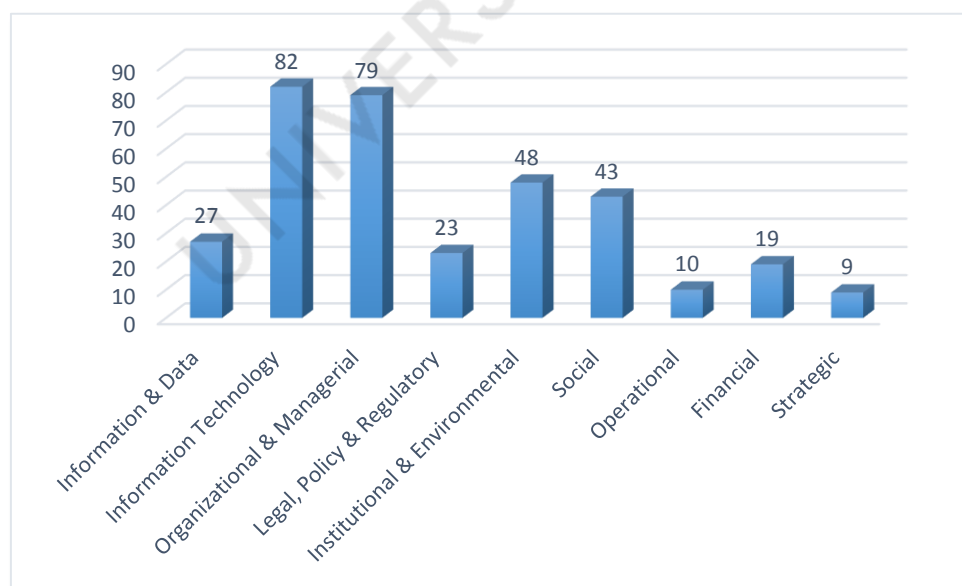


Figure 2.13: E-Government Challenges Distribution per Category

Those findings are expected since, within the period of before 2005, most of the researchers were dedicated to prove the importance of using the Internet for online services and establish a strong IT infrastructure to support e-government implementation initiatives as well as its usability, security, complexity and reliability, etc... as per Figure 2.15. In addition, another challenge category, the organizational and managerial, was also of big importance to the researchers whose studies focused on the managers' attitude, the organization's resistance to change, the lack of qualified employees within the organization and other relevant aspects that could affect the organization decision whether to support the e-government implementation or not as per Figure 2.16.

But, if we look to the Figure 2.14, we found that the information technology, organizational & managerial and institutional & environmental challenges along with less social and information & data challenges were targeted by researchers before 2005, which is the period of e-government initiation and development stages. After 2005, the information technology and organizational & managerial challenges categories remain of interest to the researchers in addition to an increased reviews on the Social challenge category that is appearing, during this period of time, of interest to researchers to be studied in deep.

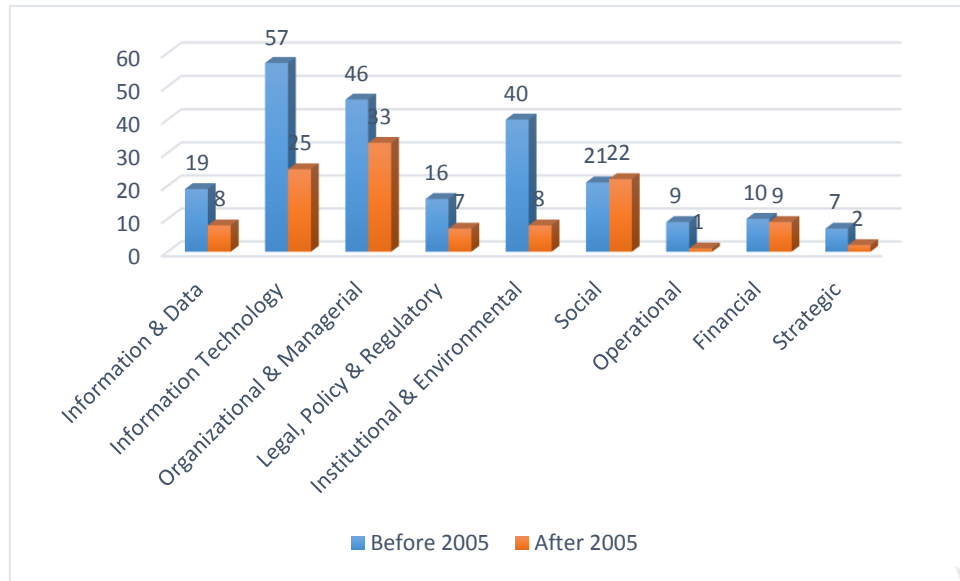


Figure 2.14: E-Government Challenges Distribution per Category over Two Periods of Time

This category was identified and reviewed before 2005, but after 2005 with the big improvement in the IT industry and the e-government initiations in different countries worldwide, the social challenge category became a main category to be assessed. It reviews multiple social factors like social or citizens' culture to resist to any potential change and their willingness to adopt new technologies like e-government in developed and developing countries. This is in addition to other social factors like society technology skills, digital divide and lack of trust in government as per Figure 2.17.

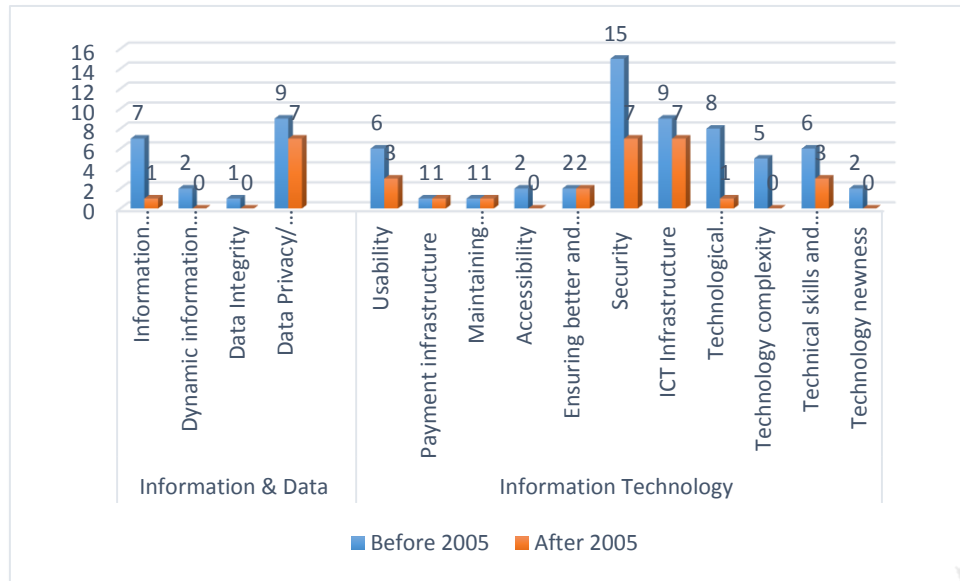


Figure 2.15: E-Government Challenges Distribution over Two Periods of Time (Part 1)

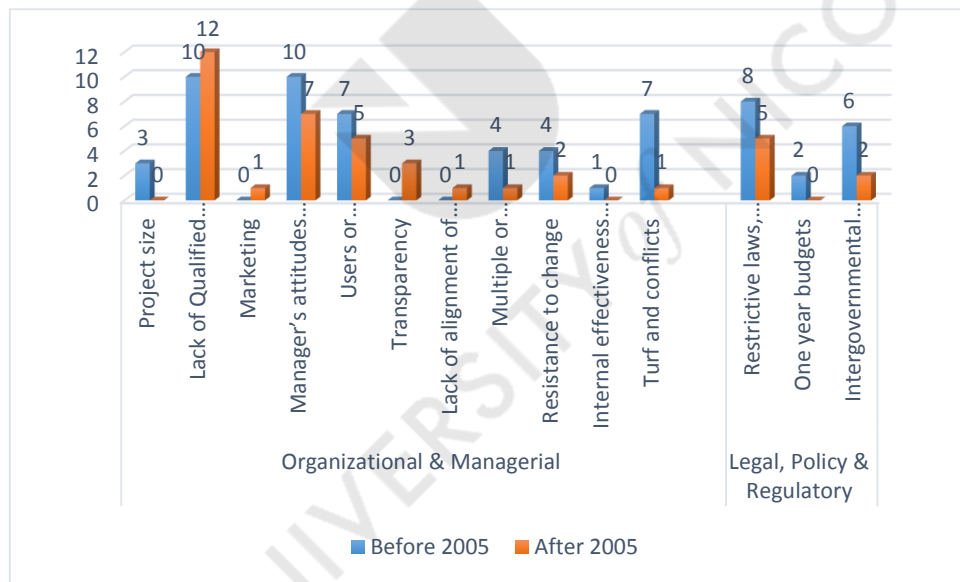


Figure 2.16: E-Government Challenges Distribution over Two Periods of Time (Part 2)

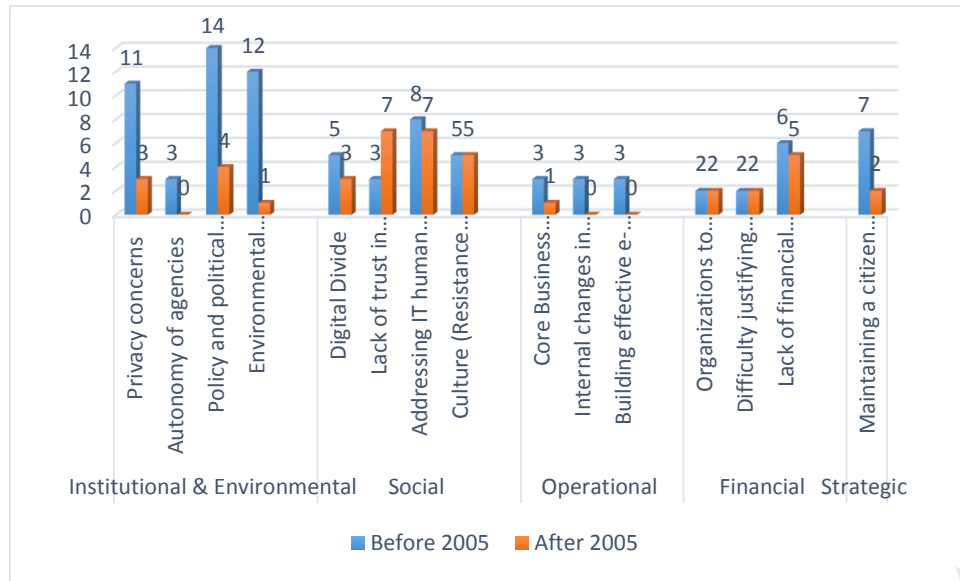


Figure 2.17: E-Government Challenges Distribution over Two Periods of Time (Part 3)

The Figure 2.15, Figure 2.16 and Figure 2.17 explains the e-government challenges distribution by category over two periods of time. It highlights the increase in reviews for old/new identified challenges between those periods indicating the change in researchers' interest alongside with the evolvement of e-government.

2.3.6 Conclusion

The objectives of the researchers mentioned before were to identify the factors having big impact on the e-government successful implementation and adoption, and promote e-government benefits to various stakeholders/ end users mainly citizens. For example, in consideration to the aforementioned challenges, we can recognize that the information technology challenge/ factor, as in Gil-García and Pardo (2005), Al-Shehry *et al.* (2006), Al-Sebie and Irani (2005), Gilbert *et al.* (2004), West (2004), Ndou (2004), Jaeger and Thompson (2003), Prins (2001), and Ashaye and Irani (2014), can be considered as the main factor affecting the e-government implementation as well as the organizational & managerial factor. However, the social culture/

attitude (AlShehri and Drew, 2010; Coursey and Norris, 2008) and citizens' e-government adoption challenges (Government Accountability Office, 2001; Reffat, 2006; Safeena and Kammani, 2013) are becoming an additional high priority factors to be studied especially after 2005, since they affect directly the successful diffusion of e-government in any society whether in a developed or developing country. In the following section, we will review the key adoption theories mainly the technology adoption ones including the Diffusion of Innovation theory – DOI (Rogers, 1995), Unified Theory of Acceptance and Use of Technology – UTAUT (Venkatesh *et al.*, 2003), Technology Acceptance Model – TAM (Davis, 1989), etc...

2.4 Adoption Theory

Adoption Theory is the theory that seeks to understand, clarify, or foresee how, why, and to what level, the public and society, either through individuals or organizations or communities, will adopt a technology, service or product. According to Rogers (1995)' definition, Adoption Theory is the fact of the first or minimal level of behavioural utilization of a concept or scheme. Psychologist say that it is all about human thought and behaviour whereas scientist say it is a tested and testable concept explaining an occurrence. The author, in chapter 2, provided a detailed literature review on technology adoption theories since the whole concept of the thesis is about geospatial technology adoption to enhance the e-government services from the government as well as citizens' perspectives. Such deep review requires first an understanding of the adoption theories origins with an introduction or overview of some key adoption theories used in the technology, business, and many other sectors, realizing their significance in assessing the success of any concept implementation.

We summarized below the most referenced adoption theories having over 100 citations (according to Google Scholar) and considered as key technology adoption or acceptance theories and models:

2.4.1 Diffusion of Innovations

Diffusion of Innovation Theory (DOI) has been used since 1960 to describe and study innovations' spreading across different industries (Lu *et al.*, 2003). DOI has been modified and reviewed by multiple researchers until Rogers (1962; 1995) published the best DOI model.

As per Rogers (2003), Diffusion is “the process by which an innovation is communicated through certain channels over time among the members of a social system”. In this definition, DOI is identified by the main four components: innovation, communication channels, social system and time. Diffusion is a way of communication responsible for spreading out messages in order to promote a new idea.

2.4.1.1 Innovation

An innovation is “an idea, practice, or object that is perceived as new by an individual or other unit of adoption” (Rogers, 2003). Innovation, in order to spread and be adopted quickly, is characterized by the “Relative advantage, Compatibility, Complexity, Image, Visibility, Results Demonstrability, Voluntariness of use, Trialability and Observability” (Rogers, 2003).

2.4.1.2 Communication

Communication is a process of sharing information among individuals or contributors to discuss and explain a specific idea or innovation. The communication channel is the network by which all information and messages are shared and distributed. Some of those contributors, including at times individuals that are more influential than others, are identified as change agents, highly connected and highly respected by their peers and might have powerful position to influence

their followers or even peers to adopt or reject any new idea or innovation. The nature of interconnection between the contributors within a social network/system also influences the likelihood of diffusion. Rogers (2003) defines two types of connection's nature, the homophily type described by an individual accepting to adopt a new idea proposed by peers sharing same attributes and heterophily type where individuals differs with peers on multiple attributes.

2.4.1.3 Time

Time is a key element since it is involved in different ways in the diffusion of innovation.

First, the innovation decision process (Rogers, 2003) is a conceptual time-driven process that describes the different stages by which an individual, potential innovation adopter, passes before reaching the innovation acceptance or rejection decision. This five-step process consists of knowledge, persuasion, decision, implementation and confirmation (Rogers, 2003).

After confirmation, and in case of full adoption during specific period, the adopter may abandon the innovation. Such late rejection to continue the innovation adoption is called discontinuance.

The Figure 2.18 describes the innovation decision process steps.

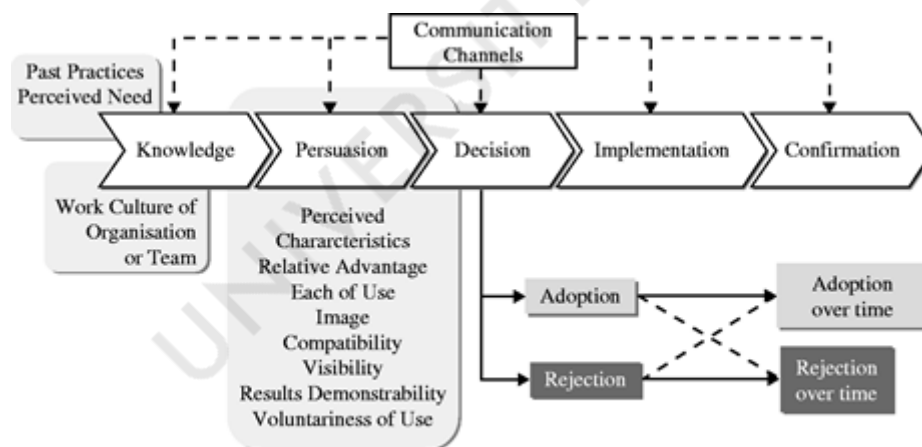


Figure 2.18: Innovation Decision Process (Rogers 2003)

Second, the diffusion of innovation adoption time of an individual or other unit of adoption is another way of time contribution. Five groups of adopters were identified by Rogers (1995)

according to adoption time categorization, following the same categorization defined by Bryce Ryan B. and Gross N. (1943). The five categories are the innovators (2.5% of adopters), early adopters (13.5% of adopters), early majority (34% of adopters), late majority (34% of adopters) and laggards (16% of adopters).

The Figure 2.19 shows the categories of the innovation adopters over time

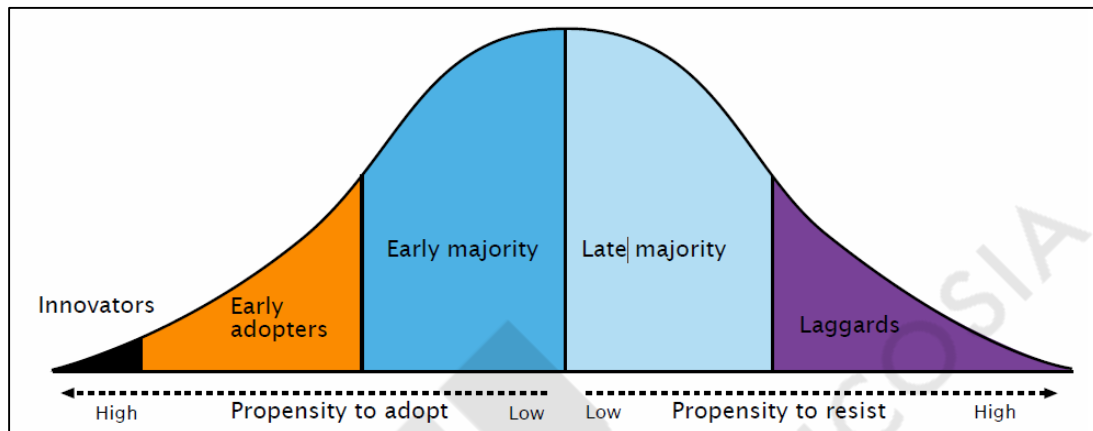


Figure 2.19: Adopters Categorization (Rogers, 2003)

Third, the rate of adoption is an important measurement driven also by time. Rogers (1995) used the S-shaped diffusion curve introduced by Tarde (1903) stating that “most innovations have an S-shaped rate of adoption”. Rogers (1983; 1995) developed Tarde’s statement by introducing the slope degree on the “S” directly related to the slow or rapid adoption rate of the innovation.

The Figure 2.20 shows the Diffusion S-curve over time

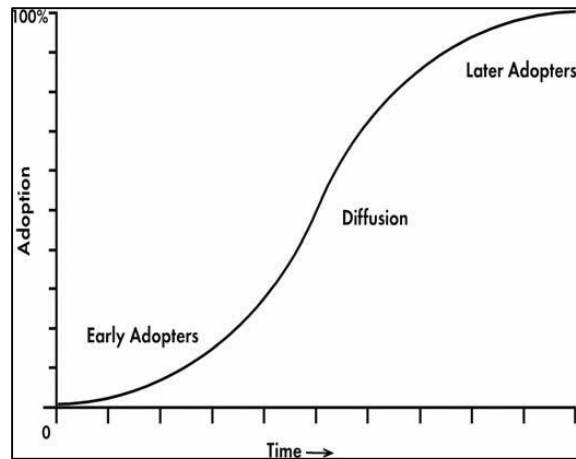


Figure 2.20: The Diffusion S-Curve over time (Rogers, 1995)

2.4.1.4 The social system

Social system is another key element of the DOI. It is an interrelation between different units that might be individuals, informal groups, organizations, etc... creating a group that is involved in problem solving and diffusing new ideas or innovations. Innovation diffusion in such system will be affected by its norms, degree of network interconnectedness and the existence of opinion leadership.

2.4.2 Managerial fads and fashions: The diffusion and rejection of innovations theory – DRI

Abrahamson (1991) started his research from reviews and studies on the diffusion of innovation literature where the main goal for Abrahamson was to find out an answer to the essential question:

“When and by what process are technically inefficient innovations diffused or efficient innovations rejected?” (Abrahamson, 1991: 587)

Rogers (1962, 1983) identified one principal perspective called “Efficient-choice” which assumes that regular adopters are willing to make independent evaluation and effective decision

for selecting technically efficient innovations to be diffused or technically inefficient innovations to be rejected. March (1978) identified two major assumptions driving the efficient-choice perspective:

- a. Organizations within a group can freely and independently choose to adopt an administrative technology and
- b. Organizations are relatively certain about their goals and their assessments of how efficient technologies will be in attaining these goals.

Abrahamson as well as many researchers and reviewers (Downs and Mohr, 1976; Kimberly, 1981; Rogers, 1962; Rogers, 1983; Rogers and Schoemaker, 1971; Van de Ven, 1986; Zaltman *et al.*, 1973) do believe that the above “dominant perspective in the diffusion of innovation theory contains pro-innovation biases which suggest that innovations and the diffusion of innovations will benefit adopters” (Abrahamson, 1991: 587). They do believe that rejecting the dominant perspective ones will support in identifying another perspectives relevant to the counter-assumptions and at the same time could respond to Abrahamson’s question.

The first defined assumption was rejected or criticized by identifying some outside organization not within the same group of organizations, like regulatory bodies or consulting firms, which can influence the choices of organizations within the group (Kimberly, 1981; Rogers, 1983). Accordingly, two perspectives are now on board: organizations inside or outside a group to drive the diffusion of innovations.

The second defined assumption was rejected or criticized by proposing the possibility of having unclear goals and high uncertainty in some organizations about the technical efficiency of administrative technologies (March and Olsen, 1976). According to this counter-assumption, the

organizations will be obliged to imitate other organizations choices that could be within or outside the group.

Thus, three less dominant perspectives were identified in this theory and therefore will support in developing some propositions that could respond to Abrahamson's main question. The Figure 2.21 will summarize the four theoretical perspectives explaining the diffusion and rejection of administrative technologies:

Outside-Influence Dimension	Imitation-Focus Dimension	
	Imitation Processes Do Not Impel the Diffusion or Rejection	Imitation Processes Impel the Diffusion or Rejection
	Organizations Within a Group Determine the Diffusion and Rejection Within This Group	Organizations Outside a Group Determine the Diffusion and Rejection Within This Group
	Efficient-Choice Perspective	Fad Perspective
	Forced-Selection Perspective	Fashion Perspective

Figure 2.21: Theoretical Perspectives Explaining the Diffusion and Rejection of Administrative Technologies (Abrahamson, 1991)

The fad perspective makes two assumptions: organizations within group are uncertain about both their goals and the efficiency of innovations and are not so influenced by outside organizations. Thus, organizations within a group can replicate others' adoption of inefficient innovations or rejection of efficient ones.

The fashion perspective assumes high uncertainty among organizations in a group. It recognizes influences from organizations outside their group. Thus, the outside fashion organizations either

lead the diffusion of inefficient innovations or the rejection of efficient innovations when they introduce substitute innovations.

The forced-selection perspective assumes both low uncertainty and outside influences by organizations. It suggests that it may be in the interest of powerful outside organizations, such as governmental regulators or labour unions, to coerce organizations inside a group either to adopt technically inefficient innovations or to reject efficient ones.

After defining the four perspectives, we still need to find out answers to “When and by what process are technically inefficient innovations diffused or efficient innovations rejected?”

According to reviews and analysis of many researchers’ findings and propositions, Abrahamson identified some main propositions that respond to the above question.

The Table 2. 1 summarizes the Abrahamson (1991)’s propositions according to diffusion or rejection of innovations by perspective:

Perspective	Diffusion proposition	Rejection proposition
Efficient-Choice	“Performance gaps will prompt the diffusion of innovations only among organizations that can efficiently close these gaps by adopting these innovations.”	“Organizations in a group will tend to reject an innovation when environmental changes make it less technically efficient in closing these organizations' performance gaps.”
Forced-Selection	“Technically inefficient innovations will tend to diffuse among groups of organizations when these innovations receive the support of powerful	“A group of organizations will tend to reject a technically efficient innovation when organizations, outside this group, exerting political pressures to reject this innovation,

	organizations outside these groups.”	have greater power than those exerting pressures to retain it.”
Fashion	“Technically inefficient innovations will tend to diffuse among organizations when organizations in fashion-setting networks promote them.”	“Organizations will tend to reject old technically efficient innovations when fashion-setting networks introduce mutually exclusive replacements.”
		“Over time, organizations will tend to reject technically efficient innovations promoted by fashion-setting networks.”
Fad	“The propensity of organizations in a group to imitate each other's decisions to adopt a technically inefficient innovation will vary with the nature of pressures impelling imitation and the demography of immunities in that group to succumbing to this pressure.”	“The propensity of organizations to imitate each other's decisions to reject a technically efficient innovation will vary with the nature of pressures impelling and countering imitation and the demography of immunities in that group to succumbing to these pressures.”

Table 2. 1: Diffusion or Rejection of Innovations by Perspective Propositions

2.4.3 Information Integration Theory

The Information Integration Theory (IIT) was developed by Anderson in 1971 and experimented over the years (1981 – 1991). The purpose was to explore how the human attitudes are made and how it can change when integrating existing beliefs or thoughts with new information.

Anderson (1971) believes that any new idea is a combination of portions of information where each portion has a value and weight. The value is the information's evaluation and the weight is the information's identified importance. Any new information, according to Anderson (1971), affects and influences the human beings attitudes positively or negatively based on its important qualities, weight and value.

When integrated with the existing beliefs and thoughts, new information will create new attitude. It can be added or averaged into the existing knowledge without necessarily giving exact results on the human beings attitude's change to the incoming information, at least representative and somehow close to the reality.

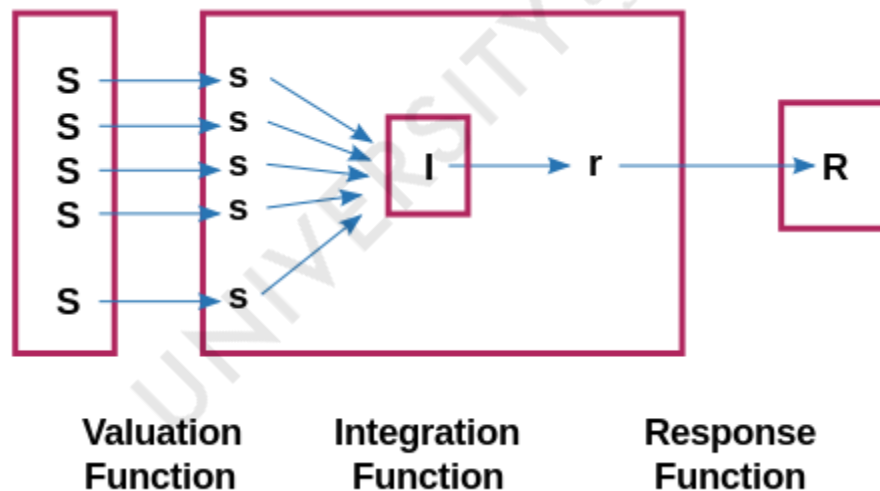


Figure 2.22: Information Integration Theory (Andersen, 1971)

2.4.4 Theory of Reasoned Action

The Theory of Reasoned Action (TRA) was introduced by Fishbein and Ajzen (1975) as an enhancement of the Information Integration Theory (IIT). The TRA focuses on the human behaviour and not only attitude as the IIT did. Two important changes were added by Fishbein and Ajzen (1975) to the IIT:

In the first one, they have inserted the behavioural intention element to the process of persuasion, a middle stage between attitude predictions and actual behaviour where multiple factors (level of control over our behaviour, attitudes and behaviour measured at the same level, behavioural intent and behaviour must be measured at the same time since human attitude change over time) can limit the influence of attitude on actual behaviour. Therefore, the behavioural intention can be different from the final/actual behaviour.

In the second one, they have inserted two elements, attitude toward behaviour and subjective norms, to predict the behavioural intent. Attitude is measured by evaluation and strength of a belief; however, subjective norms are measured by normative beliefs and motivation to comply.

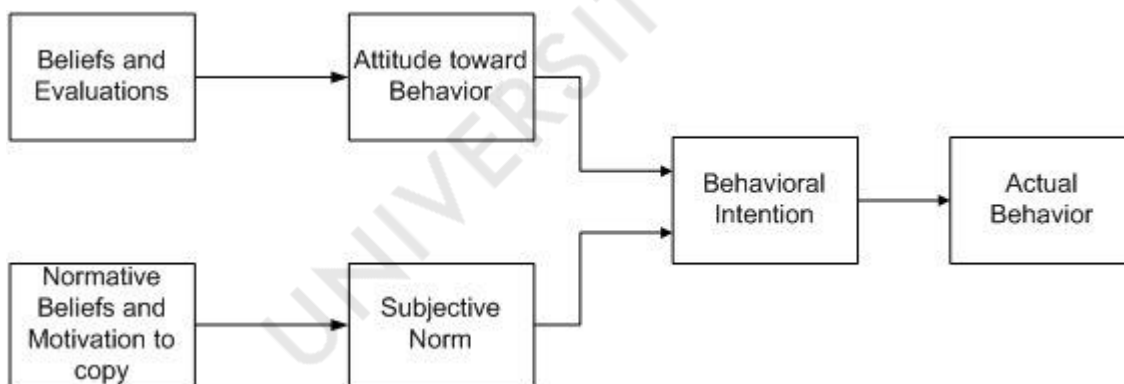


Figure 2.23: Theory of Reasoned Action (Fishbein and Ajzen 1975; 1980)

2.4.5 Theory of Planned Behaviour

The theory of Planned Behaviour (TPB) was introduced by Ajzen (1985) as an enhancement of the TRA. Considered as generalization of the TRA by Chau and Hu (2002), the TPB inserted the perceived behavioural control as an additional element to the TRA model which was considered as a third element with the attitude toward behaviour and the subjective norms to predict behavioural intention and as an independent element influencing indirectly the actual behaviour.

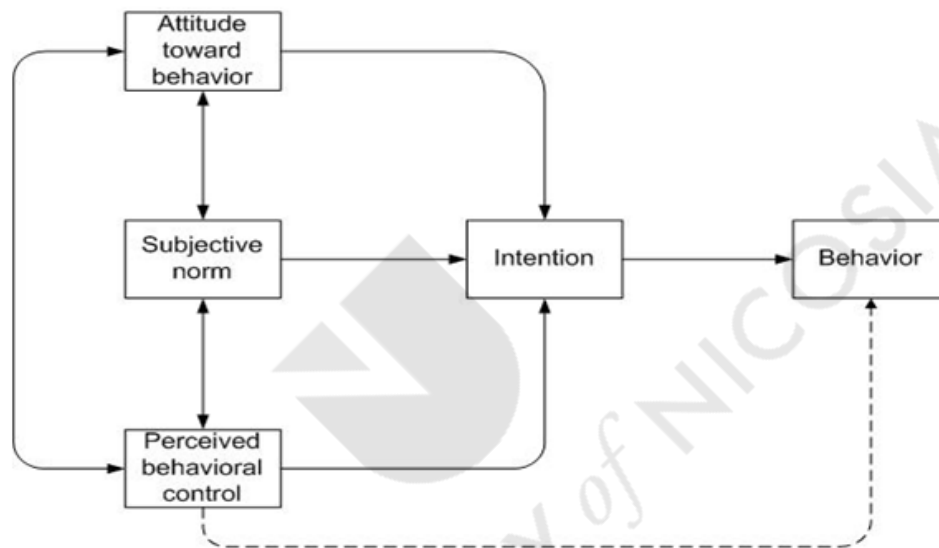


Figure 2.24: Theory of Planned Behaviour (Ajzen, 1985)

2.4.6 Technology Acceptance Model

The Technology Acceptance Model (TAM) is one of the main models used to study the user acceptance of a technology or Information System (Lee *et al.*, 2003). TAM was first introduced by Davis (1985) to show that any system use is simply a response to a user's motivation to use a system driven or influenced by external factors like system's features and capabilities.

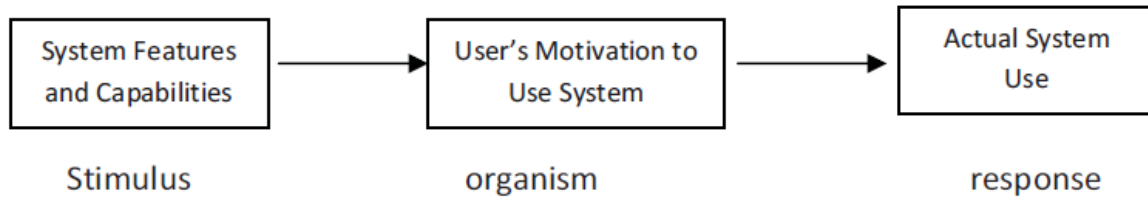


Figure 2.25: Conceptual Model for Technology Acceptance (Davis, 1985)

A new conceptual TAM was introduced by Davis (1986) as a combination between the previous conceptual TAM and the concept of the attitude of a person towards a given behaviour defined in the Theory of Reasoned Action (Fishbein and Ajzen, 1975). In this refined model, the user motivation will be defined by the existence of three main elements -Perceived System Usefulness, Perceived System Ease of Use and Attitude of a user toward using the system- where the user's attitude will determine whether he is going to accept or reject the system and the perceived system usefulness and the perceived system ease of use will be directly influenced by the external factors defined in the previous model, system's features and capabilities.

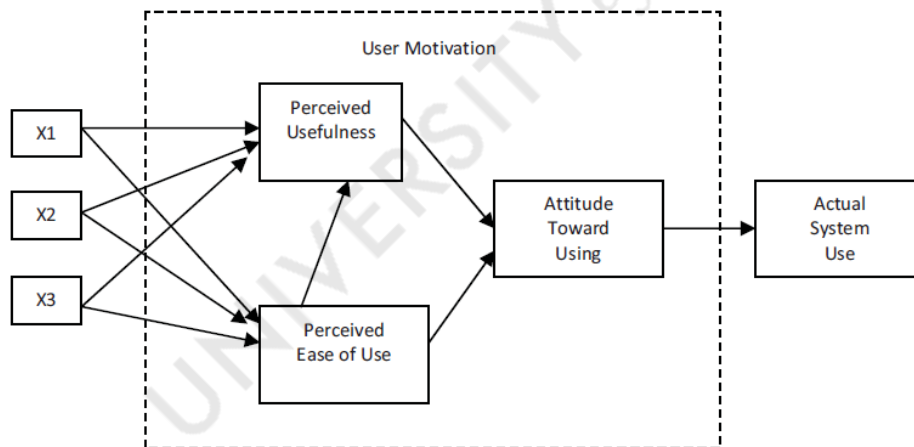


Figure 2.26: Original Technology Acceptance Model (Davis, 1986)

The original TAM (Davis, 1986) was examined by Davis to develop measurement scales for perceived system ease of use and perceived system usefulness in three stages including

pretesting phase, empirical field study and a laboratory experiment (Chuttur, 2009). As a result, new relationships into the original TAM were introduced by Davis (1993) by adding the perceived system usefulness potential influence on the actual system use and the system features and capabilities potential influence on the attitude of a user toward using the system.

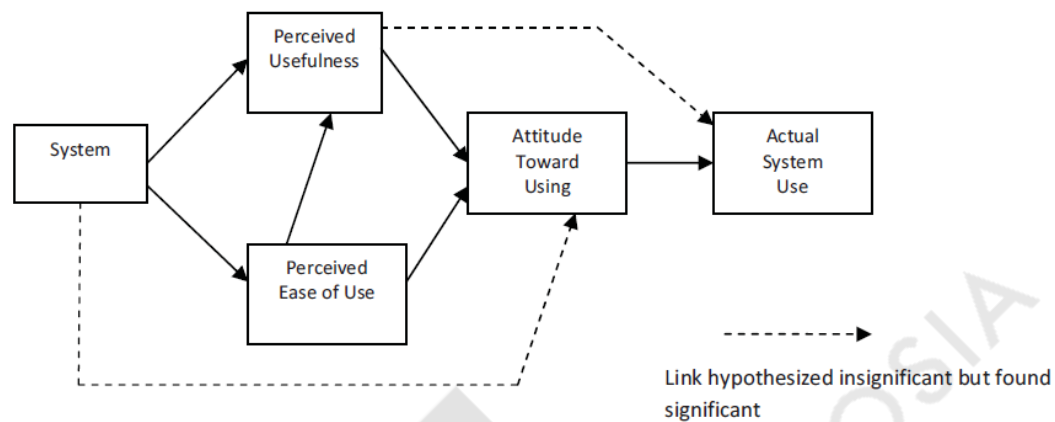


Figure 2.27: New relationship formulation of the Original TAM (Davis, 1993)

Davis *et al.* (1989) introduced a new variable into the original TAM, the behavioural intention, inspired also from the theory of Reasoned Action (Fishbein and Ajzen, 1975).

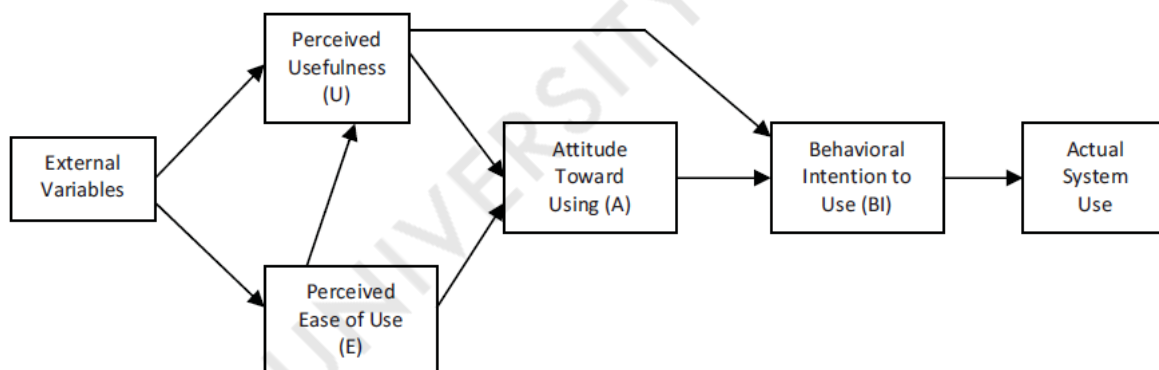


Figure 2.28: First Modified TAM (Davis *et al.*, 1989)

The first modified TAM (Davis *et al.*, 1989) was reassessed by Venkatesh and Davis (1989 – 1996) driving to new result: Perceived system usefulness and perceived system ease of use have direct influence on the behavioural intention to use system; thus, the attitude toward using a

system can be deleted. This model added new external variables like user training, user participation in design and nature of the implementation process (Venkatesh and Davis, 1996).

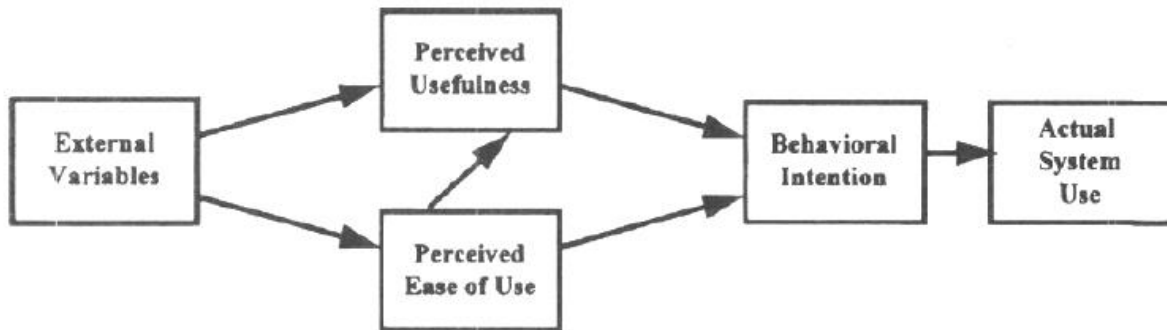


Figure 2.29: Final TAM (Venkatesh and Davis, 1996)

Since the Final TAM (Venkatesh and Davis, 1996) measures in a generic way the perceived usefulness and perceived ease of use and was experimented on voluntary environments (Chuttur, 2009), there was a need to go more in deep to explore and identify the reasons behind the importance of the perceived usefulness and perceived ease of use in influencing the behavioural intention and the actual system use. Thus, Venkatesh and Davis (2000) introduced the TAM2 which identified some predecessor variables to the perceived system usefulness and considered the mandatory and voluntary environments to experiment the TAM2.

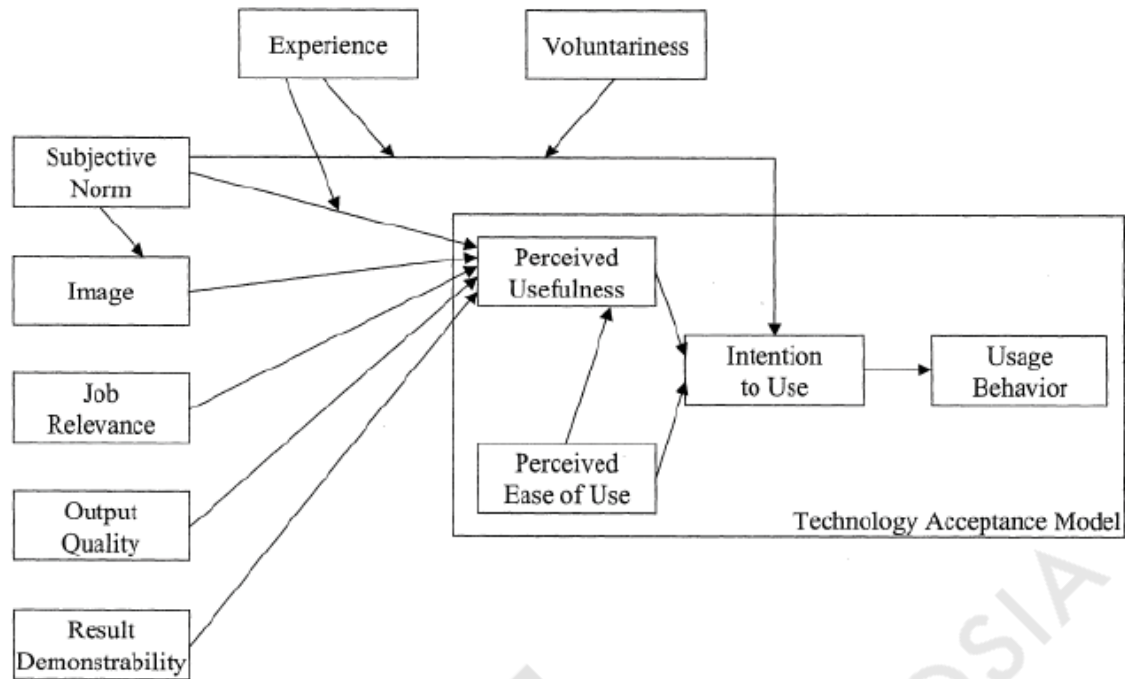


Figure 2.30: TAM2 (Venkatesh and Davis, 2000)

Another extension of the TAM was introduced by Venkatesh (2000) who identified some predecessor variables to the perceived system ease of use in the TAM. He identified two groups of predecessor variables (Chuttur, 2009), anchors and adjustments, from previous research on perceived system ease of use (Davis *et al.*, 1992; Venkatesh and Davis, 1996).

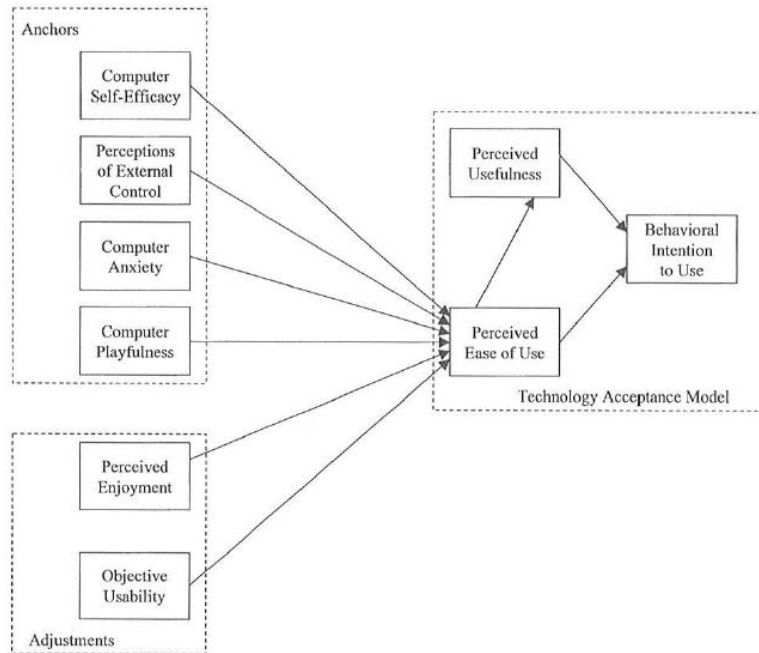


Figure 2.31: Extended TAM (Venkatesh, 2000)

2.4.7 Model of PC Utilization

Refined from the theory of Attitudes and Behaviour (Triandis, 1977), the model of PC Utilization (Thompson *et al.*, 1991) was developed to predict PC utilization behaviour. As per Thomson *et al.* (1991), this model has seven main components (6 input and one output) including job-fit (the belief of a user that the technology can improve his job or duties), complexity (the degree of difficulty to understand and use an innovation), long-term consequences (the consequences that can happen in the future), affect towards use (the user's feelings, whether positive or negative, associated to a specific act), social factors (the degree of influence of the society culture on the individual in addition to the individual influence on other society members in a specific social situations) and facilitating conditions (user's support in order to facilitate its utilization of PCs).

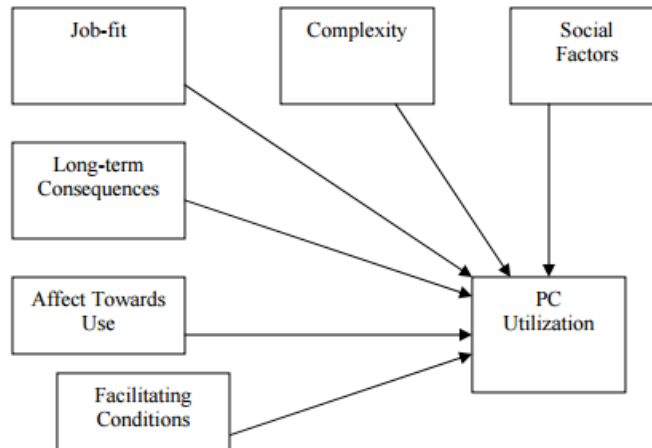


Figure 2.32: Model of PC Utilization (Thompson *et al.*, 1991)

2.4.8 Technology, Organization and Environment – TOE Framework

Developed by Tornatzky and Fleischer (1990), the TOE is considered as an important analytical framework to study the IT adoption and use at the organization level. The TOE detects three main components influencing the IT adoption and technology diffusion within a firm or enterprise: technology, organization and environment. The technology component identifies the internal IT environment including the practices and equipment as well as the available external IT technologies. The organization component describes the organization's measures including its scope, size, management, services, etc... The environment component describes the environment or the area in which the organization is executing its business including competitors, partners, deals with government, etc... (Tornatzky & Fleischer, 1990). The TOE has some similarities with DOI (Rogers, 1995) in the technology and organization components but differs in the environment component.

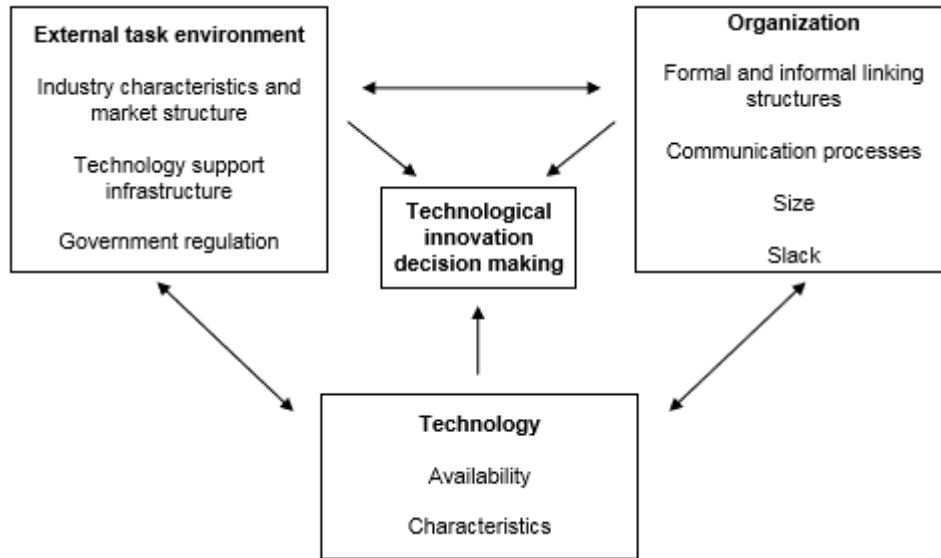


Figure 2.33: TOE framework (Tornatzky and Fleischer, 1990)

2.4.9 Perceived Characteristics Innovation – PCI model

The Perceived Characteristics of Innovation Model – PCI was developed by Moore and Benbasat (1991). The characteristics selection was based on DOI (Rogers, 1983) constructs as well as Tornatzky and Klein (1982)'s identified factors. The PCI defined factors are as following:

- Relative advantage: The degree of innovation advantages and benefits compared to its predecessor
- Compatibility: The degree of consistency of the innovation with the existing values, needs and past experiences of potential adopters
- Ease of use: The degree of ease usability of an innovation
- Observability: The degree of an innovation visibility to others
- Triability: The degree of innovation experiments before adoption
- Voluntariness: The degree of perceived voluntary use of an innovation
- Image: The degree of perceived image or status enhancement when using a innovation

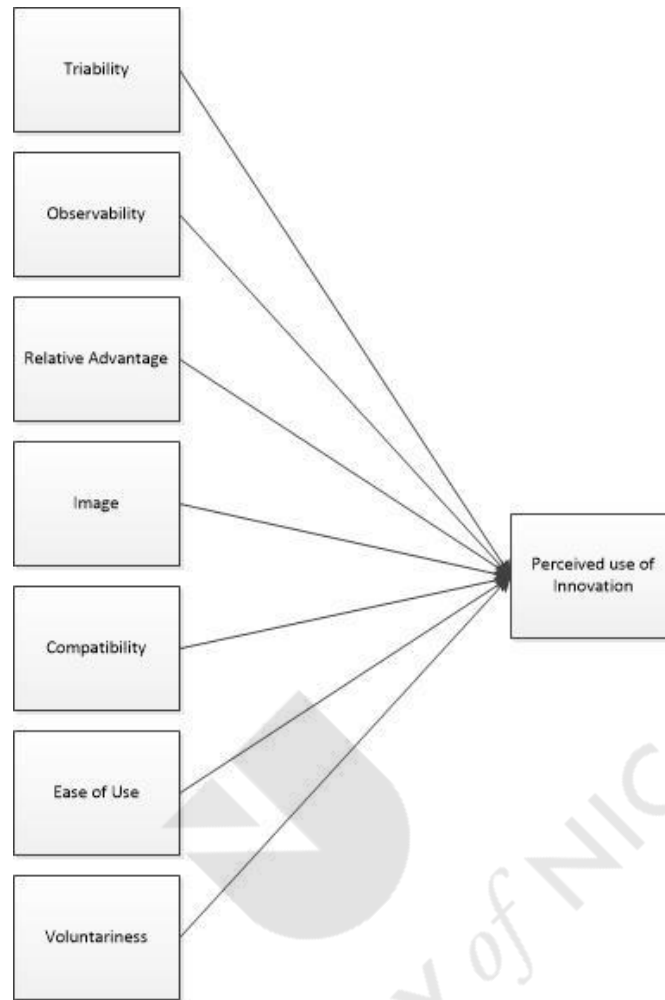


Figure 2.34: PCI Model (adapted from Brown and Venkatesh, 1991)

2.4.10 The Motivational Model

The Motivational Model was developed by Davis *et al.* (1992) in order to analyse the IT adoption and use. The Motivation Model considers the users' behaviour as established according to "extrinsic and intrinsic motivations".

Extrinsic motivation, like perceived usefulness, perceived ease of use and subjective norm, is the ability of a user to do an activity since it is supposed that the activity is will be helpful to achieve valued results distinct from the activity itself (Davis *et al.*, 1992).

Intrinsic motivation, like computer playfulness and enjoyment (Davis et al., 1992; Venkatesh, 2000), associates the ability of pleasure and satisfaction from performing the behaviour (Vallerand, 1997).

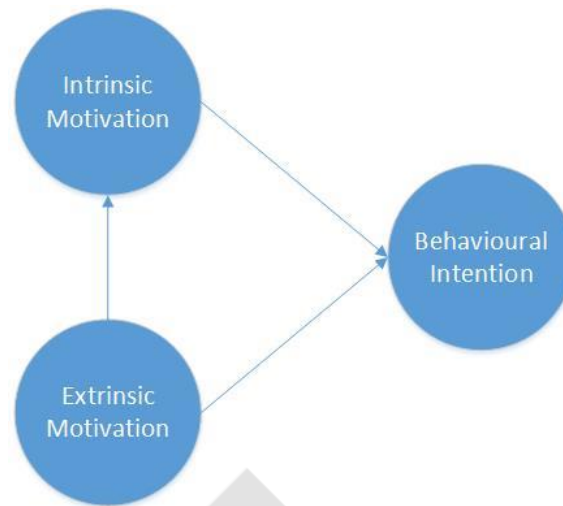


Figure 2.35: Motivational Model (Davis et al. 1992)

2.4.11 Social Cognitive Theory

The traditional technology adoption models (TRA, TPB, TAM, DOI,...) were developed according to the concept of unidirectional causal relationships between most of the identified variables in those models (Li, 2010). The Social Cognitive Theory (SCT) initiated by Bandura (1986) assumed that many factors including environmental, personal and behaviours should be determined mutually. Compeau et al. (1999) believe that a user's cognitive capabilities influence the behaviour of technology usage, and consider the effective inter-communication with that technology as also influential on the cognitive understanding (Compeau et al., 1999).

Compeau et al. (1999) highlighted that SCT emphasized the concept of computer self-efficacy as highly important and should be distinguished. Computer self-efficacy is the user's self-judgment on its ability to use a technology in order to execute a task and finalize it properly (Compeau & Higgins, 1995).

The below diagram (Compeau and Higgins, 1995) shows the interconnection between computer self-efficacy, performance and prior performance, outcome expectations including the personal (users' approval and satisfaction on tasks' accomplishment) and performance (job) related ones, and the behaviour modelling.

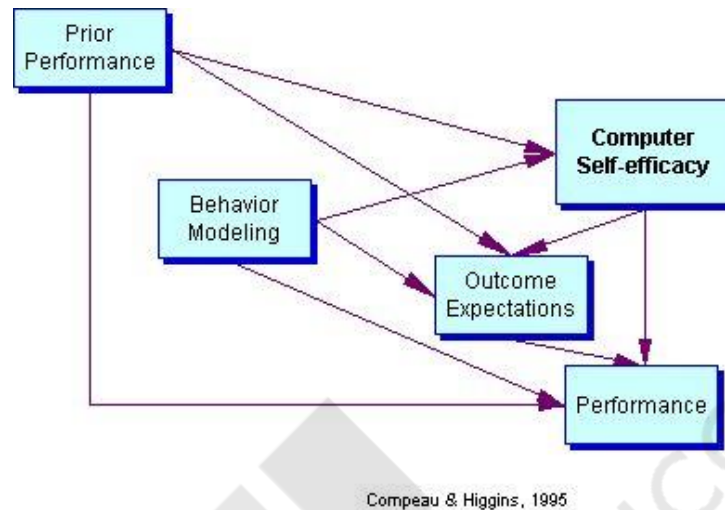


Figure 2.36: Social Cognitive Theory (Compeau and Higgins, 1995)

2.4.12 Unified Theory of Acceptance and Use of Technology

The Unified Theory of Acceptance and Use of Technology (UTAUT) was first introduced by Venkatesh et al. (2003) and was considered as a revolutionary model for the technology user acceptance integrating multiple existing user acceptance models into one unified theoretical model. This theoretical model brought the identified factors influencing directly the behavioural intention in the previous models into the new model. The model was tested in 6 large firms from different industries; the independent factors having a direct influence on the behavioural intention were highlighted and others having non-significant influence on the behavioural intention were eliminated, which led to the generation of the final UTAUT model.

The UTAUT model combined the following theoretical models: TRA (Davis *et al.*, 1989), TAM (Davis, 1989), motivational model (Davis *et al.*, 1992), TPB (Ajzen, 1991), the combined model of TAM and TPB (Taylor and Todd, 1995), PC utilization model (Thompson *et al.*, 1991), DOI (Rogers, 1995) and social cognitive theory (Compeau and Higgins, 1995).

According to Venkatesh et al. (2003), the performance expectancy (degree to which an individual believes that using the system will help him or her to attain gains in job performance), effort expectancy (degree of ease associated with the use of the system), and social influence (degree to which an individual perceives that important others believe he or she should use the new system) are independent factors that have direct influence on behavioural intention. The behavioural intention as well as facilitating conditions (degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system) are independent factors that have direct influence on the Use Behaviour. The attitudes toward using technology, self-efficacy, and anxiety factors were considered as non-significantly influencing the behavioural intention and the use behaviour; thus they were eliminated. Some additional factors were defined as moderators: Age, gender, complexity and voluntariness of use. Those moderators factors power or strengthen the influence of the four described independent factors on the behavioural intention and use behaviour.

According to AlAwadhi and Morris (2008), the performance expectancy should be measured based on the citizens' perception to use e-government services by:

- Offering benefits like saving time, money and effort
- Facilitating the communication between government agencies
- Improving the quality of services
- Providing the tools to run businesses successfully with government

The effort expectancy should be measured based on the citizens' perception of ease of use of e-government services in addition to learn how to use easily. As for the social influence should be measured based on the citizens' influence by society leaders, experts, family members and peers' opinion or recommendation. Moreover, facilitating conditions should be measured based on the citizens' ability to access the needed resources, acquire the required knowledge, get the needed support for e-government services use and fit the technology into the user's lifestyle of the user. The measurement of behavioural intention should be based on the user's intention, prediction and plan to use of the e-government services.

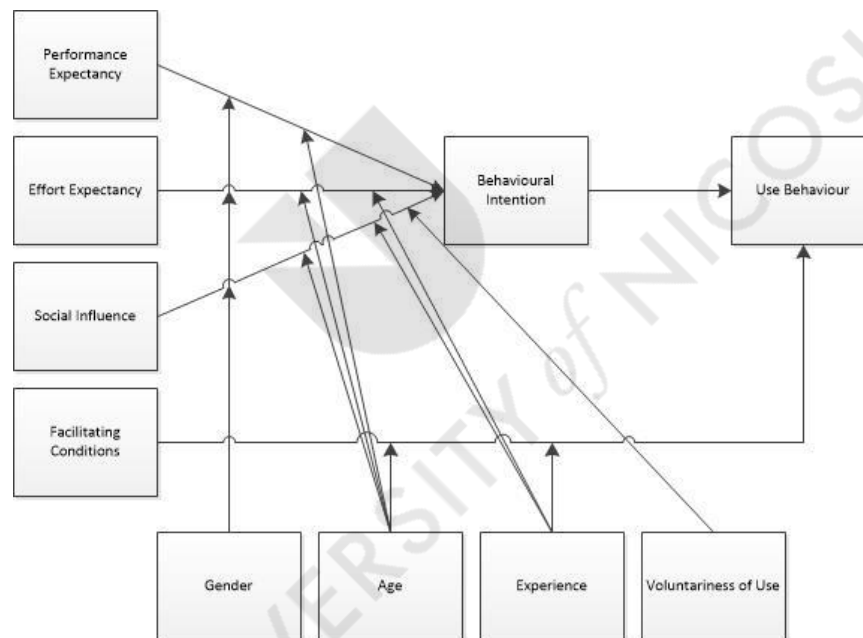


Figure 2.37: Unified Theory of Acceptance and Use of Technology UTAUT Model

(Venkatesh *et al.*, 2003)

2.4.13 Extended Model Acceptance of Technology in Households – MATH

Model

The Model Acceptance of Technology in households was first introduced by Venkatesh and Brown in 2001. In 2005, Brown and Venkatesh developed the extended MATH model which

integrates the original MATH model, including some constructs from TAM and UTAUT with additional new constructs related to existing beliefs like attitude and control, with the household life cycle by inserting some demographic features as moderating variables. This extended MATH model (Brown and Venkatesh, 2005) can be described as following:

- Attitudinal Beliefs
 - Utilitarian outcomes – applications for personal use: The importance of using PC to improve the usefulness of household activities.
 - Utilitarian outcomes – utility for children: The importance of using PC to improve the children's usefulness in finishing their activities like homework.
 - Utilitarian outcomes – utility for work-related use: The importance of using PC to improve the usefulness of performing work-related activities.
 - Hedonic outcomes – applications for fun: The degree of pleasure when using PC.
 - Social outcomes – status gains: The role of PC purchase for home use in increasing the user prestige.
- Normative Beliefs
 - Friends and family influences: The degree of social network, including friends and family members, and influence on one another's behaviour.
 - Secondary sources' influences: The degree of influence of information received from TV, newspaper and other secondary sources on behaviour.
 - Workplace referents' influences: The degree of influence of co-workers on behaviour.
- Control Beliefs

- Fear of technological advances: The degree of fear regarding uselessness of PC purchase.
- Declining cost: The decreasing cost of a PC over time affecting its adoption.
- Cost: The current high cost affecting its adoption.
- Perceived ease of use: The degree of ease of use of a PC.
- Requisite knowledge: The user's belief about the required knowledge to use a PC which is defined as computer self-efficacy.

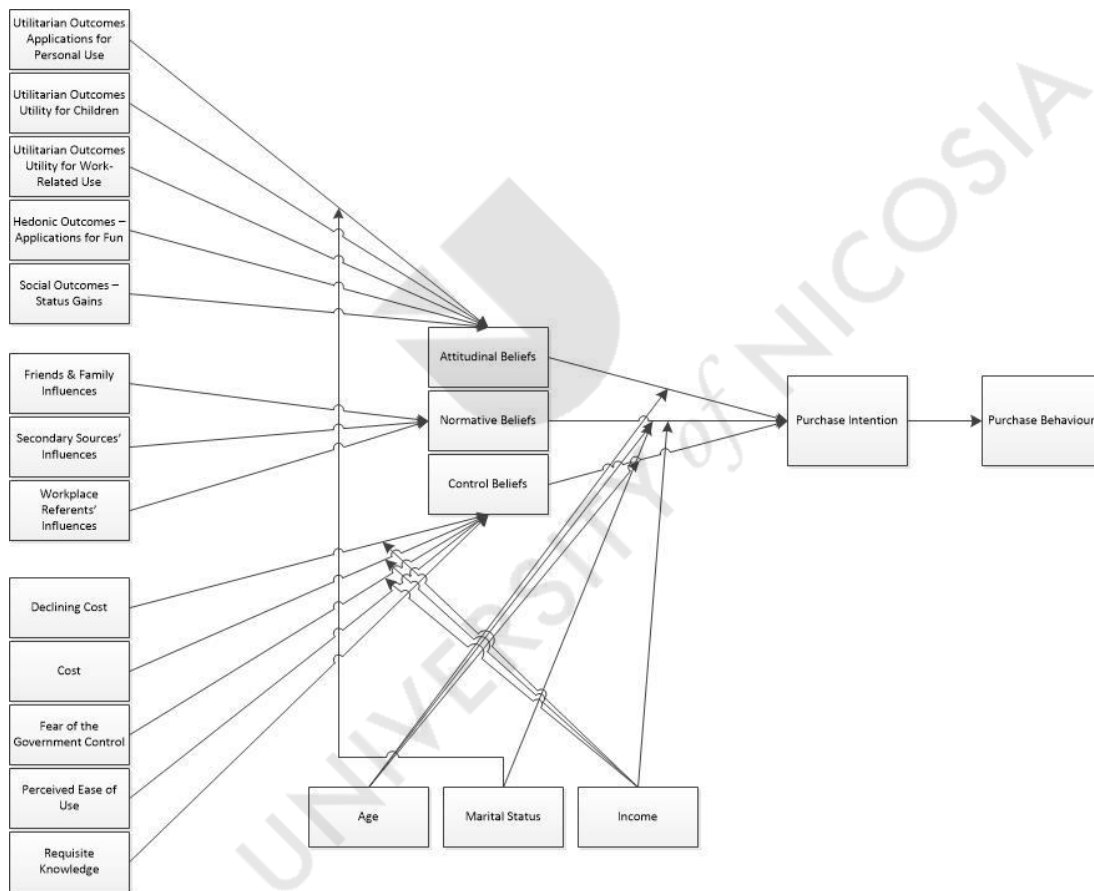


Figure 2.38: Extended MATH Model (adapted from Brown and Venkatesh, 2005)

2.4.14 Conclusion

Based on the aforementioned, 13 main technology adoption theories and models were identified, adopted and validated over the last 4 decades to understand the user's technology acceptance (Venkatesh et al., 2003; Hu et al., 1999) where user can be an individual, household, organization or community. It was obvious that some researchers were deductive and added their contributions to the already existing models and come up with new models. The others were fully inductive and started their model's development from scratch ignoring all others' contributions (Venkatesh et al., 2003). A quick interpretation of the identified models shows strength and weakness in most of them. For example, the TRA, TAM and DOI models, considered as the pillar of studies related to attitude behaviour and innovation adoption and used by most of the IS researchers to analyse the IT usage behaviour (Ajzen and Fishbein, 1980; Suh and Han; 2003), does not consider the ability, time, environmental or organisational limits as potential obstacles impeding the freedom of action when someone is intended to act as well as the prediction limitation of an individual's behaviour to the voluntary situation and not to the mandatory one. Moreover, the TRA model ignored major variables that can evaluate the adoption and utilisation of complicated systems like e-government (AlGhamdi and Beloff, 2014). Also, Matheison et al. (2001) stated that TAM model did not succeed in providing significant information about the user's acceptance of a particular technology as well as the exclusion of some important variables and factors like time and money that can influence negatively the users to use a technology (AlGhamdi and Beloff, 2014). However, it has been widely used to analyse and predict the user's acceptance of any new technology including emails and graphics software (Venkatesh and Davis, 2000). The TPB model, considered as the general model of TRA model (Chau and Hu, 2002), inherited the same limitations of TRA but took into

account the voluntary and mandatory situations when predicting an individual's behaviour. The DOI model in turn ignored some factors considered as essential to analyse properly the diffusion and adoption of new innovation (AlGhamdi and Beloff, 2014). On the other hand, we recognised that the TOE and DOI models are widely used to test the technology adoption at the organization level unlike the rest of the technology adoption models used mainly to test at the individual level (Chong et al., 2009). The UTAUT model, considered as one of the latest, most generic and mature model tested over different industries that took into consideration all the variables and factors affecting the user's technology acceptance identified from most of the existing technology adoption models, like TRA, TAM, TPB, DOI and others (Venkatesh et al., 2003), was mainly adopted and studied on large organizations. Nonetheless, it lacks the exclusion of some factors like trust, culture and others considered as key variables affecting directly or indirectly citizens' behaviours or intentions to use or adopt a technology (AlGhamdi and Beloff, 2014). The extended MATH model, also considered as one of the latest mature models, is limited to the use of some technologies in household like PC and not for broadband network technology (Choudrie and Dwivedi, 2004).

In the next section, we focus on identifying some of the existing e-government citizen's adoption models, whether generic or countries' case study based, to have better understanding of the variables and factors affecting the user's e-government acceptance and their relation to the existing technology adoption models.

2.5 E-government Citizen's Adoption Models

In the previous section, we introduced the existing well-known adoption theories, mainly the one related to the technology industry. Based on those theories, many researchers were eager to study and analyse the factors influencing the citizens and overall society to adopt e-government

technology, defined by Carter and Bélanger (2005) and Warkentin et al. (2002) as the “intention” and by Gilbert et al. (2004) as the “willingness” of the citizens to use e-government. They have developed various adoption models as an outcome of a deep literature review on technology adoption and use case studies to verify the reliability and validity of the proposed models. Hereunder, we will present some of the latest e-government citizen’s adoption models tested and validated in either developing or developed countries. We chose the ones developed after 2005, the period where the Web 2.0 was launched officially, raising the capabilities of the online/Internet based tools and technologies (O’reilly, 2005) including e-government.

2.5.1 Abu Nadi et al. E-Government Adoption Model

Abu Nadi et al. (2008) did a deep literature review, identified the main factors of citizen’s or individual’s E-government adoption and then developed a model based on “Base Variables (BVs)” and “Dependant Variables (DVs)” where the BVs are the factors that affect directly the DVs and DVs are the factors related to E-government adoption.

Base Variables	Dependant Variables	Sub-factors
Living region	ICT accessibility	ICT availability
		ICT cost
		ICT quality
Income	ICT usage	Internet experience
Age		Internet years of experience
Education		
Nationality	Believes about E-gov	Security
E-Commerce experience		Privacy
Disposition toward technology	Behaviour intentions to adopt E-gov	Ease of use
Disposition toward technology in education		Usefulness
E-Government experience	Decision on E-gov adoption	Reliability
E-Commerce experience		
Number of participants	E-gov adoption	Perceived best method to contact the government

		Best perceived method to increase E-gov awareness
		Preference of receiving or not a hardcopy evidence of e-transaction status

Table 2. 2: E-Government Citizen's Adoption Model (Abu Nadi et al., 2008)

As shown in

Base Variables	Dependant Variables	Sub-factors
Living region	ICT accessibility	ICT availability
		ICT cost
		ICT quality
Income	ICT usage	Internet experience
Age		Internet years of experience
Education		
Nationality	Believes about E-gov	Security
E-Commerce experience		Privacy
Disposition toward technology	Behaviour intentions to adopt E-gov	Ease of use
Disposition toward technology in education		Usefulness
E-Government experience	Decision on E-gov adoption	Reliability
E-Commerce experience		
Number of participants	E-gov adoption	Perceived best method to contact the government
		Best perceived method to increase E-gov awareness
		Preference of receiving or not a hardcopy evidence of e-transaction status

Table 2. 2, the proposed model is an enhanced model of TPB (Ajzen, 1991) combined with TAM (Davis, 1986) with additional factors like Trust, Security and Privacy (Carter and Belanger, 2005; Joshi et al., 2002; Warkentin et al., 2002). This model was tested based on a quantitative primary research methodology – Questionnaire Survey method on a sample of 316 citizens from the Kingdom of Saudi Arabia. The data collected from the survey were analysed using the Normalized Frequency Distribution Analysis Method. This model succeeded in identifying

several factors affecting the E-government adoption but omitted the interrelation between the BVs and the different identified DVs. The outcome of the survey's analysis shows a Major influence of Living region over ICT accessibility, E-commerce experience over Believes about E-gov, E-government and E-commerce experience over Decision on E-gov adoption as well as the citizens' belief in the importance of using E-gov to be in contact directly with the government. In addition, it shows Average influence of Nationality over Believes about E-gov, Disposition toward technology (even in education) over the Behavior intentions to adopt E-gov. The income, age and education have Major influence on the Internet years of experience but not on the Internet experience thus we can consider that the income, age and education have an influence over the ICT usage in general but not well defined.

2.5.2 Abu-Shanab Digital Government Adoption Model

Abu-Shanab (2012) did a research about citizen's adoption of Digital Government (DG) or E-government in Jordan. He proposed a DG citizen's adoption model based on constructs from TAM (Davis 1989) as well as factors Trust and Risk Model (Belanger and Carter 2008). The proposed model is shown in the Figure 2.39.

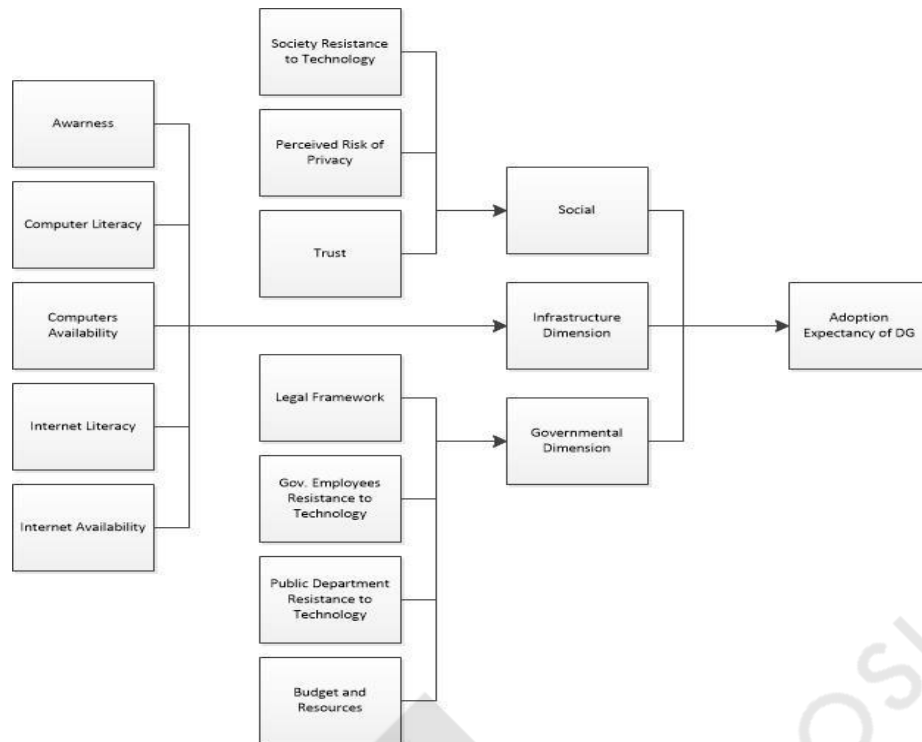


Figure 2.39: DG Citizen's Adoption Model (Adapted from Abu-Shanab, 2012)

This model was tested based on a quantitative primary research methodology – questionnaire survey method on a sample of 259 citizens from Jordan. The structured questionnaire was constructed based on e-government adoption obstacles items (Abu Shanab et al., 2010). The data collected from the survey were analysed using the Principal Component Analysis Method with Varimax rotation technique and forced four factor mode. This model succeeded in identifying the factors affecting the DG or e-government adoption in Jordan. The outcome of the survey's analysis shows major influence of social, infrastructure dimension and governmental dimension on the adoption expectancy of DG. Two main concerns were identified in this model: the first is the selection criteria of the survey sampling from three schools in a small town in Jordan, the second is the inclusion of the governmental dimension as part of the factors affecting the adoption expectancy where mainly this dimension is considered as part of the factors affecting e-government implementation or e-readiness.

2.5.3 Akkaya et al. E-Filing Adoption Model

In their research, Akkaya et al. (2013) focused on identifying the constructs or factors affecting the German citizens to adopt e-government services. Based on a deep literature review on technology adoption models and two descriptive studies about factors influencing citizen's e-government adoption executed in 2010 and 2011 in Germany, Akkaya et al. (2013) proposed a model revealing all the identified factors based on constructs from DOI (Rogers, 1995) as well as factors related to trust and risk model of Belanger and Carter (2008). The proposed model is shown in the Figure 2.40.

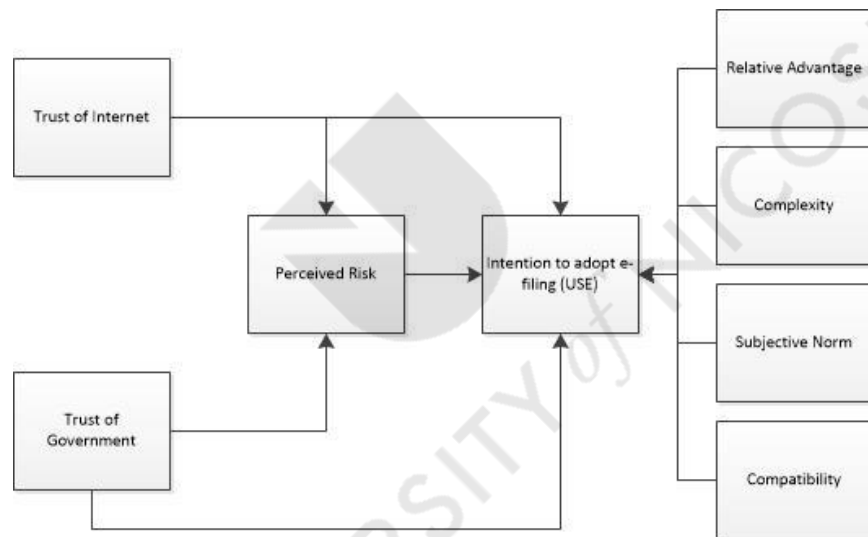


Figure 2.40: E-Filing Citizen's Adoption Model (Adapted from Akkaya et al., 2013)

This model was tested based on an explanatory quantitative primary research methodology – questionnaire survey method on a sample of 1000 citizens from Germany. The structured questionnaire was constructed based on trust items (McKnight et al., 2002; Teo et al., 2008), technology use items (Taylor and Todd, 1995), IT innovation adoption items (Moore and Benbasat, 1991) and TAM items (Davis, 1989; Davis et al., 1989). The questionnaire was pilot tested through two academics experts in the area of trust and IS research, two PhD holders experts in the IS domain and one marketing research expert. Their feedback was taken into

consideration to enhance the overall questionnaire. The data collected from the survey were analysed using the second generation multivariate analysis technique Structural Equation Modelling (SEM). This model succeeded in identifying the factors affecting the e-filing adoption in Germany. The outcome of the survey's analysis shows major influence of perceived risk, compatibility, and relative advantage either positively or negatively over the Intention to use e-filing in addition to the bare influence of the subjective norm factor. Also, it shows major influence of trust of Internet factor on perceived risk in comparison to the bare influence of the trust of government factor. In addition, it appears that the compatibility has a major negative influence on the perceived risk. One main concern identified in this model is related to the selection of e-filing as single e-government service for model testing which Akkaya et al. (2013) considered to be a complex e-service. Thus, we believe that this model should be tested over e-government services in general to be able to confirm the findings of Akkaya et al. (2013) test and analysis.

2.5.4 Al Hujran et al. E-Government Adoption Model

Al Hujran et al. (2013) focused in their research on identifying the factors influencing the e-government citizen's adoption in developing countries and took Jordan as a use case. Based on a literature review on both e-government current status in Jordan and technology adoption models as well as the e-government adoption research, Al Hujran et al. (2013) proposed a model revealing all the identified factors based on constructs from TAM (Davis, 1989) in addition to factors related to user satisfaction (Wixom and Todd, 2005), service quality (Agarwal et al., 2007; Shih, 2004; Yaghoubi et al., 2011) and trustworthiness (Titah and Barki, 2006; Susanto and Goodwin, 2010; Carter and Bélanger, 2005; Wang, 2003; Warkentin et al., 2002). The proposed model is shown in Figure 2.41.

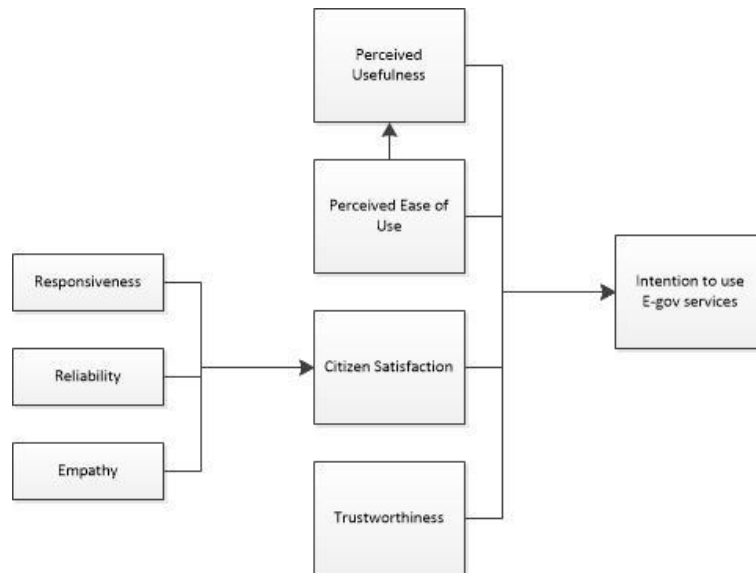


Figure 2.41: E-Government Citizen's Adoption Model (Adapted from Al Hujran et al., 2013)

This model was tested based on a quantitative primary research methodology – questionnaire survey method on a sample of 356 citizens from Jordan having access to the Internet. The structured questionnaire was constructed based on TAM items (Davis, 1989; Davis et al., 1989), BI items (Malhotra and Galletta, 1999; Pavlou, 2003), trustworthiness items (Carter and Belanger, 2005), citizen satisfaction items (Molla and Licker, 2001) and service quality items (Parasuraman et al., 1985). The questionnaire was pilot tested through three academics and one postgraduate student in the field of IS where their feedback was taken into consideration to enhance the overall questionnaire. The data collected from the survey were analysed using single and multiple linear regression analysis. This model succeeded in identifying the factors affecting the intention to use e-government services in Jordan. The outcome of the survey's analysis shows major influence of perceived usefulness, perceived ease of use, citizen's satisfaction and trustworthiness on citizen's intention to use e-government services. In addition, the analysis identified major Influence of responsiveness, reliability and empathy on the citizen's satisfaction.

2.5.5 Alateyah et al. E-Government Adoption Model

Alateyah et al. (2013) targeted in their literature review to identify the influential factors on the E-government citizen's adoption in developing countries mainly in Saudi Arabia taking into consideration the Saudi government challenges to convince the citizens adopting the E-government services. Alateyah et al. (2013) proposed a detailed model for E-government Citizen's Adoption combining various factors or constructs extracted from TAM (Davis, 1989), DOI (Rogers, 1995), UTAUT (Venkatesh *et al.*, 2003), Trustworthiness (Belanger et al., 2002), Privacy & Security (Rogers, 1995; Akkaya et al., 2012; Pi et al., 2012), Culture (AlAwadhi and Morris, 2009; Akkaya et al., 2012), Quality of Service (Rehman and Esichaikul, 2011), Skills and Knowledge (Cole and Kelsey, 2004) Lack of Awareness (AlShihi, 2005; AlAwadhi and Morris, 2009; Baker and Bellordre, 2004) and Technical Infrastructure (Al-Sobhi et al., 2010; AlAwadhi and Morris, 2009). The below model, in Figure 2.42, is adapted from Alateyah et al. model.

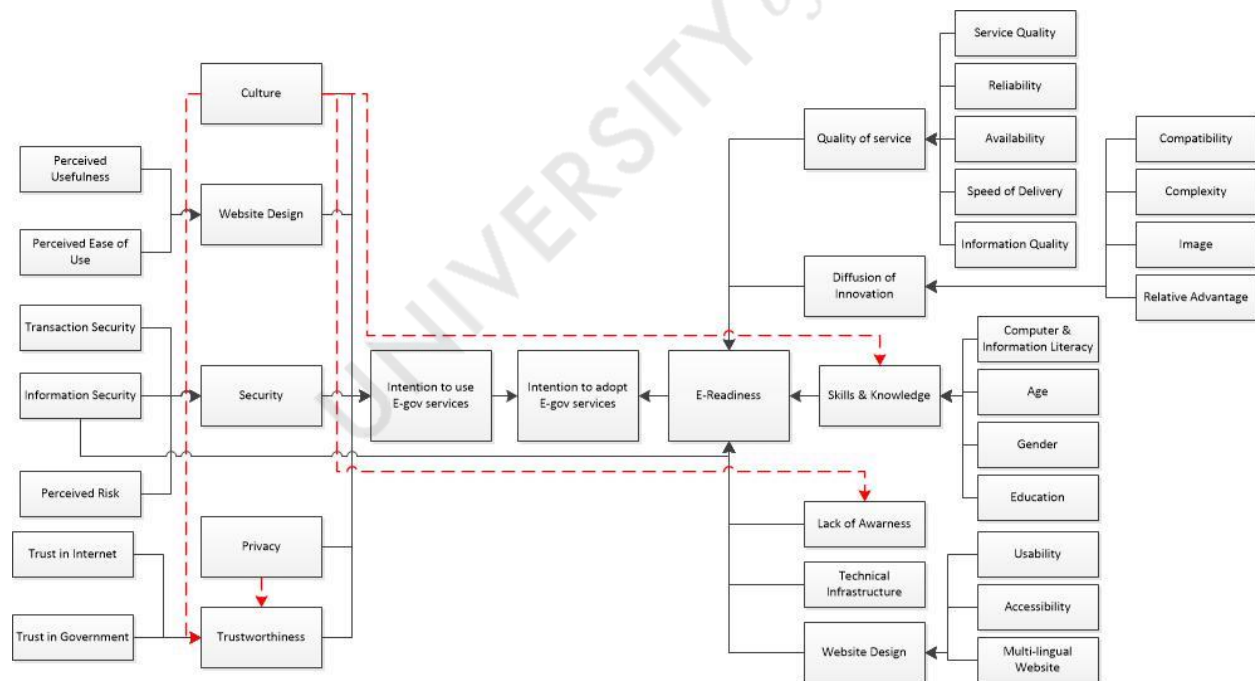


Figure 2.42: E-Government Citizen's Adoption Model (Adapted from Alateyah et al., 2013)

The proposed model considered three types of citizens: Government employees, Experts and public citizens. This model was tested based on a qualitative research methodology – Interview with the E-government experts based on a structured close ended questionnaire (except 2 open ended questions) and a quantitative primary research methodology – Questionnaire Survey method with 2 different structured questionnaires where one is for government employees and the other is for the public citizens. The data collected from the survey were analysed using one sample T-test. This model succeeded in identifying the factors affecting the intention to use E-government services in KSA which represents the citizen's concerns to use and adopt the E-government services. The outcome of the survey's analysis shows direct influence of Culture, Website Design, Security, Privacy and Trust factors on Citizen's Intention to use E-government services. In addition, it shows indirect influence of Culture and Privacy on the Trust factor. One main concern identified in this model is related to the analytical tool, One Sample T-test, used to explore some findings from the data collected where we believe of a multivariate analytical tool for more accurate and justified results.

2.5.6 Alawadhi and Morris E-Government Adoption Model

Alawadhi and Morris (2008) did an extensive literature review to identify the main factors influencing the e-government citizen's adoption in developing countries mainly in Kuwait. Alawadhi and Morris (2008) proposed an e-government citizen's adoption model based on the UTAUT model (Venkatesh et al., 2003). The UTAUT model was amended to reflect the purpose of the research where the age factor was deleted since the research was addressed only to young people in universities. The below model, in Figure 2.43, is adapted from Alawadhi and Morris model (2008).

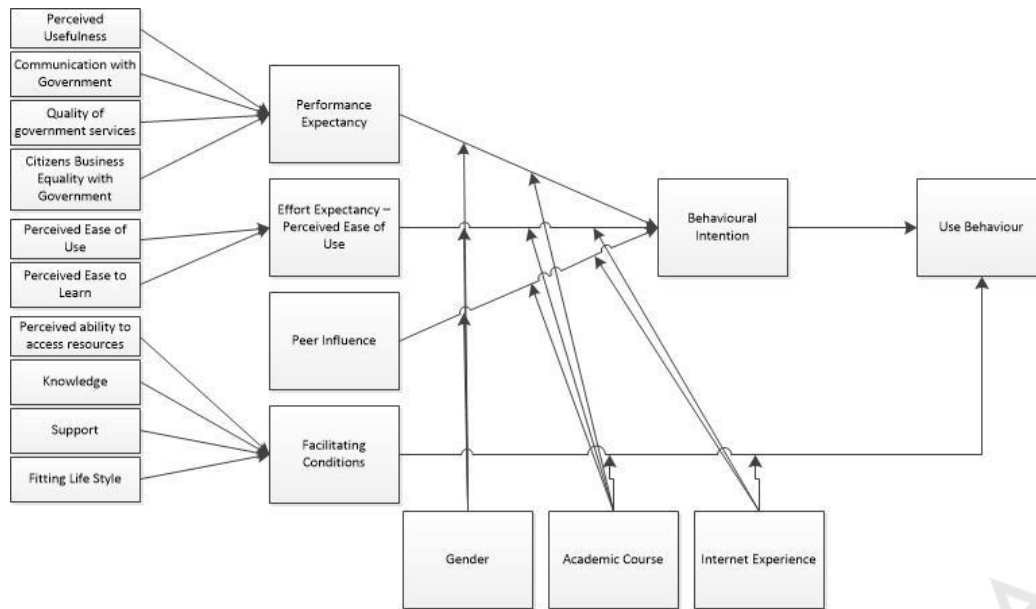


Figure 2.43: E-Government Citizen's Adoption Model (Adapted from Alawadhi and Morris, 2008)

This model was tested based on a quantitative primary research methodology – questionnaire survey method in three stages (current, near future, future) on a sample of 880 pupils from the University of Kuwait. The structured questionnaire was constructed based on UTAUT items (Venkatesh et al., 2003). The data collected from the survey were analysed using Logistic Regression Analysis (Logistic Regression, Forward Stepwise Logistic Regression). This model succeeded in identifying the factors affecting the intention to use e-government services in Kuwait. The outcome of the survey's analysis shows major influence of the performance expectancy on the behavioural intention on all phases when moderated by the Internet experience. The effort expectancy shows also major influence on the behavioural intention and its significance increases when moderated by the Internet experience and academic course. Peer influence showed major impact on the behavioural intention only at the early stage where the respondents have no or limited experience with the e-services; later on, it loses its significance. Behavioural intention and facilitating conditions have major influence on the use behaviour. The

gender factor, as moderator, has almost no influence on performance expectancy, effort expectancy and peer influence. One main concern identified in this model and highlighted by Alawadhi and Morris (2008) is about the questionnaire's sampling taken from one university which affects the generalizability of this model.

2.5.7 Alghamdi and Beloff E-Government Adoption and Utilization Model

Alghamdi and Beloff (2016) did an extensive literature review and found that most of the existing e-government adoption models have some limitations as they ignored some important factors like security & privacy risk, regulations & policies risk, trust in Internet and trust in government. Accordingly, they developed a new model named E-Government Adoption and Utilization Model (EGAUM) that covers most of the factors and constructs identified in TRA (Ajzen and Fishbein, 1975), TAM (Davis, 1989), DOI (Rogers, 1995), Perceived Characteristics Innovation – PCI model (Moore and Benbasat, 1991) and UTAUT (Venkatesh et al., 2003) in addition to the risk and trust theories (Taiwo et al., 2012). The proposed model was developed according to the findings of the deep literature review on the e-government adoption models and the previous findings of some researchers on the Saudi e-government implementation and citizen's adoption (Al-Sabti, 2005; Alshehri and Drew, 2005; Al-Nuaim, 2011; Alateyah et al., 2012; Alateyah et al., 2013). The below model, in Figure 2.44, is adapted from Alghamdi and Beloff (2014).

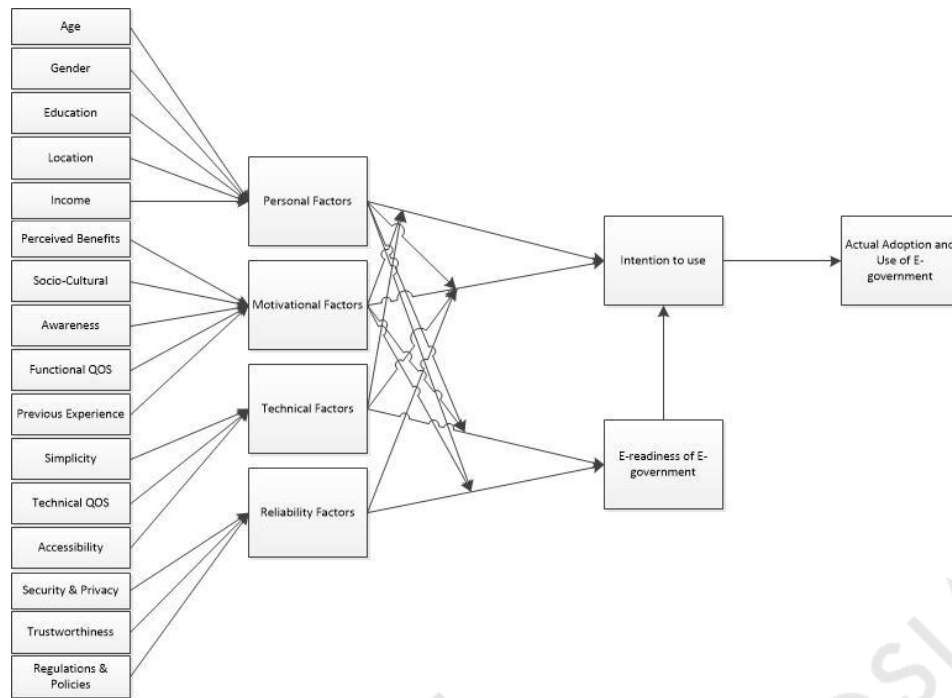


Figure 2.44: E-Government Adoption and Utilization Model (Adapted from Alghamdi and Beloff, 2016)

This model was tested based on a quantitative primary research methodology – questionnaire survey method on a sample of 53 business organizations’ leaders in Saudi Arabia. The structured questionnaire was constructed based on TRA (Ajzen and Fishbein, 1975), TAM (Davis, 1989), DOI (Rogers, 1995), Perceived Characteristics Innovation – PCI model (Moore and Benbasat, 1991) and UTAUT (Venkatesh et al., 2003) in addition to the risk and trust theories (Taiwo et al., 2012) items. The data collected from the survey were analysed using descriptive analysis. This model succeeded in identifying the factors affecting the intention to use e-government services in Saudi Arabia. The outcome of the survey’s analysis shows major influence of the perceived benefits factor on the intention to use E-government. The awareness and the previous experience factors have also medium influence on the intention to use e-government.

2.5.8 Alomari E-Government Citizen's Adoption Model

Alomari (2010 – 2014) focused in his literature review on identifying the factors affecting the e-government factors in Jordan. He proposed an e-government citizen's adoption model based on the factors and constructs identified in the DOI model (Rogers, 1995) and TAM model (Davis, 1989). The below model, in Figure 2.45, is adapted from Alomari (2010).

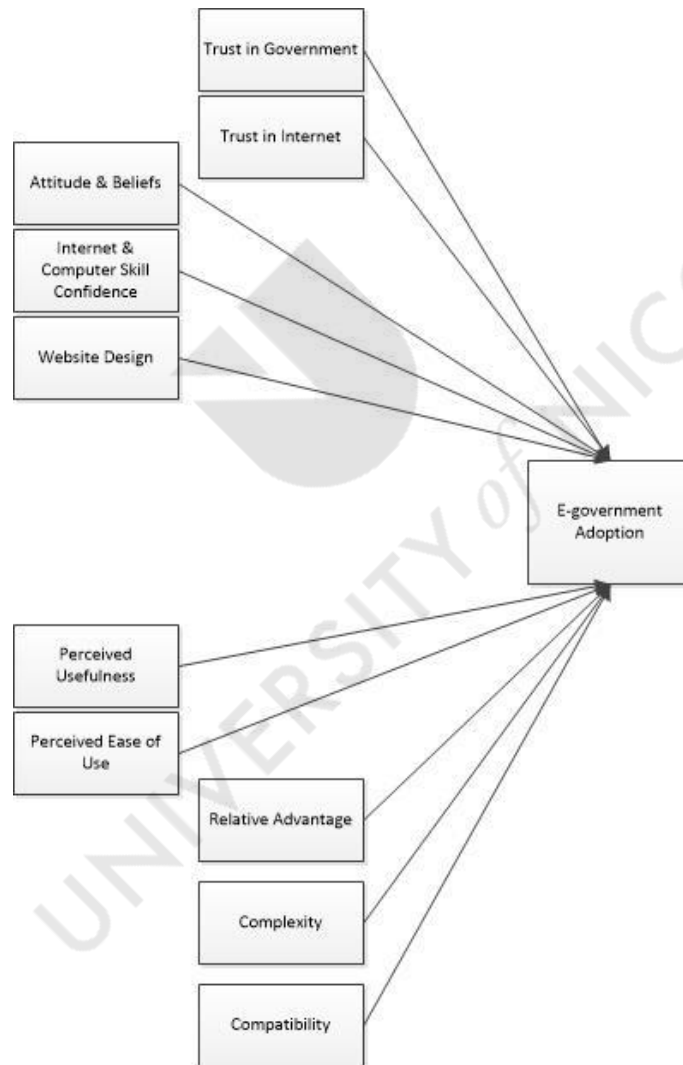


Figure 2.45: Alomari E-Government Citizen's Adoption Conceptual Model (Adapted from Alomari, 2010)

This model was tested several times based on a quantitative primary research methodology – questionnaire survey method on a sample of around 350 Jordanian citizens and Internet users. The structured questionnaire was constructed based on previous studies (Carter and Bélanger, 2005; Wang, 2003; Alomari et al., 2012; Waddel and Sohal, 1998; Harrison-Walker, 2001; Van Slyke et al., 2004) and additional self-developed items. The questionnaire was pilot tested by experienced e-government researchers in order to enhance the questionnaire and its translation so as to guarantee credibility, accuracy and integrity. The data collected from the survey were analysed using factor analysis. This model succeeded in identifying the factors affecting the citizen's adoption of e-government services in Jordan. The outcome of the surveys' analysis shows major influence of trust in Internet, website design, religious beliefs (attitude & beliefs), Internet and computer skills confidence, perceived usefulness, relative advantage, complexity of e-government adoption factors introduced in the initial model as shown in Figure 2.45. This is in addition to some new factors identified during the model testing from 2010 till 2014 which are the word of mouth (Social/Peer Influence), resistance to change, digital divide and wasta (political/decision makers connections) with major influence of word of mouth and resistance to change. Thus, we can consider that the final Alomari E-Government Citizen's Adoption Model incorporated the word of mouth, resistance to change and wasta as additional social factors and the digital divide as additional accessibility factor.

2.5.9 Al-Shafi and Weerakkody E-Government Citizen's Adoption Model

Al-Shafi and Weerakkody (2009) focused in their research on identifying the factors affecting the citizen's adoption of the e-government services in the state of Qatar. Their literature review covered most of the well-known technology adoption models where they found that the UTAUT model (Venkatesh et al., 2003) is the most suitable for their research. The proposed e-

government citizen's adoption model is based on factors and constructs identified in the UTAUT model. The below model, in Figure 2.46, is adapted from Al-Shafi and Weerakkody (2009).

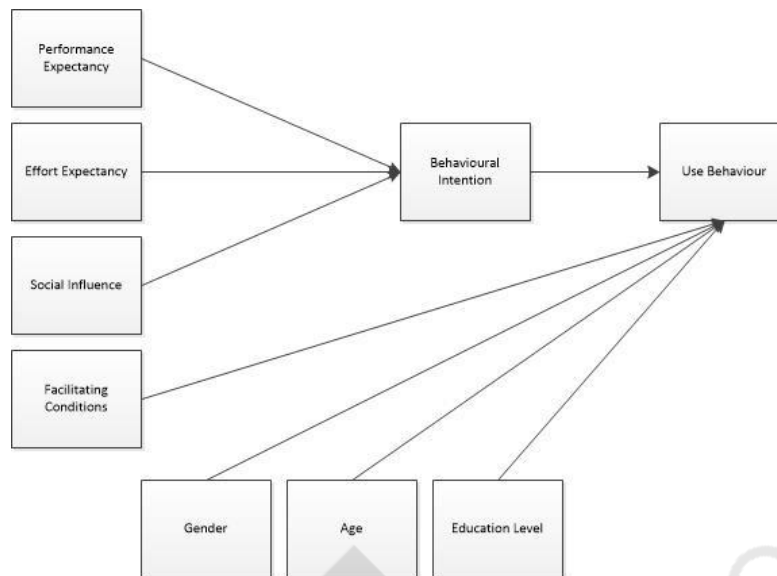


Figure 2.46: Al-Shafi and Weerakkody E-Government Citizen's Adoption Model (Adapted from Al-Shafi and Weerakkody, 2009)

This model was tested based on a quantitative primary research methodology – questionnaire survey method on a sample of 1179 Qatari residents. The structured questionnaire was constructed based on the UTAUT model items (Venkatesh et al., 2003). The questionnaire was pilot tested by experienced e-government researchers in order to enhance the questionnaire and its translation so as to guarantee credibility, accuracy and integrity. The data collected from the survey were analysed using factor analysis (Principal Component Analysis – PCA with the Varimax rotation method). This model succeeded in identifying the factors affecting the citizen's adoption of e-government services in Qatar. The outcome of the survey's analysis shows major influence of effort expectancy and social influence on the behavioural intention to use e-government and major influence of age, gender, education level and behavioural intention on the e-government use behaviour.

2.5.10 Rokhman E-Government Citizen's Adoption Model

Rokhman (2011) did a literature review on the factors affecting the citizen's adoption of the e-government services mainly in the developing countries in the South Eastern of Asia. He selected the DOI model (Rogers 1995) and perceived characteristics innovation – PCI model (Moore & Benbasat, 1991) as the foundation for his study and accordingly used its factors and constructs to propose an e-government citizen's adoption model for the developing countries. The below model, in Figure 2.47, is adapted from Rokhman (2011).

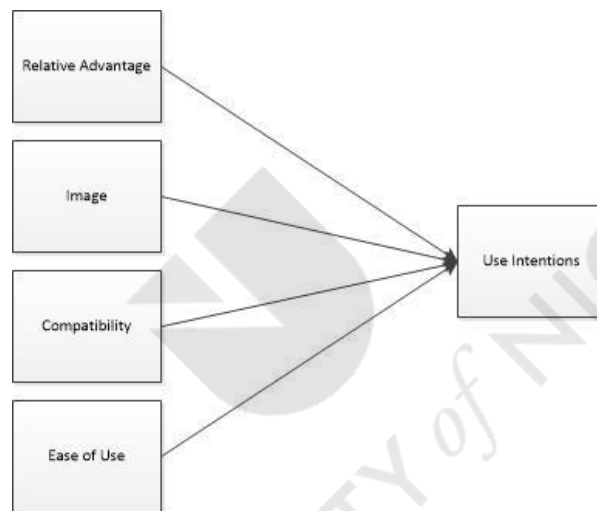


Figure 2.47: E-Government Citizen's Adoption Model (Adapted from Rokhman, 2011)

This model was tested based on a quantitative primary research methodology – questionnaire survey method on a sample of 751 Indonesian Internet users. The structured questionnaire was constructed based on the DOI (Rogers 1995) and PCI (Moore and Benbasat, 1991) models' items. The questionnaire was pretested by Indonesian Internet users to check its reliability and validity. The data collected from the survey were analysed using Binary Logistic Regression Model. This model succeeded in identifying the factors affecting the citizen's (Internet users) adoption of e-government services in Indonesia (Developing countries). The outcome of the survey's analysis shows major influence of relative advantage and compatibility on the use

intention to use e-government services in comparison to the no influence of the image and ease of use factor.

2.5.11 Harfouche Public E-services Citizen's Adoption Model

Harfouche (2010) did an extensive research on the technology adoption models and the factors affecting the acceptance and rejection of e-government services in Lebanon. After an interpretation of the existing models describing their strengths and weaknesses, he decided to develop the intention to accept or reject e-government services model (ITA E-Gov Model) based on factors and constructs extracted from MATH – Model Acceptance of Technology in Households (Brown and Venkatesh, 2005; Venkatesh and Brown, 2001) and the Two-Factors theory (Cenfetelli 2004). The below proposed model, in Figure 2.48, is adapted from Harfouche (2010).

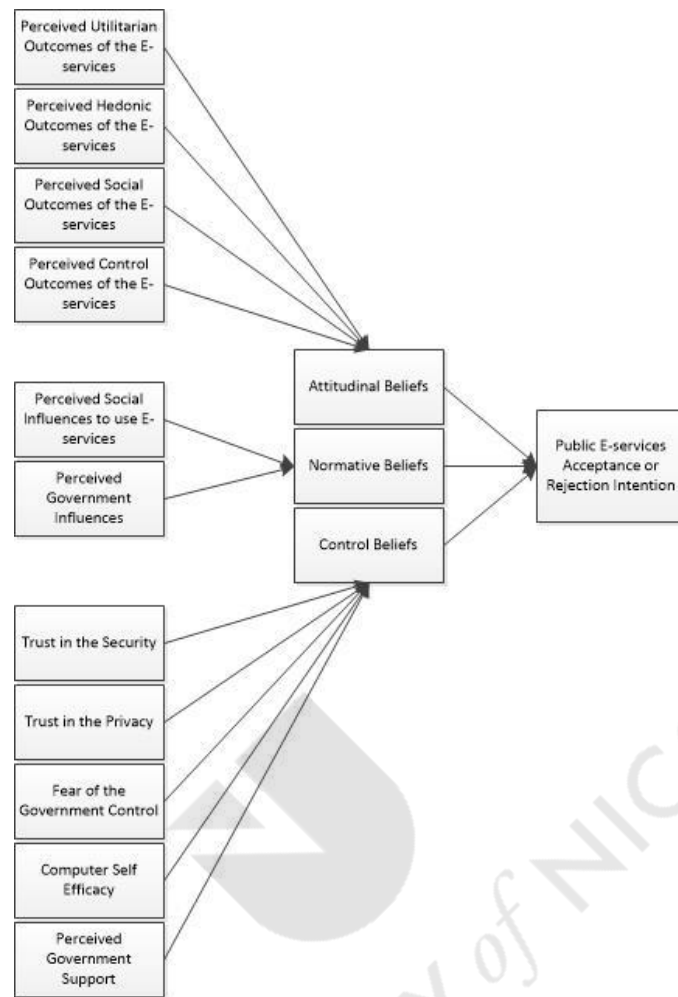


Figure 2.48: ITA e-Gov Model (Adapted from Harfouche, 2011)

This model was tested in two stages: The first stage test was based on qualitative method – interviews with open-ended questions to compare the 188 collected interviewees’ responses about the potential acceptance or rejection factors with the literature review findings. The proposed ITA E-Gov Model is the outcome of stage 1 and the literature review findings. The second stage test was based on a quantitative primary research methodology – questionnaire survey method on a sample of 210 public e-service users. The structured questionnaire was constructed based on MATH items with some modifications taken from Van Dijk et al. (2008). The data collected from the survey were analysed using the Structural Equation Modeling (SEM), Partial Least Squares (PLS) techniques to check the relation between independent and

dependent variables, SmartPLS for data analysis and the bootstrap resampling method for significance determination. This model succeeded in identifying the factors affecting the citizen's acceptance/rejection of e-government services in Lebanon. The outcome of the survey's analysis shows major influence of fear of government control, trust in the security and trust in the privacy, which means major influence of control beliefs in addition to the moderate influence of perceived utilitarian outcomes, perceived government influences and perceived government support.

2.5.12 Voutinioti E-Government Citizen's Adoption Model

Voutinioti (2013) did a literature review on the factors affecting the citizen's adoption of the e-government services in Greece. He selected the UTAUT model (Venkatesh et al., 2003) as the foundation for his study extended by the trustworthiness factors (trust in Internet, trust in government, trust in citizen service centre) and the Internet experience factor and accordingly proposed an e-government citizen's adoption model for Greece. The below model, in Figure 2.49, is adapted from Voutinioti (2013).

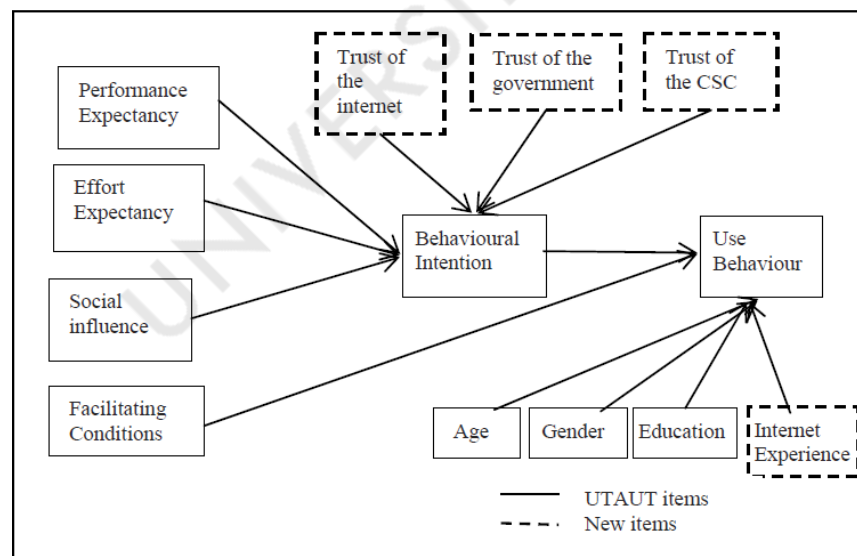


Figure 2.49: E-Government Citizen's Adoption Model (Adapted from Voutinioti, 2013)

This model was tested based on a quantitative primary research methodology – questionnaire survey method on a convenience sample of 224 users familiar with Internet. The structured questionnaire was constructed based on the UTAUT model (Venkatesh et al., 2003) and trustworthiness (Belanger and Carter, 2008; Paul and John, 2003; Gefen et al., 2003) models' items. The data collected from the survey were analysed using Structural Equation Modelling (SEM). This model succeeded in identifying the factors affecting the citizen's (familiar with internet) adoption of e-government services in Greek (developed countries). The outcome of the survey's analysis shows major influence of effort expectancy, trust of CSC, trust in government and trust in Internet on the intention to use e-government services and less influence for social influence facilitating conditions and performance expectancy.

2.5.13 Bwalya E-Government Citizen's Adoption Model

Bwalya (2017) did a literature review on the factors influencing the citizen's adoption of the e-government services in developing countries – case study Zambia. He selected exclusively the TAM model (Davis, 1989) as the foundation for his study extended by some other factors like trust and computer self-efficacy categorized under external variables. The below model, in Figure 2.50, is adapted from Davis (1989).

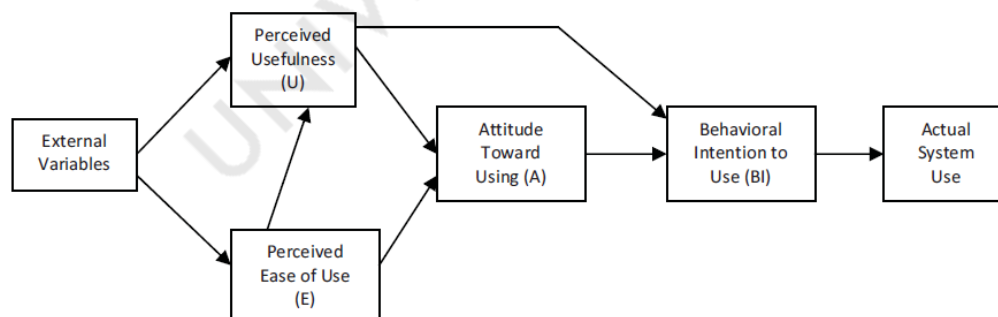


Figure 2.50: E-Government Citizen's Adoption Model – TAM (Adapted from Davis, 1989)

This model was tested based on a quantitative and qualitative primary research methodology – questionnaire survey method with closed and open ended questions on a purposive sample of 408 citizens. The questionnaire was piloted on 40 individuals with ICT skills for review and rephrasing where needed. The structured questionnaire was constructed based on the TAM model (Davis, 1989) and multiple external variables' items such as trust and computer self-efficacy. The data collected from the survey were analysed using Standard Multiple Regression, Exploratory Factor Analysis (EFA) – Principal Component Axis Factoring (PCA) with Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Chi-square. This model succeeded in identifying the factors affecting the citizen's (ICT skilled) adoption of e-government services in Zambia (developing countries). The outcome of the survey's analysis shows influence of the computer self-efficacy, trust in government, actual & continuous usage of e-services, perceived ease of use, perceived usefulness and ICT infrastructure capability on the intention to use e-government services.

2.5.14 Haider et al. E-Government Citizen's Adoption Model

Haider et al. (2015) did a literature review on the factors influencing the citizen's adoption of the e-government services in Pakistan. He selected the UTAUT model (Venkatesh et al., 2003) as the foundation for his study on e-government Citizen's adoption in Pakistan. The below model, in Figure 2.51, is adapted from Venkatesh et al. (2003).

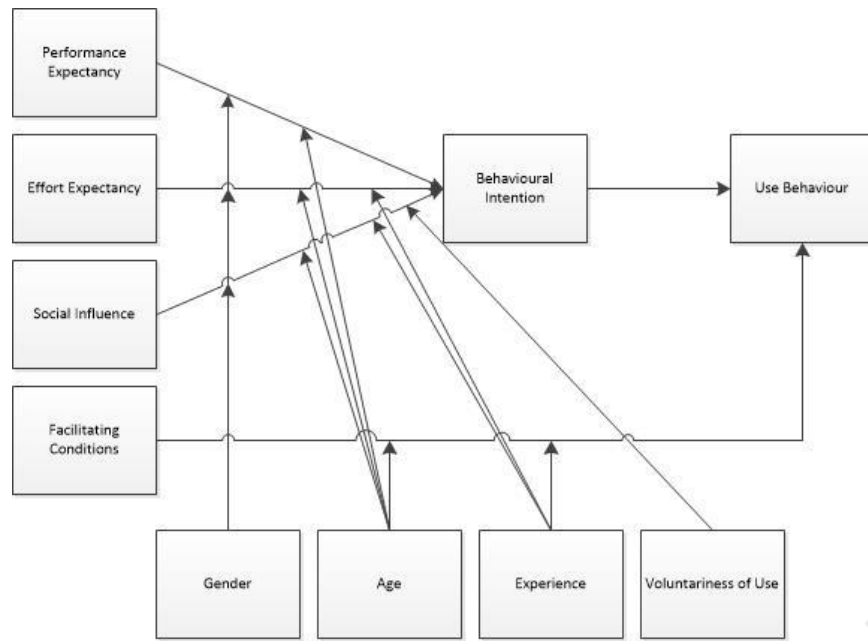


Figure 2.51: E-Government Citizen's Adoption Model (Adapted from Venkatesh et al., 2003)

This model was tested based on a quantitative primary research methodology – questionnaire survey method with closed ended questions on a random sample of 200 citizens. The structured questionnaire was constructed based on the UTAUT model (Venkatesh et al., 2003). The data collected from the survey were analysed using Structural Equation Modelling (SEM). This model succeeded in identifying the factors affecting the citizen's adoption of e-government services in Pakistan (developing countries). The outcome of the survey's analysis shows the impact of the effort expectancy, performance expectancy, facilitating conditions and social influence on the intention to use e-government services.

2.5.15 Asmi et al. E-Government Citizen's Adoption Model

Asmi et al. (2017) did a literature review on the factors influencing the citizen's adoption of the e-government services in Pakistan. He selected the TAM model (Davis, 1989) as the foundation for his study extended by the trustworthiness factors (Belanger & Carter, 2008; Gefen, 2003) and

Social influence (Venkatesh et al., 2003) factors to develop the proposed e-government citizen's adoption in Pakistan. The below model, in Figure 2.52, is adapted from Asmi et al. (2017).

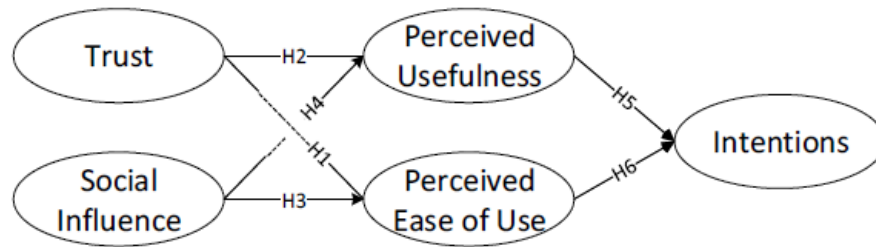


Figure 2.52: E-government Citizen's Adoption model (Adapted from Asmi et al., 2017)

This model was tested based on a quantitative primary research methodology – questionnaire survey method with closed ended questions on a random sample of 153 users of e-tax applications. The structured questionnaire was constructed based on the TAM model (Davis, 1989), trust and social influence factors' items. The data collected from the survey were analysed using Exploratory Factor Analysis (EFA) – Principal Component Axis Factoring (PCA) with Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Structural Equation Modelling (SEM). This model succeeded in identifying the factors affecting the citizen's adoption of E-government services in Pakistan (developing countries). The outcome of the survey's analysis shows influence of the perceived ease of use and perceived usefulness on the intention to use e-government services in addition to the influence of the trust factor on the perceived usefulness and the impact of social influence factor on the perceived ease of use and perceived usefulness.

2.5.16 Gupta et al. E-Government Citizen's Adoption Model

Gupta et al. (2016) did a literature review on the factors influencing the citizen's adoption of the e-government services in Pakistan. He selected the UTAUT model (Venkatesh et al., 2003) as the foundation for his study on e-government citizen's adoption in India, extended by trustworthiness factors (Carter and Belanger, 2008; Gefen, 2003) and citizen's satisfaction (Kumar et al., 2007) factors. The below model, in Figure 2.53, is adapted from Venkatesh et al. (2003).

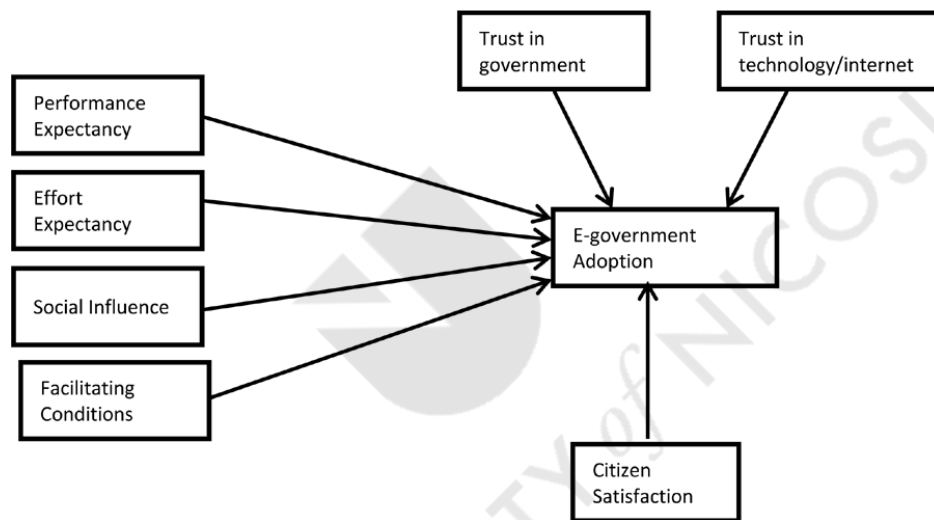


Figure 2.53: E-Government Citizen's Adoption Model (Adapted from Gupta et al., 2016)

This model was tested based on a quantitative primary research methodology – questionnaire survey method with closed ended questions on a random sample of 392 citizens. The questionnaire was piloted on 100 students and 34 e-government users with ICT skills for review and rephrasing where needed. The structured questionnaire was constructed based on the UTAUT model (Venkatesh et al., 2003) extended by the trustworthiness and citizen's satisfaction factors' items. The data collected from the survey were analysed using Exploratory Factor Analysis (EFA) – Principal Component Axis Factoring (PCA) with Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy. This model succeeded in identifying the potential

factors affecting the citizen's adoption of e-government services in India (developing countries).

The outcome of the survey's analysis shows a potential influence of the effort expectancy, performance expectancy, facilitating conditions, social influence, trust in government, trust in Internet and citizen's satisfaction on the intention to use e-government services.

2.5.17 Conclusion

Based on the abovementioned, Eleven (16) e-government citizen's adoption models were identified since 2005 and the latest ones in 2017. The Table 2. 3 shows a summary of the identified models.

#	Author	Year	Country	Category	Research Methodology	Testing tools	Questionnaire Scale	Sampling Size
1	Abu Nadi et al.	2008	KSA	Developed	Quantitative primary research methodology – questionnaire survey method	Normalized Frequency Distribution Method	Binary and Four values	316
2	Abu Shanab	2012	Jordan	Developing	Quantitative primary research methodology – questionnaire survey method	PCA with Varimax rotation technique, Cronbach alpha > 0.5, Significance at level 0.01	NA	259
3	Akkaya et al.	2013	Germany	Developed	Quantitative primary research methodology – questionnaire survey method	T test, Confidence level 95%; Harman's single-factor test for BIAS; PCA; second generation multivariate analysis technique Structural Equation Modeling (SEM); confirmatory factor analysis (CFA);	Likert scale 7 points	1000
4	AlHujran et al.	2013	Jordan	Developing	Quantitative primary research methodology – questionnaire survey method	Cronbach's alpha 0.6; reliability function in SPSS 17; Single and Multiple Linear regression	Likert scale 5 points	356
5	AlAteyah et al.	2013	KSA	Developed	Qualitative research methodology – interview & quantitative primary research methodology – questionnaire survey method	Cronbach's alpha 0.6; reliability function in SPSS 17; T-test	Likert scale 5 points	NA
6	AlAwadhi and Morris	2008	Kuwait	Developed	Quantitative primary research methodology – questionnaire survey method	Cronbach's alpha 0.7 to test reliability of the scale construct; Logistic Regression analysis	Likert scale 7 points	880

#	Author	Year	Country	Category	Research Methodology	Testing tools	Questionnaire Scale	Sampling Size
7	AlGhamdi and Beloff	2016	KSA	Developed	Quantitative primary research methodology – questionnaire survey method	Descriptive Analysis, Cronbach's alpha 0.5 to test reliability of the scale construct; Logistic Regression analysis	Likert scale 5 points	53
8	Alomari	2014	Jordan	Developing	Quantitative primary research methodology – questionnaire survey method	Exploratory Factor Analysis; Cronbach alpha > 0.5	Likert scale 5 points	356
9	Al-Shafi and Weerakkody	2009	Qatar	Developed	Quantitative primary research methodology – questionnaire survey method	PCA with Varimax rotation technique, Cronbach alpha > 0.5, Significance at level 0.01; Logistic Regression Modeling	Likert scale 5 points	1179
10	Rokhman	2011	Indonesia	Developing	Quantitative primary research methodology – questionnaire survey method	Structural Equation Modeling (SEM), Partial Least Squares (PLS) techniques to check the relation between independent and dependent variables, SmartPLS (Chin and Frye 1996) for data analysis and the bootstrap resampling method for significance determination	Likert scale 7 points	210
11	Harfouche	2010	Lebanon	Developing	Qualitative research methodology – interview & quantitative primary research methodology – questionnaire survey method	binary logistic regression model; Cronbach's Alpha score of more than 0.6; Chi-Square test	Likert scale 5 points	751
12	Voutinioti	2013	Greece	Developed	Quantitative primary research methodology – questionnaire survey method	Structural Equation Modeling using Smart-PLS tool	Likert scale 5 points	224
13	Bwalya	2017	Zambia	Developing	Quantitative and qualitative primary research methodology – questionnaire survey method (closed and open ended questions)	Multiple Regression, Exploratory Factor Analysis (EFA) – Principal Component Axis Factoring (PCA) with Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and ANOVA; Cronbach alpha > 0.5	NA	408

#	Author	Year	Country	Category	Research Methodology	Testing tools	Questionnaire Scale	Sampling Size
14	Haider et al.	2015	Pakistan	Developing	Quantitative primary research methodology – Questionnaire Survey method	Structural Equation Modeling using Smart-PLS tool; Cronbach alpha > 0.5	NA	200
15	Asmi et al.	2017	Pakistan	Developing	Quantitative primary research methodology – questionnaire survey method	Exploratory Factor Analysis (EFA) – Principal Component Axis Factoring (PCA) with Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Structural Equation Modelling (SEM); Cronbach alpha > 0.7	Likert scale 5 points	153
16	Gupta et al.	2016	India	Developing	Quantitative primary research methodology – questionnaire survey method	Exploratory Factor Analysis (EFA) – Principal Component Axis Factoring (PCA) with Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy; Cronbach alpha > 0.5	Likert scale 5 points	392

Table 2. 3: E-Government Citizen's Adoption Models summary

As per Table 2. 3, Nine (9) models were tested in developing countries including Jordan, Indonesia, Zambia, Pakistan, India and Lebanon, and Seven (7) models were tested in KSA, Kuwait, Qatar, Greece and Germany categorized as per the World Bank ranking (2016). The Figure 2.54 shows the distribution of the identified e-government citizen's adoption models per country.

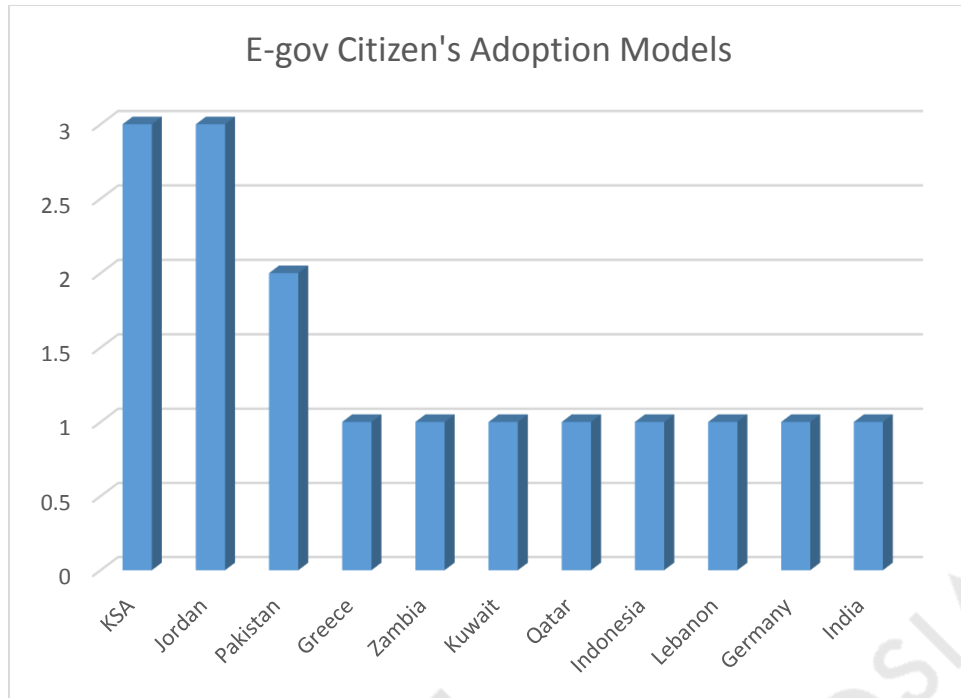


Figure 2.54: Distribution of E-Government Citizen's Adoption Models

In addition, we can realize that most of the identified models used TAM (Davis, 1989), DOI (Rogers, 1995), UTAUT (Venkatesh et al., 2003) and Trust & Risk (Belanger and Carter, 2008) as the basis of their models. The Figure 2.55 shows the frequency of use of each technology adoption model in the identified e-government citizen's adoption models.

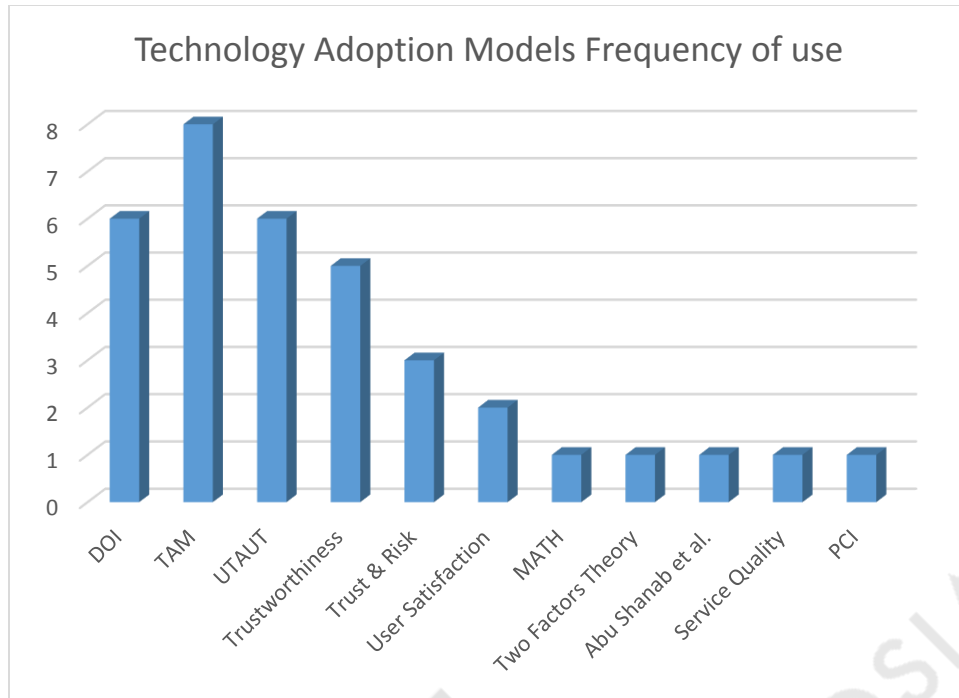


Figure 2.55: Technology Adoption Models Frequency of Use

As per Figure 2.55, TAM, DOI, UTAUT and trustworthiness are the most used technology adoption models. Venkatesh and Davis (2000) defined the TAM model as the most well-established, well-tested, powerful, robust and parsimonious model for predicting user acceptance of technology and the most popular amongst all the existing technology adoption models (Chuttur, 2009; Gefen and Straub, 2000; Taylor and Todd, 1995). Lu et al. (2003) defined the DOI model as the most used since 1960s for innovations' assessment including information system tools. Many researchers describe the DOI as the second most popular technology adoption model (Lyytinen and Damsgaard, 2001; Prescott and Conger, 1995) whereas the UTAUT model is a newer model having fewer number of implementations (Khan and Woosley, 2011). As for trustworthiness, it is defined by Pavlou (2003) as trust and risk factors that should be integrated with technology adoption or acceptance models.

Since TAM and UTAUT test the adoption of technology at the individual level and the DOI tests the adoption and diffusion of technology at the organization and community level (Chong et al.,

2009), and we are assessing the citizens' technology adoption as individuals, the upcoming conceptual GE-government citizen's adoption model will be based on the TAM (Davis, 1989), considered as one of top mature technology adoption models. It is widely used and tested over the last two decades in various information systems including e-services, and extended by the trustworthiness, mainly by integrating the trust in government and trust in Internet factors into the TAM model.

2.6 Geographic Information (GI)

2.6.1 Geographic information definition

Goodchild (1997; 2010) defined the geographic information (GI) as the location or information linked to a place or property on or near Earth and the knowledge about the location of something along its description at a specific time or time interval. GI was represented historically as the information available or stored on paper maps or analogue format. Nowadays, GI is handled digitally by complex and advanced information systems to provide the potential users more usability, flexibility and information accuracy. With GI, any object in the globe can be represented as a point, line or polygon and referenced geographically according to a specific reference system, adding the location as a new dimension to this object in addition to all associated information that varies according to the object type. GI with its relevant tools will play a growing and major role in the society over the time (Goodchild and Palladino, 1995).

According to Goodchild and Palladino (1995), there is a process to get digital GI starting from analogue GI (maps, aerial photography, satellite imagery, CAD drawings, remote sensing) or raw data (database, excel sheets, survey data, field observations, documents, ...) conversion into digital maps, analysed spatially and non-spatially with advanced geospatial tools in order to be

used for decision making. Along with this process, there are plenty of fundamental issues to be considered to guarantee GI usefulness and accuracy. Therefore, those issues cannot be addressed and resolved using only the geospatial or GI tools; we need to do at least basic scientific research that surrounds the use of GI tools to solve those issues (Goodchild, 1992).

According to the aforementioned, the GI is identified as following:

- The Geographical Information System (GIS): Provide the geographic information with “the infrastructure, tools and methods for tackling real world problems within acceptable timeframes” (Maguire, 2010).
- The Geographic Information Science (GIScience): “Allows us to consider the philosophical, epistemological and ontological contexts of geographic information” (Maguire, 2010).

2.6.2 What is Geographic Information System (GIS)?

Roger Tomlinson, recognized as the father of GIS, was the first to introduce the GIS for use in 1960 (Goodchild and Palladino, 1995; Coppock and Rhind, 1991). The definition of GIS varied over time especially with the broad development of technology and the GI dependency on technology to provide powerful analytical and decision making tools (Gould and Herring, 2001). The Table 2. 9 summarizes some of the identified GIS definitions showing the progress and transformation in the GIS definition over time as well as the relevant definition’s approach classification as developed by Cowen (1988). This includes process or function oriented, application, toolbox, database and decision support system approaches in addition to the management information system approach identified by Devine and Field (1986), GIS elements approach identified by Dickinson and Calkins (1988) and social construction approach identified by Chrisman (1997).

23 Geographic Information System's definitions were identified in Table 2. 9 where the first definition was initiated by Tomlinson in 1960. Those definitions were categorized according to the identified definition's approaches where we realized that almost half of the definitions (10 out of 23) are categorized under process/function approach. 4 definitions are categorized under toolbox and 3 under GIS elements as per Figure 2.56. The first definition by Tomlinson saw the GIS as an application, however, by the time and the booming of the "use of GIS" in 1980s (Goodchild, 2006), the GIS researchers started defining GIS as toolbox, process or function, database and in late of 1980s appeared the first definition of GIS elements and the decision support system.

The most recent definitions are "process/function" approach oriented (Esri, 2015; Bhargava et al., 2012) and the "Toolbox" approach (Maguire, 2010) with the emergence of the "Social Construction" starting 1999 as a new approach category (Longley et al., 2005; Chrisman, 1999). The definitions of Longley et al. (2005) and Chrisman (1999), categorized under Social Construction and Process/Function oriented approaches, best describe the geographic information system as a process and function based system offering the people and society the needed tools to measure, represent, operate and transform the geographic aspects into tangible objects that can be used to enhance the day to day activities. This definition is totally aligned with the author's objective in showing the importance of geographic information to improve society and citizens' adoption of the e-services.

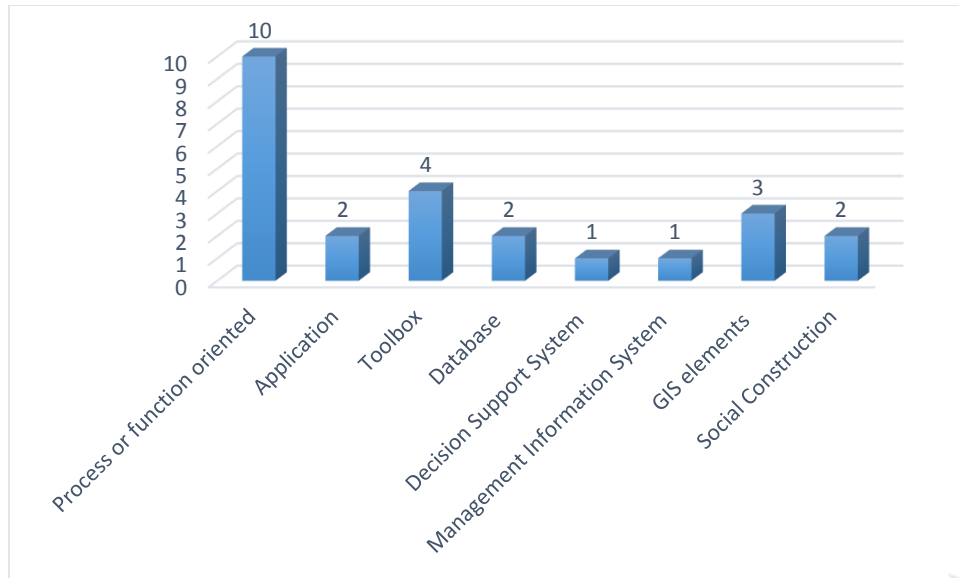


Figure 2.56: Geographic Information System Definitions by Approach

2.6.3 What is Geographic Information Science (GIScience)?

Several terms had been proposed before geographic information science was widely accepted. The term spatial information science was the original term used during a keynote speech at the 4th International Symposium on Spatial Data Handling in Zurich, Switzerland in 1990 (Gould, 2010). Geomatics was then a term favoured in many countries because of its simplicity and its ease of translation into French (Wright et al., 1997). Nowadays, the geographic information science is the common term used worldwide to describe the generic research on issues related to the use and implementation of the GIS technology (Goodchild, 1992). Those bodies of research help understand how people think geographically and check how influential is the GIS on society in order to propose improvements on the user's interfaces to map and reflect those findings (Goodchild and Palladino, 1995).

In the late 1996, the National Centre for Geographic Information and Analysis (NCGIA) developed a conceptual framework or model defining the various GIScience research topics that should be covered (Goodchild, 2010; Goodchild et al., 1999). The identified research topics are

combinations of three domains apportioned differently: Computer domain, individual user domain, and society domain. Figure 2.57 shows the GIScience framework including the domains as well as the research topics.

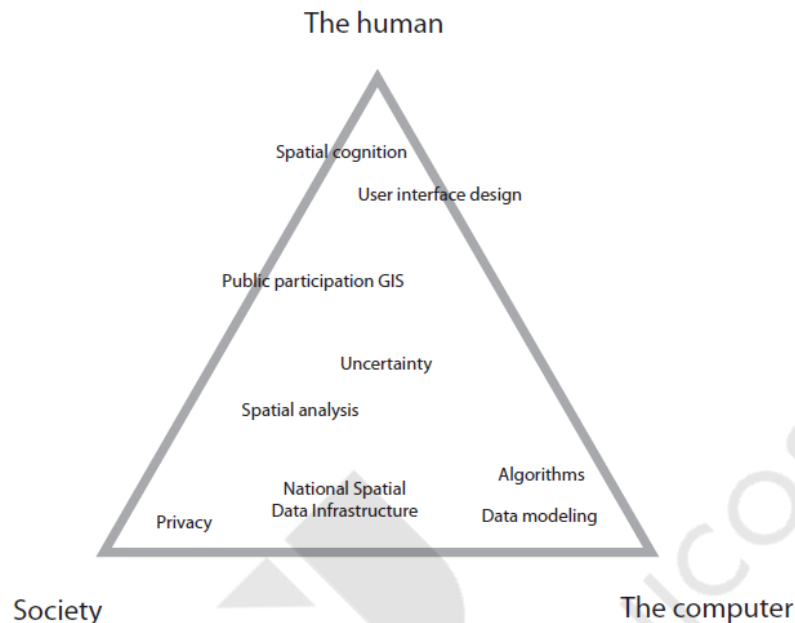


Figure 2.57: Conceptual Framework for GIScience

The National Science Foundation defines in 1999 the GIScience as the basic research field that seeks to redefine geographic concepts and their use in the context of geographic information systems (Mark, 2000). Later on, Mark (2003) defines GIScience as the development and use of theories, methods, technology, and data for understanding geographic processes, relationships, and patterns. This definition pinpoints the different components of GIScience and provides the principal framework for doing GIS and the workflow that allows turning information into evidence and knowledge (Longley et al., 2005). Though, Maguire (2010) gives a philosophical definition of GIScience considering it as “the philosophical, epistemological and ontological contexts of Geographic Information”.

According to the aforementioned, the GIScience conceptual model developed by NCGIA best describes the GIScience. It provides a very good understanding of the relation between the three

domains, considered as beneficiaries of GI, and the role of GI on each one of them which is compliant and complimentary to the GI. It also gives a GIS definition in relation to the role of GI in enhancing the citizen's adoption of the e-government services.

2.6.4 Geographic Information implementation benefits

As described in the section 2.6.2 and 02.6.3, most of the geographic information definitions, either as a system or a science, list the main benefits of the geographic information. For example, Chrisman (1999) and Longley et al. (2005) stated that GI offers the people and society the tools and processes to measure, represent, operate and transform the geographic aspects into tangible objects that can be used to enhance the day to day activities. Moreover, the conceptual framework, developed by National Centre for Geographic Information and Analysis (1996) for GIScience, identified the three main domains (human, society and computers) considered as stakeholders and beneficiaries of GI. It further listed some research topics related to those domains where some can be also considered as GI benefits like public participation, spatial analysis, user's interface design. In addition, Gould and Herring (2001) considered that the benefits of GI, as a technology related field, increased since 1990 due to many factors like the emergence of new markets (geomarketing, navigation, tracking, geomatics, telematics, location based services) that require geographic information along with the development of new IT tools, like the Internet and world wide web (WWW) (Bunch, 2012) as well as the global positioning system (GPS) technologies, used extensively in the GI domain to improve its offered services and capabilities to the human and society through applications like WebGIS and Mobile LBS.

Several authors worked on the identification of the GI benefits and tried to classify them into categories. For example, Knepper (1990) used the terms tangible and intangible benefits while Prisley (1987) and Clarke (1991) identified efficiency, effectiveness and intangible. Born (1992)

distinguished primary and secondary benefits in addition to Behr (1994) who classified GI benefits under increased efficiency, operational, strategic and external benefits. The Table 2. 10 (see Appendix B) illustrates the author's findings on the GI benefits according to categories defined by multiple researchers (Behr, 1994; Webb, 1994; Grimshaw, 1994; Smith, 1992; Clarke, 1991; Antenucci, 1991; Prisley, 1987) and includes four main categories:

- Efficiency & Effectiveness (EFF) – includes enhanced productivity, information accuracy, interdepartmental cooperation, and mobile usage (Behr, 1994; Webb, 1994; Antenucci, 1991; Clarke, 1991; Prisley, 1987)
- Operational (OPR) – includes enhanced data quality, user friendliness (ease of use), unique data repository, and high level of public service (Behr, 1994)
- Strategic (STR) – includes technological changes, optimization of business processes, job satisfaction, competitive advantages, improved public image, decision-making processes, and standards compliancy (Behr, 1994; Grimshaw, 1994)
- External (EXT) – includes benefits to local governments, citizens, businesses, and communities (Behr, 1994; Smith, 1992; Wilcox, 1990; Gramlich, 1981)

The beneficiaries of the geographic information will be distributed according to the e-government beneficiaries' categories which include government, businesses and citizens.

Thus, according to Table 2. 10, we can summarize the geographic information benefits' categories as following: efficiency and effectiveness, operational, strategic and external. Each of those benefits' categories has its own impact on the geographic information provider or the end user beneficiary that includes government, citizens or businesses.

The Figure 2.58 shows e-government benefits classification by Category:

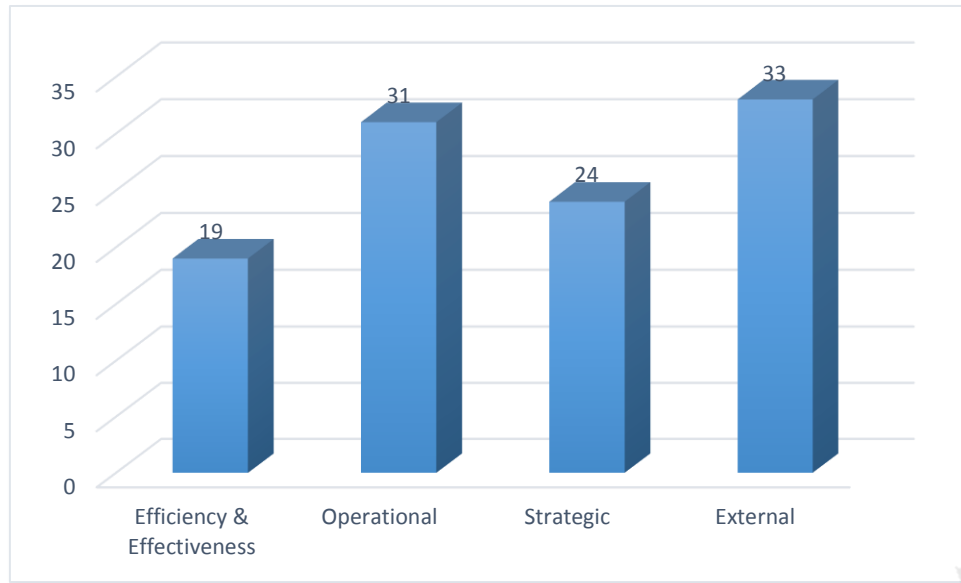


Figure 2.58: Geographic Information Benefits Classification by Category

It is obvious that most of the GI researchers put more emphasis on the external and operational benefits and less on the strategic and efficiency & effectiveness. Definitely, the GI researchers want to show how important are the GI technologies for the government, businesses and citizens. This is logical since any organization and its shareholders will not support the implementation of any new technology, especially the GI technology, unless it guarantees an improvement of the external beneficiaries' daily operations. Nevertheless, the strategic and efficiency & effectiveness benefits are also essential as the first focuses on the internal benefits of GI for any organization while the second emphasizes the easiness and usefulness of any geo-enabled application for its end users.

According to Figure 2.59, the main external beneficiary of the Geographic Information are the Citizens where they appear 32 times out of 74 in Table 2. 10. Therefore, it is evident that the focus of the GI researchers to highlight the citizens as the key GI stakeholders and bring out the attention of the citizens to the importance of using the GI technologies to facilitate their daily operations and activities.

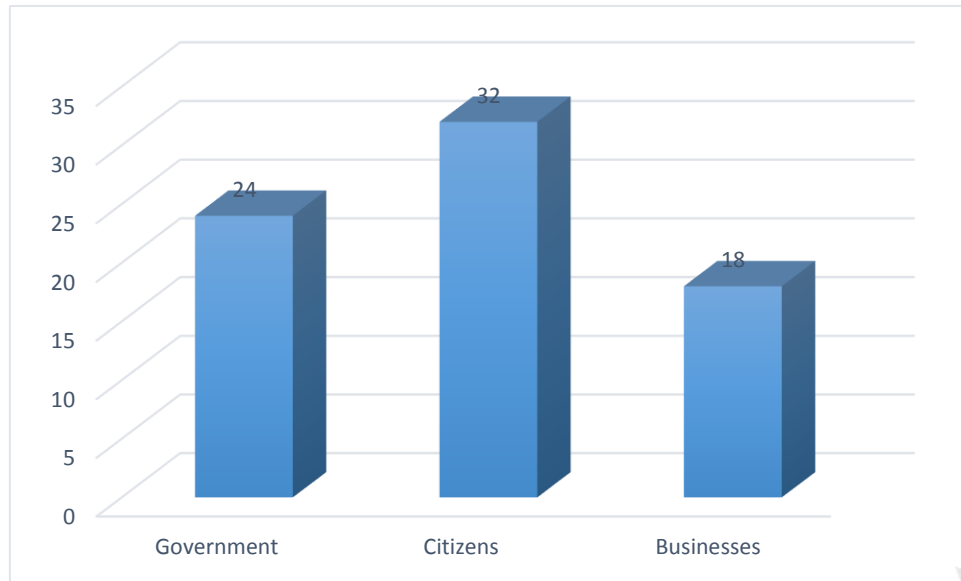


Figure 2.59: GI Benefits Distribution According to End User Beneficiary

The Figure 2.60 shows the distribution of the benefits by category between two periods: Before 2005 and after 2005:

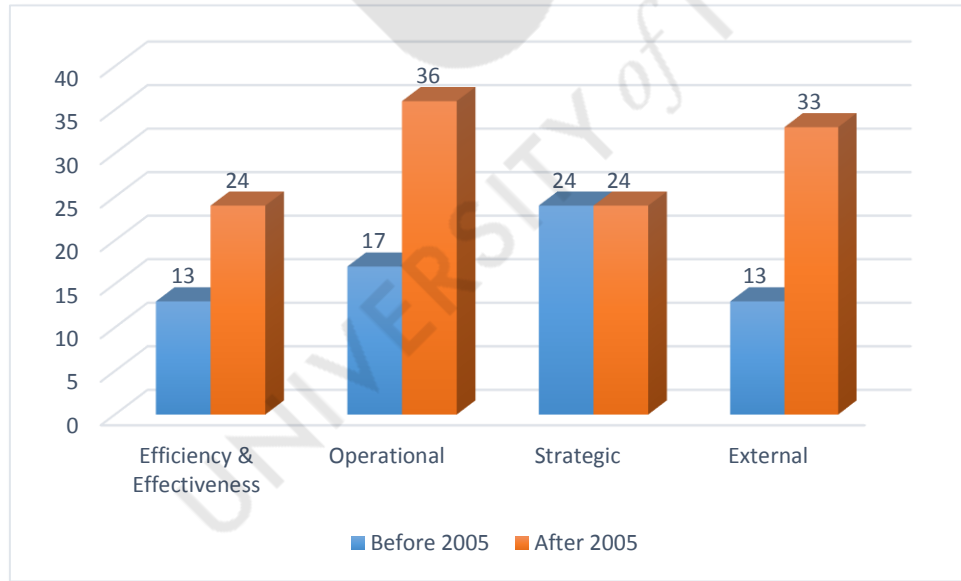


Figure 2.60: GI Benefits Classification by Category as Identified across Different Periods of Time

This distribution of benefits' identification across the two periods shows the tremendous increase in the studies of the GI benefits for the period after 2005 especially for the external and operational benefits as compared to the efficiency and effectiveness. This is valid because, at this stage (the stage of 2004 – 2005), all information system technologies profited from the Web 2.0 booming that offered the geographic information technologies the additional capabilities to share and distribute its GI functions and tools across the citizens and the community which was limited to the GI experts and researchers.

2.7 Geographic Information Adoption & Applications for E-Government

The main goal of this section is to identify the major geographic information (GI) based e-government applications and services and highlight the positive impact of using the GI technologies in the e-government in order to enhance its services and increase its citizens' adoption. According to O'Looney (2000), the GI is being used widely in public sector to geo-enable its applications like land use and urban planning, emergency and disaster management, public information services and many other applications. Those applications respond to the citizens' needs and facilitate their interaction with the government as well as support the government and local government in enhancing their planning and decision-making processes (Kurwakumire, 2013; Nedovic-Budic, 1999).

Hereunder is a list of some GI based e-government applications with brief description:

1. E-government geospatial web services: Those services, for example, used for the Zoning Plan department and the Map and Cadastre department in government or local government like Land Registry in England, Cadastre.gouv.fr in France, Ferbritas in

Portugal, MapData services in Australia and TAKBIS in Turkey, are implemented widely in order to enhance the geospatial/geographic data interoperability within the governmental agency and between the governmental agencies, and to facilitate the daily tasks and activities of the citizens with the government that requires up-to-date geospatial/geographic data, increasing their satisfaction. Such geo-web services will incorporate automatically all related geo-data required during the e-services or online form filling process and accordingly offering additional benefits to citizens' such as reducing the time, effort and cost needed to complete the same process using the same e-service without the GI integration/adoption.

2. E-land administration application: This application is used widely by the government and local governments where the assessment of the GI adoption, as a core part of this application, showed its positive impact on the citizens' adoption of this service especially that it helped in the reduction of the corruption, allocation of the exact land, exact matching in land use, etc...
3. Web GI parcel application: The main goal of this application is to facilitate the access and transmission of the parcel based official documents like construction permission plans, cadastral plans, land usage plans, etc. over the internet by the citizens and businesses so they can fill and prepare the needed documents automatically and online with the minimum data.
4. Web GI Campus Information System: This application is used widely by the public and private universities as well, where you can query interactively the campus maps in addition to the possibility of querying and collecting graphical and regular information about the university and its departments through an attractive graphical user interface

website that gives you the feeling of being virtually in the campus using advanced information technologies, advanced visual effects, and 2D/3D display capabilities.

5. Disaster Management System: The DMS, geo-enabled by the Crowd-Sourced Emergency Services, is currently widely used to improve the response of the government to any incident, event or disaster. Citizens dynamically collaborate, through those geospatial e-government services, to support the governmental disaster/emergency agencies by providing them situational awareness with accurate real-time geo-information via the DMS's interactive map that facilitates the sharing of the incidents' location with all relevant and supportive information. Such capability will assist in mapping all the information (spatial and non-spatial) received from the citizens so as to enhance the on-event decision making, improve the future analysis of the government's response to disasters and incidents and support the proper development of a preventive disaster management plans.
6. E-Tax Application: The geo-enabled e-Tax application is an additional application that uses geospatial tools and capabilities to facilitate the citizens' transactions with the government. This application offers a map-based property valuation tool that supports in calculating the property's taxes according to its location and its relevant valuation.
7. Web GI Transit Information System: This is an e-government application that uses the Web GI platform to provide real-time information and reports about the traffic conditions, directions and idle roads, transit options and available routes based on the citizens start and destination trips through an interactive map with querying, searching and navigation capabilities.

8. **Complaints Management System:** The adoption of the GI in this system increased the response efficiency of the local government, like Amsterdam in 2007, to the citizens' complaints within two working days to 80% throughout the possibility of accurately pinpointing the incident or complaint location with all relevant information, facilitating the citizens' process of incident's information and location identification and improving the government employees' operational response process.
9. **Spatial Data Infrastructure Geoportal (Geospatial One Stop) Application:** SDI Geoportal is a web GI application that provides the government agencies, citizens and businesses a direct and easy access to all available GI data in the SDI. The SDI could be at different levels going from the corporate level up to the global level passing by the local and national level. It is a portal that offers a one gateway access to maps, spatial and non-spatial data and services, standardizes the data content & policies and updates procedures across the government's agencies to ensure consistency and facilitate the sharing of data from multiple sources and provide a unified and easy to access repository of data belonging to multiple governmental agencies.
10. **E-Participation Application:** This is a web GI e-government application with an attractive GUI, could be 3D animated or mobile enabled, usually launched by local governments and municipalities to offer the citizens, for example, the ability to visualize the urban planning of any new development, get their feedback and reactions to what is proposed, chat and communicate with local government decision makers and thus improving the citizens' participation in all governments' future policy making and service delivery.
11. **E-Tourism Application:** This is a web GI e-government application for tourists looking for touristic supportive information. It facilitates the tourists' daily activities by offering

advanced querying capabilities like the nearest facilities, search by address, way finding or shortest path, and develop a tour plan with multiple scenarios. In addition, they can print the results on paper or display on mobile if the application is developed on the latest web technologies (html5). Lately, those applications support 3D displaying of the touristic sites in order to give more attractions to tourists as well as increase their familiarity with the sites to be visited. As part of the experience sharing, those applications support the insertion of blogs or reviews on each visited site as a kind of sharing the travellers' experience.

12. E-Elections Management Application: This geospatial based e-government application offers the citizens the capability of registering online for the election as a voter, querying information about the election process or procedure such as the voters' (citizens) location, the polling station, the shortest path to the polling station with directions, location of the voters' assemblies, location of the buses, taxis or any available transportation system with schedules and routes. This is in addition to the population distribution by region and categories, and the candidates along with their distribution by region and categories. Furthermore, the application allows the citizens/voters doing situation analysis to support the voters in their decision-making, generates the query results in map based reports, plots the election's execution progress and results in real time, as it is in progress, on the map with all relevant information by region or by selected area. Furthermore, it displays in real time any incident or event happening during the election execution for citizens' awareness, and provides the citizens with the capability of sharing their observations and opinions about the overall election procedure

and execution directly on the application or through the integration with the social media apps.

13. The GI Based Environmental Management Application: This is a geo-enabled e-government easy to use web application providing the public the capability of accessing, sharing and analysing different shared data types including Geological data, hydro-meteorological data, water/water resources data, nature conservancy data, etc.... It also provides the projects' investors and their environmental experts with the needed data to do the environmental impact assessment (EIA), the government the capability to update continuously its data with automatic public sharing and the citizens the possibility of interacting and participating in the environmental permitting process.

In the Table 2. 4, the impact of the e-services' GI enabling on improving the citizens' adoption of the above government e-services and applications is described according to the authors' highlighted GI impact over a set of e-government citizens' adoption influential factors. Those factors, identified during our research were coded as per Alomari (2010) and Davis (1989):

- Website Design: WEB
- Perceived Ease of Use: PEU
- Perceived Usefulness: PU

Application/ Service	WEB	PEOU	PU	Authors
E-Government Geospatial Web Services		X	X	Bediroğlu (2015), Geymen and Yomralioglu (2008), Kurwakumire (2007), Akinici (2004)
E-Land administration application		X	X	Ashaye (2012), Akingbade (2012), Avgerou (2010), Palmer et al. (2009), AGIS (2009), Yongling and Junsong (2007), Van Der Molen and Tuladhar (2006), Ciborra and Navarra (2005), Enemark et al. (2005), Schennach (2004), Tulloch and Epstein (2002), Tettey, (2000), Gillespie (2000)

Application/ Service	WEB	PEOU	PU	Authors
Web GI parcel application		X	X	Baz et al. (2010)
Web GI Campus Information System	X	X	X	Baz et al. (2010)
Disaster Management System		X	X	Bott & Young (2012), Grant et al. (2012)
E-Tax Application		X	X	Chatfield (2009), Geymen and Yomralioglu (2008)
Web GI Transit Information System		X	X	Ganapati (2010)
Complaints Management System		X	X	Hickel and Blankenbach (2012) , Hassan (2010), Stachowicz 2004
Spatial Data Infrastructure Geoportal (Geospatial One Stop) App.	X	X	X	Sigala (2009), Aditya (2008), Masser et al. (2008), O'Flaherty et al. (2005), Sanz Salinas et al. (2005) FGDC (2004), Annoni et al. (2004), Busby and Kelly (2004), Sivakumar et al. (2004), OGC (2004)
E-Participation application	X	X	X	Ijeh (2014), Moody (2007), Stachowicz (2004), OECD (2001)
E-Tourism Application	X	X	X	Marson et al. (2015), Shah and Wani (2015), Pandagale et al. (2014), Yan and Wang (2012), Singh et al. (2011), Wei (2011), Nair and Katiyar (2011), Balogun et al. (2010), Timčák, et al. (2009), Dye and Shaw (2007), Berger et al. (2007), Ulm, et al. (2005), Baggio and Caporarello (2005), Stachowicz (2004), Feick and Hall (2000)
E-elections Management Application		X	X	Aphane (2015), Gupta et al. (2014), Everton et al. (2013), International IDEA (2013)
The GI based Environmental Management Application		X	X	Protic and Nestorov (2013), ITU (2008), Tuchyna (2006)

Table 2. 4: GI Impact on the E-Government Applications Citizens' Adoption Factors

Based on the Table 2. 4 findings, each of the identified applications highlighted the geographic information impact over the e-government applications/services citizens' adoption factors.

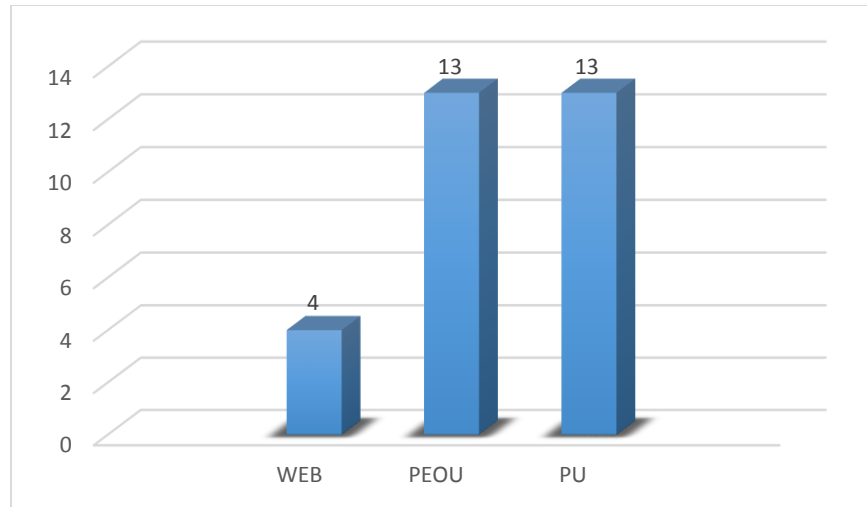


Figure 2.61: GI Impact over E-Government Citizens' Adoption Factors

According to Figure 2.61, we can realize the GI factor positive impact over the perceived ease of use and the perceived usefulness e-government citizens' adoption factors appearing in almost all of the 13 identified applications. The website design factor is slightly affected by the GI adoption by appearing only in 4 applications.

2.8 Conclusion

In this chapter, we did an extensive systematic literature review on (i) e-government with all its aspects, (ii) technology adoption theories and models, (iii) e-government citizens' adoption models and frameworks and (iv) geographic information and its applications on the e-government. We were able to identify a research gap related to the potential existence of GI influence on the citizens' adoption of the e-government services through its impact on other e-government citizens' adoption influential factors like website design, perceived ease of use, perceived usefulness, and the evidence of any published e-government citizens' adoption models considering the GI as an independent factor having an impact on the e-government citizens' adoption and this will be in the focus of our study.

In the following chapter, we will present the research philosophy and methodology that will be followed by research to find reliable and valid answers to the proposed research aim, objectives and questions.



Chapter 3: Research Methodology

The research methodology chapter of this doctoral thesis provides an overview of the researcher philosophy, the research aim, gaps, objectives and questions, the research design and methodology as well as the applied methods that the author will follow in order to execute the data analysis.

3.1 Introduction

This study started with a key question about the geographic information (GI) enrichment of the e-services citizens' adoption mainly the e-government. In the literature review, the author did an extensive literature review that covers the following: (i) the e-government aspects including definitions, dimensions, maturity models, benefits, challenges and barriers, (ii) 13 main adoption theories used widely by researchers like DOI, DRI, UTAUT, TAM, TOE, etc., (iii) 11 main e-government citizens' adoption models for developed and developing countries with majority from the Middle East region, such as Alghamdi, Al Omari, Abu Nadi, Abu Shanab, Harfouche, Akkaya, etc., models, (iv) geographic information (GI) as a substantial factor having big impact on the technology adoption through the GIS and GIScience, (v) and finally the GI adoption in e-government with 13 identified GI based e-government applications that showed how positively the GI factor has a positive impact on some of the e-government citizens' adoption influential factors.

The e-government, as per The World Bank Group (2004) definition, refers to the use of IT by government agencies (such as wide area networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of 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. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions. The Adoption Theory is the theory that seeks to understand, clarify, or foresee how the public and society, either through individuals or organizations or communities, why, and to what level, they will adopt a technology, service or product. According to Rogers (1995) definition, Adoption theory is the fact of the first or minimal level of behavioural utilization of a concept or scheme. Psychologists say that it is all about human thought and behaviour whereas scientists say it is a tested and testable concept explaining an occurrence.

The geographic information, according to Goodchild (1997; 2010), is the location or information linked to a place or property on or near Earth and the knowledge about the location of something and its description at a specific time or time interval. GI was represented historically as the information available or stored on paper maps or analogue format. Nowadays, GI is handled digitally by complex and advanced information systems like E-Land Administration System, E-tourism System, Disaster Management System, etc., to provide the potential users more usability, flexibility and information accuracy. With GI, any object in the globe can be represented as a point, line or polygon and referenced geographically according to a specific reference system, adding the location as a new dimension to this object and to all associated information that varies according to the object type. GI with its relevant tools will play a growing and major role in the society over the time (Goodchild and Palladino, 1995).

According to our study needs, we have selected the TAM (Davis, 1989) model extended by the trustworthiness (trust in government and trust in Internet) to be used as the basis of our conceptual model according to the main criteria which is the maturity of the technology adoption

model and its extensive use by many researchers, over the last two decades for various information systems including e-government for developed and developing countries as per the

Table 3. 1.

#	Author	Year	Country	Category	Model Based
1	Abu Nadi et al.	2008	KSA	Developed	DOI (Rogers 1995) & TAM (Davis 1989)
2	Abu Shanab	2012	Jordan	Developing	Abu Shanab et al. (2010), TAM (Davis 1989) & Trust and Risk Model (Belanger & Carter 2008)
3	Akkaya et al.	2013	Germany	Developed	DOI (Rogers 1995) & Trust and Risk Model (Belanger & Carter 2008)
4	AlHujran et al.	2013	Jordan	Developing	TAM (Davis 1989), Service Quality and Trustworthiness (Paul and John 2003) & User Satisfaction (Wixom and Todd 2005)
5	AlAteyah et al.	2013	KSA	Developed	DOI (Rogers 1995), Trust and Risk Model (Belanger and Carter 2008) & TAM (Davis 1989)
6	AlAwadhi & Morris	2008	Kuwait	Developed	UTAUT (Venkatesh et al. 2003)
7	AlGhamdi & Beloff	2016	KSA	Developed	UTAUT (Venkatesh et al. 2003), DOI (Rogers 1995) & TAM (Davis 1989)
8	Alomari	2014	Jordan	Developing	TAM (Davis 1989) & DOI (Rogers 1995)
9	Al-Shafi & Weerakkody	2009	Qatar	Developed	UTAUT (Venkatesh et al. 2003)
10	Rokhman	2011	Indonesia	Developing	DOI (Rogers 1995) & PCI (Moore and Benbasat 1991)
11	Harfouche	2010	Lebanon	Developing	MATH-model of acceptance of technology in households (Brown and Venkatesh 2005, Venkatesh and Brown 2001) & Two Factors Theory (Cenfetelli 2004)
12	Voutinioti	2013	Greece	Developed	UTAUT (Venkatesh et al. 2003), Trustworthiness (Paul & John 2003) & Internet Experience
13	Bwalya	2017	Zambia	Developing	TAM (Davis 1989), Trustworthiness (Paul & John 2003) and Computer Self-Efficacy
14	Haider et al.	2015	Pakistan	Developing	UTAUT (Venkatesh et al. 2003)
15	Asmi et al.	2017	Pakistan	Developing	TAM (Davis 1989), Trustworthiness (Paul & John 2003) and Social Influence (Venkatesh et al. 2003)

#	Author	Year	Country	Category	Model Based
16	Gupta et al.	2016	India	Developing	UTAUT (Venkatesh et al. 2003), Trustworthiness (Paul & John 2003) & Citizen Satisfaction (Kumar et al. 2007)

Table 3. 1: E-Government Citizen's Adoption Models Summary

This chapter describes the research philosophy, design and methodology of the work undertaken in this study. The research aim, gap, questions and objectives will be described in order to provide better understanding of the study. A descriptive review of the research philosophy adopted in this study, including the ontology and epistemology, will be conducted. Then, a detailed description of the research methodology and design used will be provided including a comparison between quantitative and qualitative methodologies, the research tools and methods, inclusions and exclusions criteria, and the research analytical tools.

3.2 Research Aim, Gap, Objectives and Questions

3.2.1 Research aim

The aim of this research is to investigate the relevant importance of geographic information (GI) as an influential factor enriching the government e-services adoption models by citizens. The GI is defined by Goodchild (1997; 2010) as the location or information linked to a place or property on or near Earth and the knowledge about the location of something and its description at a specific time or time interval. More specifically, this research will examine how GI affects e-government adoption and will develop a new GI-based e-government (GE-government) citizens' adoption framework. According to the literature review, there is no evidence of any published e-government citizens' adoption models considering GI as an independent factor having an impact (direct or indirect) on e-government citizens' adoption. This is the research gap identified through our literature review. The proposed GE-government citizens' adoption framework will

offer the government the necessary guidance in order to increase the inhabitants' adoption of its e-services.

3.2.2 Research gap

The geographic information and mapping services are used nowadays by most of the governments as well as the citizens (Kurwakumire, 2013; O'Looney, 2000; Nedovic-Budic, 1999). Audet and Ludwig (2000) indicate that the GI creates an environment where users can visually discover, investigate, and make decisions about issues in an interactive and challenging manner. Shepherd (2009), Miller (2006), Lynch (2005), Hess et al. (2004), and many other researchers also stated that the geographical thinking or the location concept is currently affecting many of the traditional business subjects, such as accounting, business and management, finance, economics, human resource management, law, marketing, and statistics, in addition to the disaster and emergency management, transportation, election and many others. The aforementioned shows the GI introduction of the "where" dimension in most of the users daily operations including businesses in a very practical way that helps the users, and citizens in general, interact with government easily.

According to our literature review, we could not get an evidence of any published e-government citizens' adoption models considering (i) the GI factor as an independent factor having a direct impact on the citizens' adoption of the e-government Services (ii) and its influence on many other identified factors like website design, perceived ease of use and perceived usefulness.

We have identified many e-services (mainly government e-services) and showed, as per the Table 3. 2, the positive impact of the e-services' GI enabling on improving the citizens' adoption of the identified government e-services according to the highlighted GI positive impact over a set of e-government citizens' adoption influential factors.

Those factors, identified during our research were coded as per Alomari (2010) and Davis (1989):

- Website Design: WEB
- Perceived Ease of Use: PEU
- Perceived Usefulness: PU

Application/ Service	WEB	PEOU	PU	Authors
E-Government Geospatial Web Services		X	X	Bediroğlu (2015), Geymen and Yomralioglu (2008), Kurwakumire (2007), Akinci (2004)
E-Land administration application		X	X	Ashaye (2012), Akingbade (2012), Avgerou (2010), Palmer et al. (2009), AGIS (2009), Yongling and Junsong (2007), Van Der Molen and Tuladhar (2006), Ciborra and Navarra (2005), Enemark et al. (2005), Schennach (2004), Tulloch and Epstein (2002), Tettey, (2000), Gillespie (2000)
Web GI parcel application		X	X	Baz et al. (2010)
Web GI Campus Information System	X	X	X	Baz et al. (2010)
Disaster Management System		X	X	Bott and Young (2012), Grant et al. (2012)
E-Tax Application		X	X	Chatfield (2009), Geymen and Yomralioglu (2008)
Web GI Transit Information System		X	X	Ganapati (2010)
Complaints Management System		X	X	Hickel and Blankenbach (2012) , Hassan (2010), Stachowicz 2004
Spatial Data Infrastructure Geoportal (Geospatial One Stop) Application	X	X	X	Sigala (2009), Aditya (2008), Masser et al. (2008), O'Flaherty et al. (2005), Sanz Salinas et al. (2005) FGDC (2004), Annoni et al. (2004), Busby and Kelly (2004), Sivakumar et al. (2004), OGC (2004)
E-Participation application	X	X	X	Ijeh (2014), Moody (2007), Stachowicz (2004), OECD (2001)

Application/ Service	WEB	PEOU	PU	Authors
E-Tourism Application	X	X	X	Marson et al. (2015), Shah and Wani (2015), Pandagale et al. (2014), Yan and Wang (2012), Singh et al. (2011), Wei (2011), Nair and Katiyar (2011), Balogun et al. (2010), Timčák, et al. (2009), Dye and Shaw (2007), Berger et al. (2007), Ulm, et al. (2005), Baggio and Caporarello (2005), Stachowicz (2004), Feick and Hall (2000)
E-elections Management Application		X	X	Aphane (2015), Gupta et al. (2014), Everton et al. (2013), International IDEA (2013)
The GI based Environmental Management Application		X	X	Protic and Nestorov (2013), ITU (2008), Tuchyna (2006)

Table 3. 2: GI Impact on the E-Government Applications Citizens' Adoption Factors

Accordingly, the GI factor, considered as an essential e-government citizens' adoption factor, has been identified and an important gap has been recognized. Thus, there is a need to develop and test a new framework that assesses the role of the GI factor in the e-government citizens' adoption. This framework, as stated previously, will be developed, based on the Technology Adoption Model (Davis 1985) factors identified in the literature review in addition to the new defined geographic information (GI) factor. This framework summarizes the literature review's findings about the existing factors influencing the e-government citizens' adoption as well as the potential influence of the GI factor on the e-government citizens' adoption directly or through some of the existing e-government citizens' adoption influential factors. The proposed conceptual framework will be used as the basis that supports the author in the assessment of the significance of the factors' impact on the citizens' technology adoption and the identification of the GI factor's role in enhancing the e-government adoption. Therefore, those factors will be described in order to justify their selection and, along with each factor, a hypothesis will be developed then tested during the empirical research. Finally, mapping all those factors, the

conceptual framework will be considered as the beginning of the empirical research which will include the research data collection and data analysis.

3.2.3 Research objectives

The below points represent the main research objectives:

1. To identify the factors influencing the e-government citizens' adoption.
2. To address the potential role of GI, as an influential factor, in the adoption of e-government services and validate the identified gap.
3. To explore all the GI related components that reflect the GI influence on the e-government services adoption.
4. To develop, test, validate and finalize the GI-based e-government (GE-government) citizens' adoption framework.
5. To study the GI direct impact on the e-government citizens' adoption.
6. To study the GI direct impact on some of the identified e-government citizens' adoption influential factors.

Upon achieving these objectives, a new independent influential factor on the e-government citizens' adoption will be introduced, a new GI based e-government citizens' adoption framework will be offered and a thorough study on the GI influential role in improving the E-government citizens' adoption will be reported. This study will definitely assess the impact of other influential factors, such as the perceived ease of use and perceived usefulness defined by Davis (1985), but will focus also on studying the GI impact on these influential factors and how it would affect the overall e-government adoption process.

3.2.4 Research questions

As the aim of this research is to confirm the importance of considering the GI as a key factor enhancing the e-government citizens' adoption process and thus the need to develop a GI based e-government (GE-government) citizen adoption framework, the below research questions were developed in order to reach our goal:

- RQ1: What are the factors influencing the e-government citizens' adoption?
- RQ2: What is the impact of the geographic information (GI) and the other identified influential factors on the adoption of the e-government services?
- RQ3: What influential role has the geographic information (GI) in the e-government citizens' adoption (EGCA) influential factors?

3.3 Research Philosophy

3.3.1 Definition

In order to achieve our research objectives and find responses to our research questions, we need to choose the appropriate research approach that is in line with the author's view on reality. The research approach should be based on a specific research philosophy that is described by its four components as: ontology, epistemology, methodology and analysis. Hereunder, a definition of each of the research philosophy components:

- Ontology: defined as "The Science or Study of Being" (Blaikie, 1993) where the researcher could be subjective or objective according to his view on reality.
- Epistemology: defined as "The philosophy of knowledge" (Kurtus, 2002) where its outcomes flow from the researcher ontological position. It reflects the researchers' opinions about the right ways of exploring the world's nature (Easterby-Smith et al.,

2008) and defines the knowledge along with its sources and limitations (Eriksson and Kovalainen, 2008)

- **Methodology:** defined as the research approach, methods and techniques where it describes (i) the enquiry strategies, (ii) the relevant procedures and practices for data collection and (iii) the overall research design in order to acquire the needed knowledge (Myers, 2009). It is totally associated with the chosen ontology and epistemology.
- **Analysis:** defined as the detailed process of analysing collected data and the tools and techniques used for interpreting the data analysis outcomes (Tukey, 1961).

3.3.2 Research Philosophy selection

Galliers (1994) highlighted the process complexity selecting a suitable philosophy for an IS research. In addition, Straub et al. (2005), Irani et al. (1999), Orlikowski and Baroudi (1991) and Chua (1986) stated that IS has multiple perspectives. Having a well-defined perspective, the researcher can select the suitable research philosophy from various existing ones, mainly from the following research epistemologies: positivism, interpretive and critical.

Furthermore, many researchers, like Adam (2014), Yin (2009), Straub et al. (2004), Goles and Hirschheim (2000), Galliers (1992), Orlikowski and Baroudi (1991) and many others, cited that most of the previous IS research applied the positivism, considered as best suitable epistemology for IS research especially when there is a well-defined model or framework with well identified, independent and measureable variables, and multiple hypotheses that require quantitative testing (Cryer, 2006).

In the Table 3. 3, we summarized the three main research paradigms used in the IS research.

Research Paradigm (Ontology/Epistemology)	Description	Authors
Positivist/Positivism	<p>Used by IS researchers when there is indication of:</p> <ul style="list-style-type: none"> • Formal propositions • Quantitative measurable variables • Hypothesis testing • Representation of phenomenon's explanations through quantified population's samples <p>The researcher is independent from the phenomena based on a belief of reality in an objective world.</p> <p>The world is seen as an existing reality guided by natural and universal laws and principles in the form of cause and effect.</p> <p>Knowledge is gained in a deductive manner where the researcher, in order to understand the research phenomena, relies on existing knowledge and uses the needed theories and tools to build up the correct model, test its hypothesis and measure its variables quantitatively.</p> <p>The researcher works deductively to determine independent and causal relationships, used as the basis for generalisation that leads to expectation, justification and understanding.</p>	<p>Straub et al. (2005; 2004), Orlikowski and Baroudi (1991)</p> <p>Holsapple and Joshi (2004), Chua (1986)</p> <p>Guo and Sheffield (2006), Guba and Lincoln (1994)</p> <p>Wong (2011), Ghazali et al. (2011)</p> <p>Creswell (2013), EasterbySmith (2012), Thorpe et al. (2012), Khin (2011), Ying et al. (2011), Collis and Hussey (2009), Remenyi (1998)</p>
Interpretivist/Interpretivism	Used to support IS researchers to comprehend the human behaviour socially and organizationally.	Adam (2014), Walsham (1995),

Research Paradigm (Ontology/Epistemology)	Description	Authors
	<p>The reality for researchers is seen as human construction built subjectively based on the researcher's interaction with the research phenomena.</p> <p>The researcher tries to comprehend the research phenomena by interpreting and analysing the meanings, descriptions and viewpoints that people express to them.</p> <p>The world is seen as "an emergent social process" dependent on our subjective experience.</p> <p>Knowledge is obtained inductively through the subjective human and social understanding of the reality or the research phenomena</p>	<p>Adam (2014), Guba and Lincoln (1994)</p> <p>Myers (1997), Walsham (1995), Orlikowski and Baroudi (1991)</p> <p>Burrell and Morgan (1994), Burrell and Morgan (1979)</p> <p>Walsham (1995)</p>
Critical Realism	<p>Developed originally for organizational and social research to enhance the human conditions, critical paradigms are also applicable for information system research.</p> <p>Critical realism, the main critical paradigm, describes the reality as it is knowable, but there are structures and mechanisms that are not distinguished.</p> <p>The reality for researchers is seen as independent of the human knowledge and does not depend on pure objective or subjective beliefs.</p> <p>Knowledge is gained through transitive and intransitive dimensions. The intransitive represents the researcher's explanation of the world independently of his experiences or senses while the transitive represents the</p>	<p>Hirschheim and Klein (1989)</p> <p>Bhaskar (1998)</p> <p>Wynn and Williams (2012), Bhaskar (2008), Danermark (2002), Sayer (2000), Archer and Bhaskar (1998)</p> <p>Wynn and Williams (2012), Healy and Perry (2000), Collier (1994), Bhaskar</p>

Research Paradigm (Ontology/Epistemology)	Description	Authors
	theories and interpretations of the independent world extracted from scientific investigation. Therefore, the independent reality is created according to the intransitive knowledge which is inherited from the transitive knowledge combined with existing social interactions and beliefs.	(1975)

Table 3. 3: Summary of the Main Adopted IS Research Paradigms

Based on the aforementioned, the positivist research paradigm will be adopted in this study considered as an IS related research. The author's choice is justified by the study's need to develop from (i) existing technology adoption models and theories, (ii) existing research studies relevant to those models and (iii) an identified gap according to the conducted literature review, a new conceptual e-government (categorized under information system) citizens' adoption framework that is (a) fully developed based on TAM (Davis, 1989) model using the same defined, independent and measurable factors/variables, (b) amended by adding existing independent and measurable influential e-government citizens' adoption factors/variables in addition to the new defined GI factor (c) to be tested through a citizens' survey to assess and analyse the citizens' adoption of the e-government services. The advantage of this paradigm is its objectivity where (i) the author should be independent, (ii) the world for him is real, external, and an ordered & structured place governed by physical laws and thus can be "modelled for the learner" (Changingminds.org, 2015; Jonassen, 1991) and (iii) the author should believe in facts, theories and figures deducted from previous research and studies about e-government citizens' adoption as the majority relied on the quantitative structured questionnaire survey as an essential primary data research collection tool.

3.4 Research Design and Methodology

The purpose of this research is to test the impact of the GI factor on the e-government in order to enhance the citizens' adoption of the e-services. We will focus on testing the impact of the GI on factors like website design, perceived usefulness and perceived ease of use considered as some of the key factors influencing the e-government citizens' adoption. As evolved from the literature review, there is a need to develop a new GI based e-government adoption framework, based on the TAM (Davis, 1989) model, to be tested and validated in a developing country, Lebanon as a case study.

3.4.1 Research Type

This study investigates the impact of the GI on the e-government citizens' adoption as well as its effect on the influential factors already existing and identified in the literature review. This research should belong to one of the below three types of research:

- Exploratory: Gathers preliminary information that will help define the problem and suggest hypotheses.
- Descriptive: Describes such things as market potential for a product or attitudes and demographics of consumers who buy the product.
- Causal: Test hypotheses about cause- and-effect relationships.

Sekaran (2003) stated that, when we can identify and describe the characteristics or actions of a population, the research is considered as descriptive. Malhotra and Birks (2000) considered that descriptive research is a conclusive research, having the needed information as clear and defined, a formal and structured research process, large and representative sampling and quantitative data analysis.

Accordingly, this research will follow the descriptive type, as it studies the citizens' behaviour on the e-government adoption and the impact of the GI & the existing influential factors on the citizens' adoption decision making, following a pre-planned and structured design.

3.4.2 Research Approach

According to Saunders et al. (2003), the selection of the right research approach is very essential in the design of the research process. Two kinds of research approach are available: deductive and inductive. The inductive collects data first and then develops the theory as a result of the data analysis. The deductive develops the theory first then puts the research strategy to test the theory.

In this research, the author applies both research approaches:

- The inductive research approach used only to gain the qualitative understanding of the influencing factors needed for developing and verifying the survey questionnaire with local culture in mind.
- The deductive research approach used extensively, based on a deep literature review, in order to (i) identify a clear gap, which the non-consideration of the GI as an independent factor in any exiting e-government citizens' adoption model as an influential factor, (ii) propose a new theory, which is the GI factor improving the e-government citizens' adoption process, and (iii) develop a new framework based on the existing mature technology adoption model (TAM) and the identified influential e-government citizens' adoption factors, to be tested afterward based on a well-defined research methodology and methods.

3.4.3 Research Methodology

3.4.3.1 Introduction

The research methodology represents the research approach, methods and techniques. As it should be totally associated with the Positivist research paradigm of our study, the appropriate research methodology should provide the required methods and tools in order (i) to support the author in reaching the research objectives and (ii) respond to the defined research questions.

The Table 3. 4 identifies the suitable research methodologies/methods associated to each research question and objective.

#	Research Questions	Research Objectives	Research Methodology/ Method
1	RQ1: What are the factors influencing the e-government citizens' adoption?	RO1: To identify the factors influencing the E-government Citizens' adoption.	Secondary Data Research – Systematic Literature Review
		RO2: To address the potential role of GI, as an influential factor, over the adoption of E-government services and validate the identified gap.	Secondary Data Research – Systematic Literature Review
		RO3: To explore all the GI related components that reflect on the GI influence over the E-government services adoption.	Secondary Data Research – Systematic Literature Review

#	Research Questions	Research Objectives	Research Methodology/ Method
2	RQ2: What is the impact of the geographic information (GI) and the other identified influential factors on the adoption of the e-government services?	RO4: To develop, test, validate and finalize the GI-based e-government (GE-government) citizens' adoption framework.	Quantitative Primary Data Research – Structured Questionnaire Survey Data Analysis Method –
		RO5: To study the GI direct impact over the e-government citizens' adoption.	Descriptive Statistics, Exploratory Factor Analysis, Binary Logistic Regression Modelling and Pearson Chi-square
3	RQ3: What influential role has the geographic information (GI) factor over the E-government Citizens' adoption (EGCA) influential factors?	RO6: To study the GI direct impact over some of the identified e-government citizens' adoption influential factors.	Quantitative Primary Data Research – Structured Questionnaire Survey Data Analysis Method – Descriptive Statistics and Pearson Chi-square

Table 3. 4: Mapping Questions & Objectives to Methodologies/Methods

3.4.3.2 Secondary Data Research – literature review

In order to cover all the study research objectives, a thorough and systematic literature review was conducted using a secondary data research in order to guarantee an up to date literature review. The Literature review method supported the author in identifying the research gap,

identifying the e-government citizens' adoption influential factors, defining the GI factor and its components, and identifying the GI role in influencing the e-government citizens' adoption. The literature review was (i) planned according to a well-defined structure in order to cover the research perspectives successfully (ii) conducted according to the developed plan and (iii) finally reported and published. The secondary research method is a desk research covering data from already existing information that includes raw data and published documents easily accessible to the public. To accomplish properly this secondary research, all needed and relevant data and publications were identified based on a well-defined methodology.

First, the keywords to be used in the literature review were defined; these include the most relevant ones like e-government, digital government, e-governance, eservices, e-government challenges, e-government benefits, information system, MIS, geographic information, geospatial technology, GI science, GIS, technology adoption, adoption theories, innovation theories, technology adoption, citizens adoption, GIS adoption,... thus, at the end of stage 1, a list of keywords should be developed and updated with time and through the progressively advancement of literature review.

In stage 2, the author performed a keyword search on (i) the top ranked IS Journals (ranking based on the AIS basket of 8 and Harzing list of journals), (ii) the international press offices and international publishers, (iii) the international conferences, (iv) the reports and (v) the relevant databases in order to find and select the articles, proceedings and books related to the keywords identified previously and relevant to the study topics as well as the selection criterion (Webster and Watson, 2002).

The

Item	Example
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Item	Example
Keywords	e-government, digital government, e-governance, e-services, e-government challenges, e-government benefits, information system, MIS, geographic information, geospatial technology, gi science, gis, technology adoption, adoption theories, innovation theories, technology adoption, citizens adoption, GIS adoption, etc...
Key Journals	Association for Information Systems Research, Communications of the Association for Information Systems, Government Information Quarterly, Communications of the ACM, Academy of Management Review, American Review for Public Administration, Harvard Business Review, Information Systems Journal, MIS Quarterly, Journal of American Academy of Business, The Journal of Systems and Software , ESRI, etc...
International Press Offices and Publishers	New York Academic Press, Dorsey Press, MIT Press, Oxford University Press, ESRI Press, Wiley Publisher, Prentice Hall Publisher etc...
Key Conferences	European Conference on Information System (ECIS), EuroMed Research Business Institute (EMRBI), Americas Conference on Information Systems (ACIS), In Management of e-Commerce and e-Government (ICMeCG), European Conference on E-government (ECEG), European and Mediterranean Conference on Information Systems (EMCIS), International Information Technology, Politics and Information systems: Technologies and Applications, Hawaii International Conference on System Science, European Conference on E-Government, etc...
Databases	AIS electronic Library (AISEL), Emerald 150, Emerald Management 200, IEEE, Oxford, SAGE Premier, ProQuest, Hoover's, ABI/INFORM, etc...
Reports	United Nations, UNDP, UNASPA, Commission of the European Committee, World Bank, Accenture, Deloitte, IBM, The economist, Esri, etc...

Table 3. 5 summarizes the research keywords and the research secondary data sources.

Item	Example
Keywords	e-government, digital government, e-governance, e-services, e-government challenges, e-government benefits, information system, MIS, geographic information, geospatial technology, gi science, gis, technology adoption, adoption theories, innovation theories, technology adoption, citizens adoption, GIS adoption, etc...
Key Journals	Association for Information Systems Research, Communications of the Association for Information Systems, Government Information Quarterly, Communications of the ACM, Academy of Management Review, American Review for Public Administration, Harvard Business Review, Information Systems Journal, MIS Quarterly, Journal of American Academy of Business, The Journal of Systems and Software , ESRI, etc...

Item	Example
International Press Offices and Publishers	New York Academic Press, Dorsey Press, MIT Press, Oxford University Press, ESRI Press, Wiley Publisher, Prentice Hall Publisher etc...
Key Conferences	European Conference on Information System (ECIS), EuroMed Research Business Institute (EMRBI), Americas Conference on Information Systems (ACIS), In Management of e-Commerce and e-Government (ICMeCG), European Conference on E-government (ECEG), European and Mediterranean Conference on Information Systems (EMCIS), International Information Technology, Politics and Information systems: Technologies and Applications, Hawaii International Conference on System Science, European Conference on E-Government, etc...
Databases	AIS electronic Library (AISEL), Emerald 150, Emerald Management 200, IEEE, Oxford, SAGE Premier, ProQuest, Hoover's, ABI/INFORM, etc...
Reports	United Nations, UNDP, UNASPA, Commission of the European Committee, World Bank, Accenture, Deloitte, IBM, The economist, Esri, etc...

Table 3. 5: research keywords and the research secondary data sources

The research focused mainly on the recent publications in addition to some old publications related essentially to the old theories such as adoption, technology, geography, etc... theories and in particular the ones written in English, since most of the e-government, adoption and GI references are published in English as a common international language. The review selection criteria was based on the researchers' references and citations on e-government & GIS adoption where we emphasized the ones which highlight the e-government adoption and implementation's best practices, after the huge improvement in Information Technology in the 21st Century, mainly in the U.S., Europe, the Middle East and the developing countries (Frank, 2004; Siau and Tian, 2004; Davidrajuh, 2003; Siau, 1995). That selection criteria did not bound our research where in various cases the author referred either to some old or to non-english written publications.

A forward search was executed to explore additional sources and publications that have cited the articles selected from the keywords. A backward search was simultaneously executed (Webster

and Watson, 2002) in an iterative mode. This iterative mode was performed on all articles extracted from the previous iterations and inserted in a database. At the end of stage 2, a full database was developed including all search findings during the full thesis period.

The proposed database is simply a research publications' database that summarizes the literature review findings and includes all the selected and reviewed articles, books, proceedings, etc.....

The diagram shown in Figure 3.1 summarizes the literature review methodology.

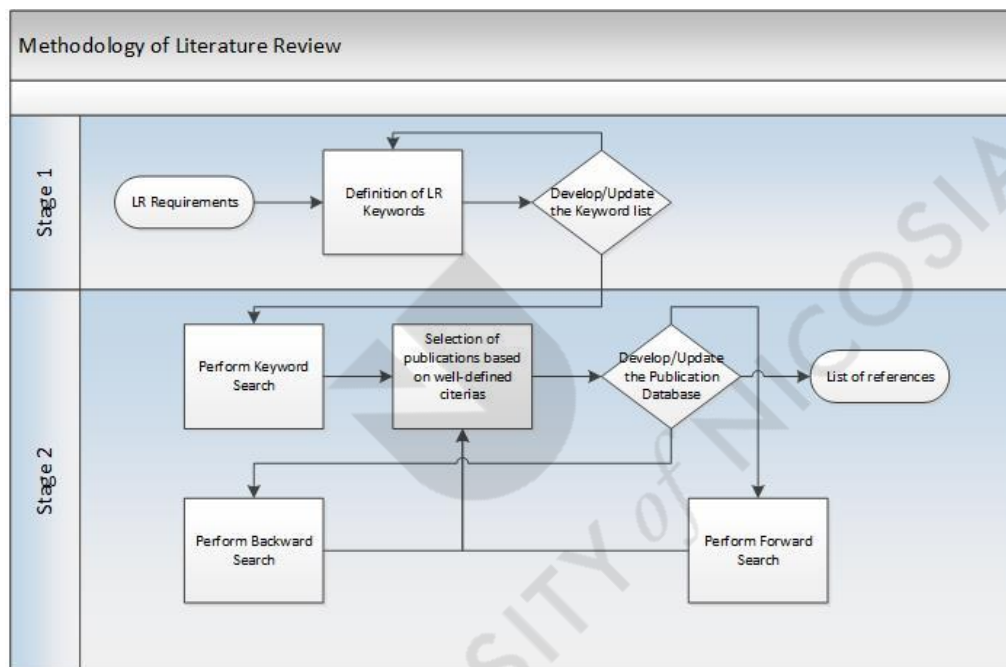


Figure 3.1: Literature Review Methodology

3.4.3.3 Primary Data Research

After the secondary data research – systematic literature review– we have identified and justified a main gap, the non-existence of an E-government citizens' adoption model considering the geographic information as an independent factor having a direct and indirect impact on the adoption of the e-government services, especially when realizing, in the literature review and according to Table 3. 2, that many of the e-government applications and e-services use the geospatial and the mapping services to enhance the services provided to citizens. As a result of

the literature review, a GI enabled e-government citizens' adoption conceptual framework will be developed and tested, taking Lebanon as a case study. It will also be justified having a main target to show the positive impact of the GI on the citizens' adoption of the e-government in general and existing factors like website design, perceived ease of use and perceived usefulness, in particular.

The primary data research can be done according to quantitative or qualitative research method in the positivist research paradigm. The Figure 3.2 shows the three research paradigms and their relevant primary data research methods (Straub et al., 2005).

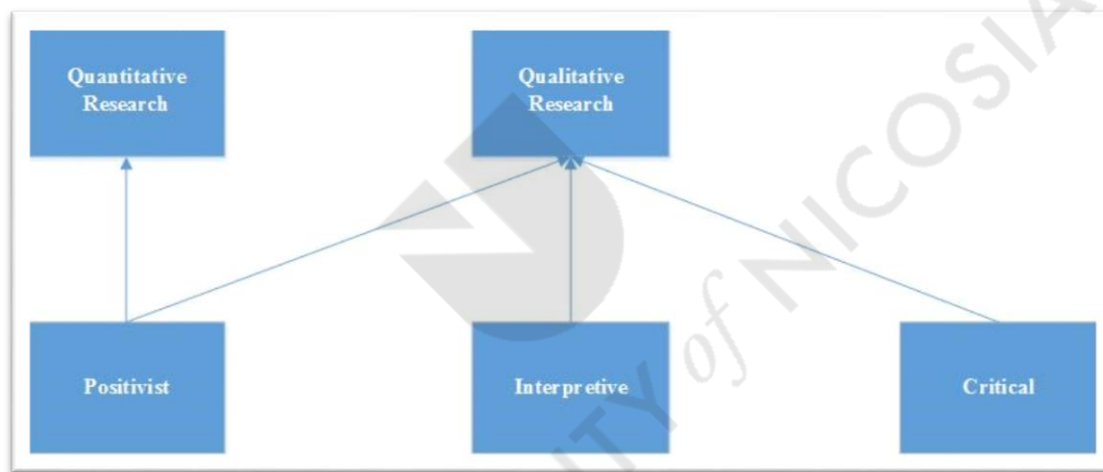


Figure 3.2: Research Paradigms and Primary Data Research Methods (Adapted from Straub et al., 2005)

Accordingly, we need to select the suitable research method in order to test and justify properly the proposed framework and get the correct outcomes. According to Brynard and Hanekom (1997), the quantitative method is very useful when there is a need to allocate figures to observation or to generalize a theory in the research. In contrast, Myers (1997) recommended the qualitative method as he considered it as more effective since a social phenomenon can be understood and explained successfully by using interviews and observations.

The

Quantitative research Method	Qualitative research Method	Authors
Data are expressed in numbers.	Information is expressed in words and/or images (semiotics) that relate to feelings, processes, actions and meanings.	Godfrey and Callagan (2003)
Concepts need to be defined in terms that are measurable.	Focus is on how people understand and interpret their social worlds.	Godfrey and Callagan (2003)
Data are collected in a way that can be generalized to a wider population.	Data collection process is a social interaction involving the researcher and the participants.	Godfrey and Callagan (2003)
Data must be valid, reliable and independent of the research setting and process.	Researcher's interpersonal skills are crucial to the understanding of the information.	Godfrey and Callagan (2003)
Study return statistical and numerical data.	Study return observations and documents.	Al-Shafi and Weerakkody (2009), Neuman (2000), Creswell (1994), Guba and Lincoln (1988)
Formal Language.	Informal Language.	Neuman (2000), Creswell (1994), Guba and Lincoln (1988)
Researcher independent from the research study.	Research is dependent on the researcher's interaction and interpretation.	Neuman (2000), Creswell (1994), Guba and Lincoln (1988)

Generalization leads to prediction, explanation, and understanding.	Researcher's understanding leads to patterns and theories.	Neuman (2000), Creswell (1994), Guba and Lincoln (1988)
Data analysis takes the form of statistics, charts, tables and their correlation to the research hypothesis.	Generalisation will be extracted from the research findings that will be organized to create a solid and reliable picture.	Neuman (2000), Creswell (1994), Guba and Lincoln (1988)

Table 3. 6 compares the features of quantitative and qualitative research methods according to Godfrey and Callagan (2003) table structure.

Quantitative research Method	Qualitative research Method	Authors
Data are expressed in numbers.	Information is expressed in words and/or images (semiotics) that relate to feelings, processes, actions and meanings.	Godfrey and Callagan (2003)
Concepts need to be defined in terms that are measurable.	Focus is on how people understand and interpret their social worlds.	Godfrey and Callagan (2003)
Data are collected in a way that can be generalized to a wider population.	Data collection process is a social interaction involving the researcher and the participants.	Godfrey and Callagan (2003)
Data must be valid, reliable and independent of the research setting and process.	Researcher's interpersonal skills are crucial to the understanding of the information.	Godfrey and Callagan (2003)
Study return statistical and numerical data.	Study return observations and documents.	Al-Shafi and Weerakkody (2009), Neuman (2000),

		Creswell (1994), Guba and Lincoln (1988)
Formal Language.	Informal Language.	Neuman (2000), Creswell (1994), Guba and Lincoln (1988)
Researcher independent from the research study.	Research is dependent on the researcher's interaction and interpretation.	Neuman (2000), Creswell (1994), Guba and Lincoln (1988)
Generalization leads to prediction, explanation, and understanding.	Researcher's understanding leads to patterns and theories.	Neuman (2000), Creswell (1994), Guba and Lincoln (1988)
Data analysis takes the form of statistics, charts, tables and their correlation to the research hypothesis.	Generalisation will be extracted from the research findings that will be organized to create a solid and reliable picture.	Neuman (2000), Creswell (1994), Guba and Lincoln (1988)

Table 3. 6: Comparison between Quantitative and Qualitative Methodologies

The Table 3. 7 shows the comparison between the two research methodologies based on the strength and weakness points identified by Bernard (2000).

Research Method	Strength	Weakness
Quantitative	<ul style="list-style-type: none"> Classify and count features, construct complex statistical forms in order to provide explanations to observations and findings. 	<ul style="list-style-type: none"> Lacks the rich details compared to the qualitative analysis that is not limited to numerical form of data. Implementation is time consuming, complex and

	<ul style="list-style-type: none"> • Generalize the outcomes to wider population. • Facilitate the analysis of researchers who are dealing with numerical form of data. • Offers high accuracy in statistics. • Measures and analyzes the dispersion. • Provides graphical presentation of the analysis and outcomes. 	<p>expensive.</p> <ul style="list-style-type: none"> • Has Low response rates. • Requires automated analysis.
Qualitative	<ul style="list-style-type: none"> • Provides detailed description. • Provides faster quantitative methods. • Provides more insights into the human experience and behavior. • Is cheaper if compared to quantitative methods. • Captures the vagueness in the human language during the analysis. 	<ul style="list-style-type: none"> • Is difficult to study. • Requires advanced interpretation skills. • Has high probability of bias. • Does not provide definite and specific conclusions. • Lacks comparison facilities. • Offers low accuracy in statistics.

Table 3. 7: Research Methodology Strength & Weakness

The Table 3. 8 shows a comparison between the 16 E-government citizens' adoption models identified in the research literature review.

#	Author	Year	Country	Category	Research Methodology	Testing tools	Questionnaire Scale	Sampling Size
1	Abu Nadi et al.	2008	KSA	Developed	Quantitative primary research methodology – Questionnaire Survey method	Normalized Frequency Distribution Method	Binary and Four values	316
2	Abu Shanab	2012	Jordan	Developing	Quantitative primary research methodology – Questionnaire Survey method	PCA with Varimax rotation technique, Cronbach alpha > 0.5, Significance at level 0.01	NA	259
3	Akkaya et al.	2013	Germany	Developed	Quantitative primary research methodology – Questionnaire Survey method	T test, Confidence level 95%; Harman's single-factor test for BIAS; PCA; second generation multivariate analysis technique Structural Equation Modeling (SEM); confirmatory factor analysis (CFA);	Likert scale 7 points	1000
4	AlHujran et al.	2013	Jordan	Developing	Quantitative primary research methodology – Questionnaire Survey method	Cronbach's alpha 0.6; reliability function in SPSS 17; Single and Multiple Linear regression	Likert scale 5 points	356
5	AlAteyah et al.	2013	KSA	Developed	Qualitative research methodology – Interview & Quantitative primary research methodology – Questionnaire Survey method	Cronbach's alpha 0.6; reliability function in SPSS 17; T-test	Likert scale 5 points	NA
6	AlAwadhi and Morris	2008	Kuwait	Developed	Quantitative primary research methodology – Questionnaire Survey method	Cronbach's alpha 0.7 to test reliability of the scale construct; Logistic Regression analysis	Likert scale 7 points	880
7	AlGhamdi and Beloff	2016	KSA	Developed	Quantitative primary research methodology – Questionnaire Survey method	Descriptive Analysis, Cronbach's alpha 0.5 to test reliability of the scale construct; Logistic Regression analysis	Likert scale 5 points	53
8	Alomari	2014	Jordan	Developing	Quantitative primary research methodology – Questionnaire Survey method	Exploratory Factor Analysis; Cronbach alpha > 0.5	Likert scale 5 points	356
9	Al-Shafi and Weerakkodiy	2009	Qatar	Developed	Quantitative primary research methodology – Questionnaire Survey method	PCA with Varimax rotation technique, Cronbach alpha > 0.5, Significance at level 0.01; Logistic Regression Modeling	Likert scale 5 points	1179

#	Author	Year	Country	Category	Research Methodology	Testing tools	Questionnaire Scale	Sampling Size
10	Rokhman	2011	Indonesia	Developing	Quantitative primary research methodology – Questionnaire Survey method	Structural Equation Modeling (SEM), Partial Least Squares (PLS) techniques to check the relation between independent and dependent variables, SmartPLS (Chin and Frye 1996) for data analysis and the bootstrap resampling method for significance determination	Likert scale 7 points	210
11	Harfouche	2010	Lebanon	Developing	Qualitative research methodology – Interview & Quantitative primary research methodology – Questionnaire Survey method	binary logistic regression model; Cronbach's Alpha score of more than 0.6; Chi-Square test	Likert scale 5 points	751
12	Voutinioti	2013	Greece	Developed	Quantitative primary research methodology – Questionnaire Survey method	Structural Equation Modeling using Smart-PLS tool	Likert scale 5 points	224
13	Bwalya	2017	Zambia	Developing	Quantitative and Qualitative primary research methodology – Questionnaire Survey method (Closed and Open ended questions)	Multiple Regression, Exploratory Factor Analysis (EFA) – Principal Component Axis Factoring (PCA) with Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and ANOVA; Cronbach alpha > 0.5	NA	408
14	Haider et al.	2015	Pakistan	Developing	Quantitative primary research methodology – Questionnaire Survey method	Structural Equation Modeling using Smart-PLS tool; Cronbach alpha > 0.5	NA	200
15	Asmi et al.	2017	Pakistan	Developing	Quantitative primary research methodology – Questionnaire Survey method	Exploratory Factor Analysis (EFA) – Principal Component Axis Factoring (PCA) with Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Structural Equation Modelling (SEM); Cronbach alpha > 0.7	Likert scale 5 points	153

#	Author	Year	Country	Category	Research Methodology	Testing tools	Questionnaire Scale	Sampling Size
16	Gupta et al.	2016	India	Developing	Quantitative primary research methodology – Questionnaire Survey method	Exploratory Factor Analysis (EFA) – Principal Component Axis Factoring (PCA) with Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy; Cronbach alpha > 0.5	Likert scale 5 points	392

Table 3. 8: Research Methodology adopted in previous E-government models test

According to Table 3. 8, Thirteen (13) E-government citizens' adoption models were tested based on quantitative research method with the latest one in 2017 and only Three (3) were tested using the mixed research method (quantitative and qualitative). The three models were testing e-government implementation in public sector and the e-government citizens' adoption. Therefore, there was a need to use the qualitative research method to test the e-government implementation and the quantitative research method to test the citizens' adoption. We can conclude that 16 models used the quantitative research method to test the e-government citizens' adoption.

In this study, we will follow the quantitative research method with an initial qualitative research method, through interviews, applied only to get experts' supportive feedback, verify and enhance the developed survey's questionnaire to ensure validity and accuracy. The main target of this research is to study the behaviour change in the citizens' adoption of the e-government services when the geographic information factor is introduced. The quantitative research method will mainly support the author in examining the e-government citizens' adoption influential factors as well as the GI role in influencing the e-government citizens' adoption and this definitely requires a data and information collection from a large citizens' sampling in order to generalize the outcomes and results. A conceptual framework will be developed based on TAM (Davis, 1989) as the literature review identified influential e-government citizens' adoption factors in addition to a list of hypotheses that will be created for testing and interpretation. Hence, we need (i) to

select a large and representative sample of the targeted population (citizens) for generalization purposes, (ii) get their response on the formal close-ended addressed questions already deducted in majority from previous researchers' questions, (iii) analyse the collected feedback and (iv) interpret the final results that should highlight the accepted and rejected proposed hypotheses. Therefore, this study (a) relies on a large collected data that is heavily expressed in numerical forms and (b) requires complex statistical analysis to study, in the proposed conceptual framework, each measurable variable or factor influence on the citizens including the GI factor as well as the correlation between those factors. As a result, the study outcomes can be generalized to a wider population where we will follow similar primary data research process, as the one adopted by Alomari (2014), Alsahfi and Weerakkody (2009), etc., where they have introduced their e-government citizens' adoption models for testing and interpretation.

Data Collection

In this research, we will proceed with the quantitative research method with a need to collect data and information from a large sample. Accordingly, we have two types of quantitative research methods: Questionnaire survey and observations.

The questionnaire survey method begins with the theoretical assumptions where the aim could be to test a theory or to construct it and help the researcher identify relationships that could be causal or strength of association in order to check the proposed hypotheses (confirmation or rejection) and test the conceptual framework patterns.

The observation method involves the opinion of particular individuals or groups, whether they are staff, consumers, or potential consumers etc. The purpose is to understand some aspects of their behaviour that will provide an insight into the problem that has been identified by the research plan.

Dwivedi and Irani (2009), Irani et al. (2009), Dwidevi et al. (2006) and many other researchers highlighted that the questionnaire survey method is widely used for investigating the technology adoption. In addition, Alomari (2014), Alshafi and Weerakkody (2009), Fowler (2008) and Mingers (2003) have adopted the questionnaire survey method for IS research. Furthermore, the Table 3. 8 shows an extensive use of the questionnaire survey method to test and analyse the e-government citizens' adoption with the existence of a pilot test phase for questionnaire validation.

Our research has begun with a theoretical assumption, "the GI positive impact on the e-government citizens' adoption", with an aim (i) to test and confirm the applicability of this theory through the new conceptual framework testing, (ii) to help the researcher in identifying the existing relationships between the existing influential factors and the new GI factor, that could be causal or strength of association, (iii) and to get answers to the proposed research questions and the research proposed hypothesis (confirmation or rejection) in order to generalize the conceptual framework. Thus, the author will adopt the questionnaire survey method, as it responds to the research requirements and needs, starting from the pilot test phase of the questionnaire survey in order to test the clarity of the proposed survey questions, improve it where needed and finally ensure the respondents' comprehension of the addressed questions.

Questionnaire Development

The purpose of the adoption of the questionnaire survey is to generalize the study outcomes that explain the role and influence of the geographic information factor on the conceptual framework and the impact of the framework's factors on the citizens' use and adoption of the e-government services.

The questionnaire will be structured, based on close-ended questions and developed according to the research literature review outcomes and the questions constructed for Alomari (2010 – 2014) and Alshafi and Weerakkody (2009)'s e-government citizens' adoption models testing in addition to the Wray (2011)'s study on the Web 2.0 GIS GE-government website. The factors to be tested in our study will include the following:

- Social Factors
 - Trust in Government
 - Trust in Internet
 - Attitude toward Technology Adoption
 - Religious Belief
 - Fear of Job Loss Belief
 - Internet & Computer Skill Confidence
 - Website Design
 - Resistance to Change
 - Digital Divide
 - Wasta (Favoritism)
 - Word of Mouth
- TAM Factors:
 - Perceived Usefulness
 - Perceived Ease of Use
- Demographic Factors:
 - Gender
 - Education

- Age
 - Income
- Geographic Information Factor
- E-Government Adoption

All the listed factors were identified and tested fully or partially in different e-government citizens' adoption models, such as that of Alomari (2010 – 2014), AlAtayah et al. (2013), Alshafi and Weerakkody (2009), etc., except the GI factor that will be tested to analyse its direct and moderate influential role on the three main factors: Website design, perceived usefulness and perceived ease of use in addition to its direct influence on the e-government adoption.

The questionnaire will contain all the needed details and instructions in order to make the questions clear enough for the respondents. A cover letter will be attached with the questionnaire to clarify the purpose of conducting this research survey.

The Figure 3.3 shows the full survey questionnaire development process starting from the Literature Review and finishing by the Data Collection.

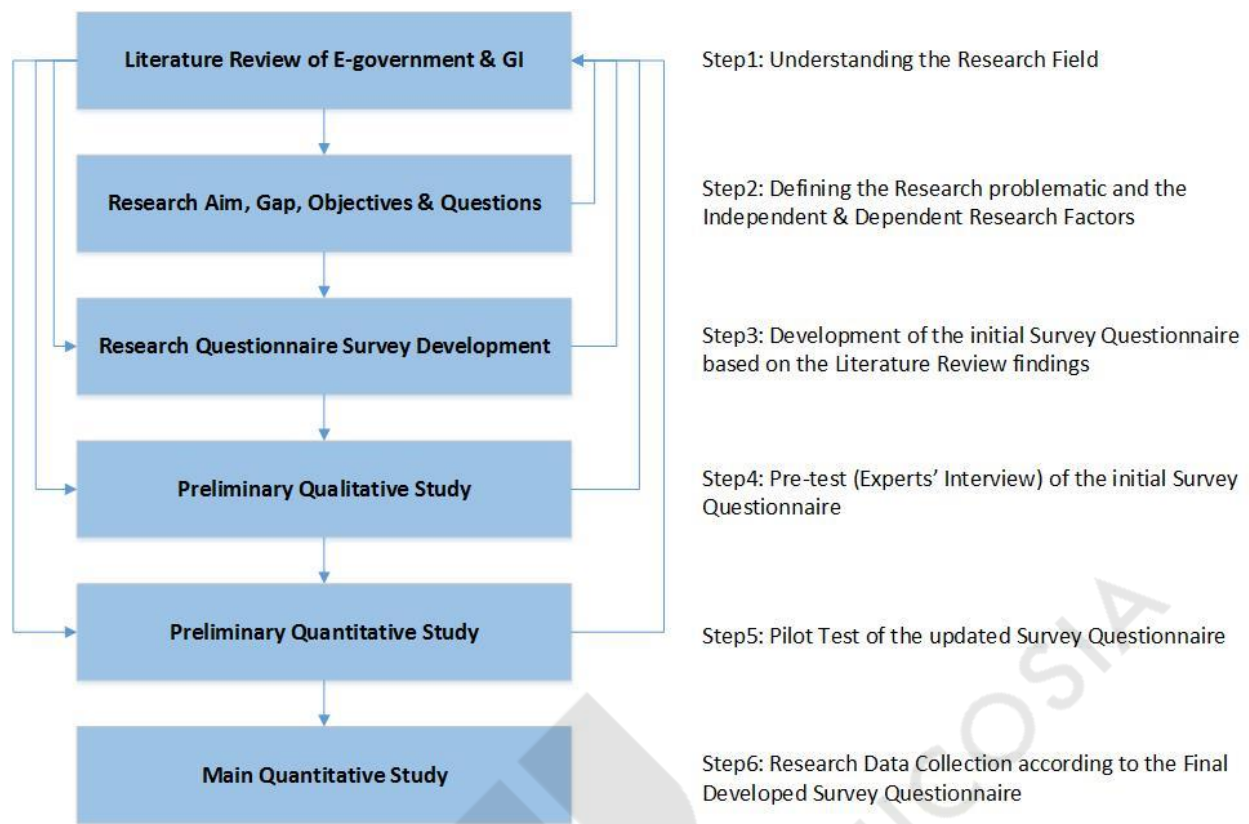


Figure 3.3: Survey Questionnaire Development Process

Questionnaire translation

As Arabic is the first language in Lebanon and English is widely used by employees in the public and private sectors, the questionnaire will be built in English and Arabic. As for the translation, it will be according to the back translation method (Brislin, 1970), since some of the potential respondent may not speak English and the respondents should have the choice to use the preferable language to answer the questionnaire. The translation from English to Arabic will be done by the researcher and reviewed by experts in translation, then a second round of translation from Arabic to English, of the Arabic version of the questionnaire, will be executed by another expert in translation. A comparison between the initial English version of the questionnaire and the translated one will be needed to guarantee the similarity, as we have to ensure the accuracy

and ease to understand the questions in both versions to avoid invalidity of the data collected (Saunders et al. 2003).

Measurement Scale

The quantitative studies using the survey questionnaire method with close ended questions require a measurement scale to measure easily the respondents' replies. Table 3. 8 shows a wide use of the Likert scale where nine (9) researchers used the Five-point Likert scale and three (3) used the Seven-point Likert scale. In this study, we will use the Five-point Likert scale, used by many e-government researchers (Alomari, 2014; AlAteyah et al., 2013; AlHujran et al., 2013; Harfouche, 2010; Alshafi and Weerakkody, 2009), and will use a ranging from “Strongly Agree” to “Strongly Disagree” for the social (except Digital Divide), TAM, GI and e-government adoption factors and the category scale for the demographic and digital divide factors.

Interview Phase

As stated previously, the questionnaire was developed based on previous studies (Alomari, 2010 – 2014; Alshafi and Weerakkody, 2009; Wray, 2011). According to Vannette (2015), an experts' interview about the questionnaire is recommended as it helps in the verification of the survey's questionnaire and can improve it tremendously. Topic experts, who have deep knowledge and expertise about the e-government & GI, should be consulted as they are capable of verifying the content of the questionnaire effectively and determine whether they think of any problems in the questions. Accordingly, a questionnaire verification form was designed in an excel sheet with a “comments box” for each question where every expert can mark if there is a potential problem with the question. Space was also provided under each question for the researcher to write specific notes about the suspected problem.

Therefore, at this stage, we had the proposed conceptual model with a list of hypotheses in addition to the proposed questions that are relevant to the proposed conceptual model and the addressed hypotheses. Having all the needed material in hand, a face-to-face interview process was executed with 3 experts and professionals in the e-government and GI domains. The Table 3. 9 summarizes the interviewees' title, organization and their experience whether in e-government or GI.

IC#	Interviewee Title	Interviewee Organization	Interviewee Qualification	Interviewee Experience
IC1	Academic Director	Antonine University	PhD in Information Management	E-government and GI
IC2	Academic Lecturer	American University of Beirut	PhD in Transportation Management	E-government and GI
IC3	Senior Director	Consolidated Engineering Company	Masters in GIS	E-government and GI

Table 3. 9: List of the Interviewed Experts

As stated before, the objective of those experts' interviews was to get their feedback about the overall study with their recommendations and questionnaire verification. Thus, the researcher started (i) by presenting the conceptual model, (ii) giving an explanation about the identified influential e-government citizens' adoption factors and the GI factor, (iii) showing the developed questionnaire and discussing its clarity and wording to the experts and (iv) finally discussing the experts' suggestions about the need to address any new factor not covered in the questionnaire. As an example of the discussion held with the 3 experts about the E-government and GI topics, the senior director discussed with the researcher the need to have information about the citizens' E-government awareness, GI awareness and their relation with the demographics factors in order to update the company future GI based E-government services implementations' strategies accordingly. Moreover, the author communicated with the academic director and the academic

lecturer about the importance of studying the moderate role of GI on the website design, perceived usefulness and perceived ease of use in relation to their potential positive impact on the E-government citizens' adoption. This process was repeated in every interview and, at the end of each one, an updated questionnaire was developed and ready to be presented to the next interviewee. At the end of this interview phase, a final updated and validated survey questionnaire was ready to be pilot tested.

Pilot Test Phase

Before proceeding with the questionnaire survey, a pilot test should be executed in order to examine the clarity of the questions, improve it where needed and finally ensure the respondents' comprehension of the addressed questions (Saunders et al., 2003). We selected 10 respondents to perform this pilot test phase using the same questionnaire verification form of the interview pre-test phase. This phase led to a collection of comments and recommendations for questions' improvements either by doing some rewording or by executing rephrasing of some questions. The final updated questionnaire was ready for the survey.

Sampling

A sample is a population's fragment selected in order to represent the targeted population as a whole. To get accurate estimations of the thoughts and behaviours of the whole population, the sample should be representative. In this study, the targeted participants of the questionnaire survey are the employees of the public and private sectors considered major e-government services' users worldwide (57%) as per Gil-Garcia (2012). The number of employees in Lebanon is around 1.8 million according to the latest study published in 2007 by the Central Administration for Statistics in Lebanon (employment to population rate in 2007 is 39.5% with a population of 4.5 million). Thus, our targeted population is the job holders in Lebanon.

According to The Research Advisors (2006) and Sekaran (2003), the sample size of our research, with a population of 1.8 million, satisfactory confidence level of 95% and confidence interval of 5% (Fowler, 2002), will be around 400 participants.

For quantitative studies using survey questionnaire, we have different sampling techniques as shown in the Figure 3.4

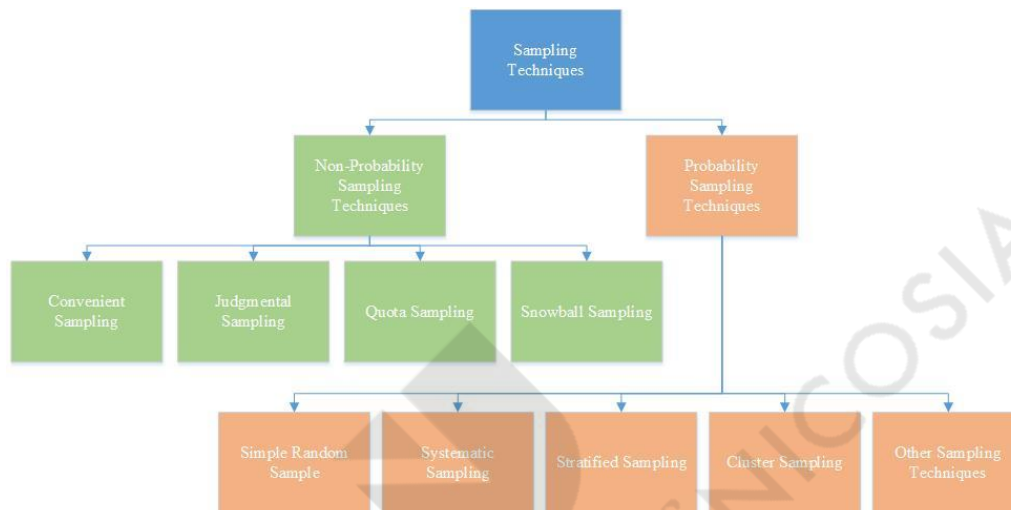


Figure 3.4: Sampling techniques (Adopted from Malhotra, 2007)

The questionnaire will be developed in the form of close-ended questions and distributed to the potential respondent by hand (printed version) or by mail. Privacy and confidentiality will be assured where none of the respondents is allowed to disclose his identity.

The survey process will start by approaching the directors or decision makers of the selected agencies to make sure we can get their permission for questionnaire distribution to the employees. The selected agencies, but not limited to, will be the following:

- Chamber of Commerce, Industry and Agriculture in North Lebanon – Private Business
- Business Incubator Association of Tripoli (BIAT) – Private Business Incubator
- Consolidated Engineering Company – Private Engineering

- CCG – Private IT
- Traggig – Private Security
- Gulfainer Lebanon – Private Seaport Logistics
- Lebanese International University – Private Education
- Lebanese Franco University – Private Education
- Manar University – Private Education
- Tripoli University – Private Education
- Medgulf Lebanon – Private Insurance
- North Lebanon Lawyers Association – Private/Business Owner Legal
- North Lebanon Dental Association – Private/Business Owner Medical
- North Lebanon Order of Engineers – Private/Business Owner Engineering
- North Lebanon Water Establishment – Public Utility
- La Kadisha Electricity Company – Public Utility
- Urban Community of Al Fayhaa – Public Municipal
- Central Bank of Lebanon – Public Banking

Based on the above selection of participants from agencies that we have access to, the convenient sampling method will be applied in this study by distributing the questionnaire to the citizens employed in those agencies. As mentioned before, the cover letter attached with the questionnaire will provide the participants an explanation of the research purpose. The employees will have the freedom to participate in the survey or to reject. In case of participation, no external pressure or influence will be allowed on the respondents. The researcher will be available for any clarification, if raised by any respondent, to facilitate the proper completion of

the questionnaire since he will be on agency's premise to collect the filled forms in the same day of distribution.

The researcher has a plan to distribute the questionnaire to a larger citizens/employees' sample size in order to reach 400 participants required for the study taking into consideration a probability of employees' rejection to participate in the survey. This task time frame, starting with the distribution and finishing by collection of the questionnaire, should not exceed three (3) months.

Data Security

In this study, data will be stored in Word or Excel format and can be accessed only using a password. The researcher only has the full accessibility and control over the data including read, write, print, export, etc. The collected data from the survey questionnaire will be entered into the Excel sheets by the researcher progressively during the data distribution/collection phase and analysed afterwards. In case there is a need for data entry support from external people, the researcher will give them a limited permission to enter data temporarily within a specific sheet. Then, data will be reviewed and approved by the researcher before being final and ready for storage. The same applies for data analysis if external support is needed and thus, the results will not be final unless reviewed and approved by the researcher.

Data Backup

Data backup is under the full responsibility of the researcher where all the data entry will be done on one machine at a time (the researcher's laptop) and a daily automatic backup on an external device will be performed.

Data Encryption

Sharing data online, via mail or cloud repository, requires the usage of an encryption model. In this study, we will encrypt using the .zip or .rar format which encodes the shared data by a password common only between the sender and the receiver.

The Figure 3.5 summarizes the primary data research process, quantitative based, applied to study the behaviour change in the citizens' adoption of the e-government services when the geographic information factor is introduced.



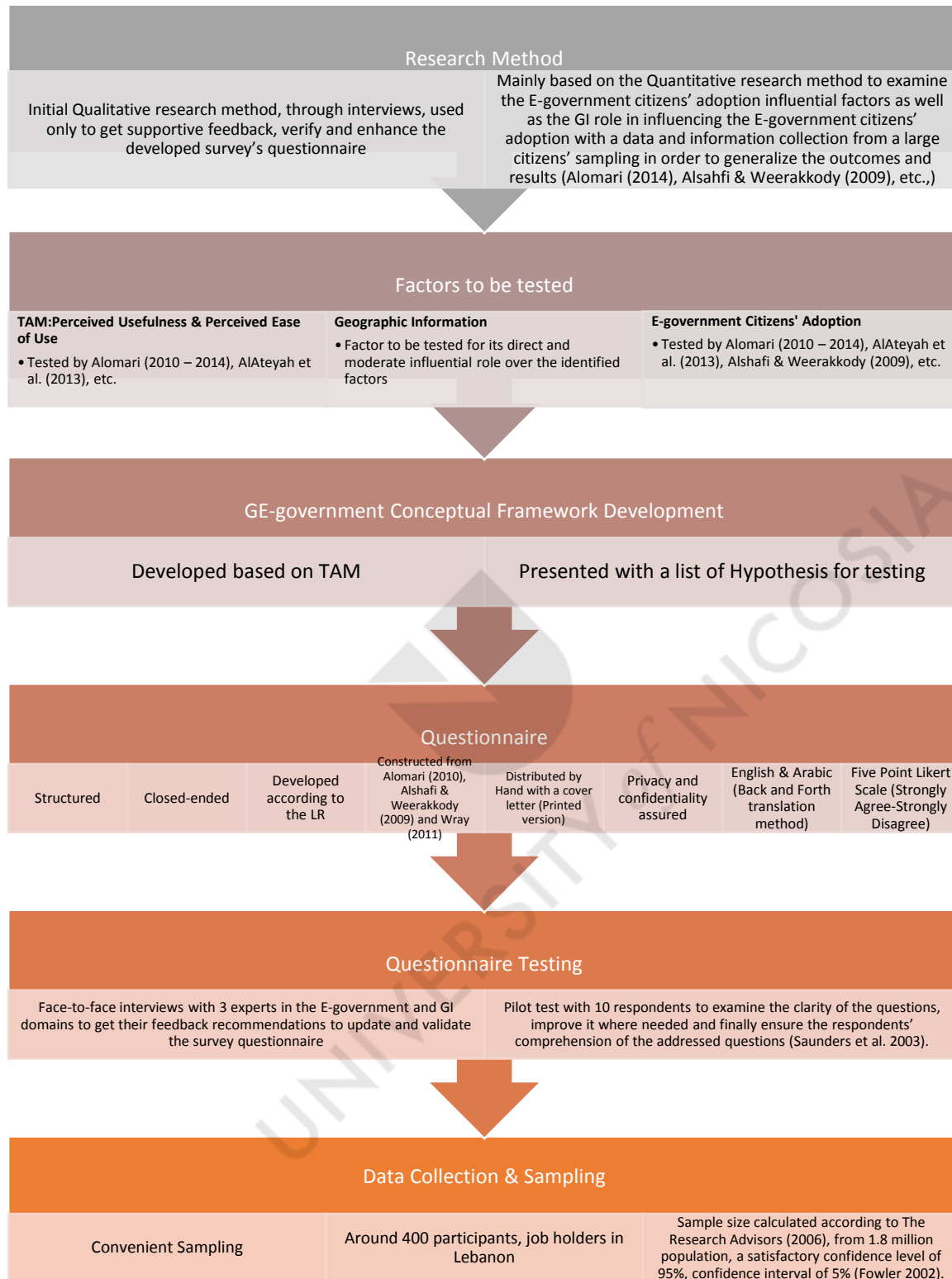


Figure 3.5: Primary Data Research Process

3.4.3.4 Data validity, reliability & analysis

Data Validity

The validity is the degree to which a test measures what it intends to measure (Bhattacharyya, 2010). Straub et al. (2004) highlighted that the recommended and standard validity techniques used in IS research to validate the measurement scale in case of quantitative data research method are construct validity and reliability. Validity is simply the truth and accuracy of conclusions extracted from research (Vogt, 2007). Miller (2003) listed the four main validity types:

- Content validity: the validity degree of the proposed instrument that is assessing or measuring the construct of interest.
- Face validity: a form of content validity that is used when an individual review the proposed instrument and gives a conclusion that measures the characteristic of interest.
- Criterion-related validity: used when we are interested in defining the relationship of scores on a test according to a specific criterion.
- Construct validity: the validity degree of the proposed instrument that is measuring the characteristic or theoretical construct that we are supposed to measure.

For this study, we will start with the content validity technique during the pre-test phase where 3 academic experts, in the field of e-government and geographic information, will review the drafted survey questionnaire to guarantee a high content validity.

A second validity technique, the face validity, will be used during the pilot study phase where we will meet the 10 respondents, ask them to check the survey questionnaire, provide their opinion about whether the addressed questions are clear enough and suggest corrections or enhancements if any.

A third validity technique, the construct validity, will be used afterwards to measure or rate from the responses of the participants (i) the degree of influence of each factor in the proposed framework over the e-government citizens' adoption, (ii) the degree of influence of the geographic information factor in the proposed framework on the e-government citizens' adoption, (iii) the degree of influence or moderation of the GI over other factors. Thus, we will use a 5-point Likert scale questionnaire and adopt the exploratory factor analysis to verify the construct validity.

Reliability

The reliability is the degree to which a measurement tool returns stable and consistent results. In any study, the researchers' main concern is about using the right measurement tool that can guarantee the similarity of the results whenever the measurement test is repeated. The reliability is used to confirm that the measurement scale is scoring in a reliable and stable way (Davis, 2005). Cronbach's coefficient alpha will be used as a measure of reliability and the obtained values will help the researcher to examine the internal data consistency after gathering (Field, 2005; Hinton et al., 2004). Reliability, in Mathematics, is defined as the proportion of the variability of the responses to the survey and is a result of differences in the respondents. The acceptable Cronbach's coefficient alpha value is above 0.5 as per the four categories' ranges of reliability suggested by Hinton et al. (2004): excellent reliability ranges (0.90 and above), high reliability (0.70- 0.90), high moderate reliability (0.50-0.70) and low reliability (0.50 and below). The reliability analysis test based on the Cronbach's coefficient alpha values' calculation was adopted by many e-government adoption researchers such as AlGhamdi and Beloff (2016), AlHujran et al. (2013), AlAteyah et al. (2013), Abu Shanab (2012), Harfouche (2010), Al-Shafi and Weerakkody (2009), AlAwadhi and Morris (2008) and others.

Data Analysis

As per Davis (2005), the importance of the collected data appears when analysed to get definitions, correlations and variances used to take the right decisions. To be properly analysed, data collected from the questionnaire survey should be (i) prepared, (ii) explored, (iii) analysed, (iv) represented and (v) results validated (Creswell and Clark, 2007). In this study, we need to investigate (a) the impact of each identified independent variables on the e-government citizens' adoption as dependent variable, (b) the impact of the geographic information independent variable on the e-government citizens' adoption dependent variable and (iii) over some of the other identified independent variables (such as website design, perceived ease of use, perceived usefulness, etc.), (iv) in addition to the existence of a correlation between variables.

As per Creswell and Clark (2007), Davis (2005) and Zikmund (2003), we need first to select a suitable and mature statistical/analytical software for the research which is the SPSS in our research case.

After the software selection, the data preparation process will be executed over the data collected starting with (i) an error checking such as blank responses, incomplete responses and inconsistent responses, (ii) followed by a conceptual framework's variables coding where a code library will be developed including the variables, codes and definitions, and (iii) finally a data categorization which groups the questions or items measuring the same variables under one category. At this stage, a specification of the independent and dependent variables is required based on the proposed conceptual framework's factors (Hair et al, 1998).

The data exploration process will then follow by applying a frequency distribution for the demographic variables and the mean, the standard deviation and the variance for the independent

and dependent variables. This type of exploration is quoted under the name of descriptive statistics.

Subsequently, the data analysis process will start using the inferential statistics where the main purpose is to get more understandings on the relationship and correlation between the independent and dependent variables.

Accordingly, the multivariate statistical approach named exploratory factor analysis (**EFA**) will be used as it offers advanced statistical tools that help the researcher measure (a) the independent variables' influence (social except digital divide, TAM and GI factors) on the corresponding measured dependent variable (e-government adoption), (b) the strength and correlation between the independent variables and the corresponding measured dependent variable, and (c) the depth, breadth and validity of the measurement scales (Malhotra et al., 2013; Williams et al., 2010; DeCoster, 1998). This statistical technique is widely used where many e-government researchers have used it including but not limited to: Alomari (2014), Harfouche (2010), Al-Shafi and Weerakkody (2009), etc.... A binary logistic regression modelling analysis (BLRMA), another analytical technique applied also in many studies like that of Harfouche (2010), Al-Shafi and Weerakkody (2009) among others, for analysing the relationship between one dependent variable (binary variable) and multiple independent variables (Malhotra et al., 2013) will follow in order to analyse the relation between the e-government citizens' adoption dependent variable (binary variable) and the independent variables (social except digital divide, TAM and GI) identified in the conceptual framework. The data analysis process will continue by using the Pearson Chi-square statistical tool that tests the relationship between two categorical variables whether they are binary (two categories) or more than two categories (Malhotra et al., 2013). Accordingly, the Pearson Chi-square will be first used to analyse the relation between the GI independent

variables and the other 3 independent variables (website design, perceived usefulness and perceived ease of use) within the conceptual framework. The study of those relationships will help get clear response to the proposed research questions. Then, the Pearson Chi-square will be used to explore the impact of the Demographic and Digital Divide variables (independent categorical variables) on the E-government Adoption (binary variable).

The Bivariate Correlation (BC), another analytical tool for analysing the relationship between two variables, will be used to analyse the relation between the variables within each of the EFA components and the relation between the FA and its reverse to analyse the construct validity.

Note that the EFA, BLRMA, BC and Pearson Chi-square were widely used by many researchers to test and analyse their conceptual frameworks (Alomari, 2014; Alhujran et al., 2013; Al-shafi and Weerakkody, 2009; Kumar and Best, 2006; Carter and Belanger, 2005; Gilbert et al., 2004; etc.). Afterwards, the data representation process will be executed by developing charts, graphs, tables and statistics in order to give figures and number for further interpretation. Finally, the results' validation process will be performed following the data reliability and validity techniques described previously.

3.5 Research Design & Conclusion

This chapter summarizes the research methodology that will be followed by researcher to find reliable and valid answers to the proposed research questions. A quantitative primary research methodology with questionnaire survey method and convenient sampling method will be applied using the exploratory factor analysis and multiple regression analysis for data analysis and conceptual framework testing. The Figure 3.6 shows a summary of the research development process.



Figure 3.6: Research Development Process

In the following chapter, we will develop the proposed conceptual framework that took into consideration the findings of the literature review.

Chapter 4: Conceptual Framework

The conceptual framework chapter of this doctoral thesis presents the initial proposed GE-government citizens' adoption framework the proposed hypotheses developed according to the findings of the literature review and traces the linkage between the proposed hypotheses and the research objectives and questions addressed in the research methodology.

4.1 Introduction

In this chapter, the GE-government (GI based E-government) Citizens' Adoption conceptual framework will be developed, based on the technology adoption model (Davis, 1985), social and demographic factors identified in the literature review in addition to the new defined geographic information (GI) factor. This framework summarizes the author literature review's findings about the existing factors influencing the e-government citizens' adoption as well as the potential influence of the GI factor over the e-government citizens' adoption directly or through some of the existing e-government citizens' adoption influential factors. The proposed conceptual framework will be used as the basis that supports the author in the assessment of the significance of the factors' impact over the citizens' technology adoption and the identification of the GI factor's role in enhancing the e-government adoption. Therefore, those factors will be described in this chapter in order to justify their selection and along with each factor a hypothesis will be developed to be tested later on during the empirical research. Finally, the conceptual framework will map all those factors and will be considered as the beginning of the empirical research which will include the research data collection and data analysis.

4.2 E-Government Citizens' Adoption Factors

Introducing e-government, as a new technology, to any country will face various challenges, specifically citizens' acceptance and adoption challenges. Hereunder, we will list the influential citizens' adoption factors identified in the literature review along with their relevant hypothesis, used for testing in the empirical research, starting by the TAM adoption theory factors, the social and demographic factors and ending by the GI factor considered as a potential direct and indirect influential factor.

4.2.1 Technology Acceptance Model Factors

The Technology Acceptance Model (TAM) is one of the main models used to study the user acceptance of a technology or information system (Lee *et al.*, 2003). TAM was first introduced by Davis (1985) to show that any system use is a simply a response to a user's motivation to use a system driven or influenced by external factors like system's features and capabilities.

A new Conceptual TAM was introduced by Davis (1986) as a combination between the previous conceptual TAM and the concept of the attitude of a person towards a given behaviour defined in the Theory of Reasoned Action (Fishbein and Ajzen, 1975). In this refined model, the user motivation will be defined by the existence of three main elements, perceived system usefulness, perceived system ease of use and attitude of a user toward using the system, where the user's attitude will determine whether he's going to accept or reject the system and the perceived system usefulness and the perceived system ease of use will be directly influenced by the external factors defined in the previous model, system's features and capabilities.

The original TAM (Davis, 1986) was examined by Davis to develop measurement scales for perceived system ease of use and perceived system usefulness in three stages including pretesting phase, empirical field study and a laboratory experiment (Chuttur, 2009). As a result,

new relationships into the original TAM were introduced by Davis (1993) by adding the perceived system usefulness potential influence on the actual system use and the system features and capabilities potential influence on the attitude of a user toward using the system.

Davis *et al.* (1989) introduced a new variable into the original TAM, the behavioural intention, inspired also from the Theory of Reasoned Action (Fishbein and Ajzen, 1975).

The first modified TAM (Davis *et al.*, 1989) was reassessed by Venkatesh and Davis (1989 – 1996) driving to new result: perceived system usefulness and perceived system ease of use have direct influence on the behavioural intention to use system and thus the attitude toward using a system can be deleted. This model added new external variables like user training, user participation in design and nature of the implementation process (Venkatesh and Davis, 1996).

Since the final TAM (Venkatesh and Davis, 1996) measures in a generic way the perceived usefulness and perceived ease of use and was experimented on voluntary environments (Chuttur, 2009), there was a need to go more in deep to explore and identify the reasons behind the importance of the perceived usefulness and perceived ease of use in influencing the behavioural intention and the actual system use. Thus, Venkatesh and Davis (2000) introduced the TAM2 which identified some predecessor variables to the Perceived System Usefulness and considered the mandatory and voluntary environments to experiment the TAM2.

Another extension of the TAM was introduced by Venkatesh (2000) who identified some predecessor variables to the perceived system ease of Use in the TAM. He identified two groups (Chuttur, 2009): Anchors and adjustments. He identified those predecessor variables from previous research on perceived system ease of use (Davis *et al.*, 1992; Venkatesh and Davis, 1996).

Based on the aforementioned description and evolution history of the TAM model, it is obvious that the TAM is mainly characterized by two main factors: the perceived ease of use and the perceived usefulness. As per Davis (1989), the TAM is very useful to evaluate the user acceptance of a technology where the ease of use and helpfulness of a technology will positively influence the user's attitude and intention to accept it and use it (Davis, 1993).

The TAM theory was widely used by researchers to study the intention to use e-government (Asmi et al., 2017; Bwalya, 2017; Alghamdi and Beloff, 2016; Alomari, 2014; Alateyah et al., 2013; AlHujran et al., 2013; Abu Shanab, 2012; Abu Nadi et al., 2008; Hung et al., 2006; Persaud and Sehgal, 2005; Chang et al., 2005; Carter and Belanger, 2005; Phang et al., 2005; Carter and Belanger, 2004) in both developed and developing countries.

4.2.1.1 Perceived Ease of Use (PEOU)

The Perceived Ease of Use is defined by Davis (1989) as the degree to which a person believes that using a particular system would be free of effort. In our research, we will study the citizens' E-government system acceptance according to its ease of use.

Therefore, we will test the influence of the perceived ease of use factor over the citizens' adoption of the e-government services. Accordingly, perceived ease of use factor is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 1 (H1): High level of perceived ease of use has positive influence on the e-government citizens' adoption.

4.2.1.2 Perceived Usefulness (PU)

The perceived usefulness is defined by Davis (1989) as the degree to which a person believes that using a particular system would enhance his or her job performance. In our research, we will study the citizens' E-government system acceptance according to its usefulness.

Therefore, we will test the influence of the perceived usefulness factor over the citizens' adoption of the e-government services. Accordingly, perceived usefulness factor is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 2 (H2): High level of perceived usefulness has positive influence on the e-government citizens' adoption.

4.2.2 Social Factors

4.2.2.1 Word of mouth (WOM)

From the e-government perspective, the word of mouth is defined by Al Omari (2010) as "the communication or message directed to citizens or end users regarding the usage of services and information available on government websites by other users who have experienced or are aware of e-government services". Word of mouth, considered as a main component of the Social Network Theory (Granovetter, 1973) under the informal channels of communication category, was introduced by Rogers (1983) as a communication channel of the diffusion process influencing the adopters during the decision stage of innovation.

In our research, we will study the influence of the word of mouth's messages over the citizens' decision to adopt e-government services similar to the studies conducted by Alomari (2010 – 2014) and Kim and Prabhakar (2004). Therefore, we will test the influence of the word of mouth factor over the citizens' adoption of the e-government services. Accordingly, word of mouth

factor is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 3 (H3): High level of positive word of mouth has positive influence on the e-government citizens' adoption.

4.2.2.2 Favouritism (FA) – Wasta

Favouritism or “Wasta”, as known in the Arabic countries, is defined by Feghali (1997) as the process of utilising human's influence through their interpersonal network to receive favours and obtain advantages among others to facilitate our everyday life needs, operations and transactions. Makhoul and Harrison (2004) considered wasta as a manner used widely in many countries including Lebanon to pass over barriers and obstacles in order to get any permit, to be hired for a job or to facilitate any transaction. Whiteoak et al. (2006), Makhoul and Harrison (2004) and Cunningham and Sarayrah (1993) considered wasta as a main factor in the social life in many Arab and developing countries.

In our research, we will study the influence of favouritism (Wasta) factor on the e-government citizens' adoption. The e-government adoption will definitely reduce the face to face interaction and thus the introduction of the new system will limit the influence of the interpersonal network on the execution of the citizens' daily operations and transactions. Therefore, we need to check whether the e-government adoption will support people in reducing their usage of wasta, or not which is very similar to what Alghamdi and Beloff (2016), Alomari (2010 – 2014) and Al Awadhi and Morris (2009) examined previously in their studies for Saudi Arabia, Jordan and Kuwait. Accordingly, the favouritism factor is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 4 (H4): Low level of favouritism has positive influence on the e-government citizens' adoption.

4.2.2.3 Digital Divide (DD)

The digital divide is defined by Van Dijk (2006) as the inequality in people accessibility to and use of the internet and computer. This gap between people was classified by Van Dijk (1999) under lack of mental access, material or physical access, skill access and usage access categories where Van Dijk and Hacker (2003) considered that the material access (physical access to internet and computer) as the main one under researchers' studies. Alomari (2006), Van Dijk (2006), Dugdale et al. (2005), Edmiston (2003), Loges and Jung (2001) and Deakins et al. (2001) stated that the income, education, age, sex, geography and ethnicity can be considered as predictors of the internet, computer and e-government access. Many researchers (Alomari 2014, Wangpipatwong et al. 2008, Kumar et al. 2007, Belanger and Carter 2006, Dimitrova and Beilock 2005, Evans and Yen 2005, Davis 1989) considered digital divide as a social factor under the accessibility category.

In our research, we will study the influence of digital divide factor, according to the main citizens' demographic elements including income, education, age and geography, on the e-government citizens' adoption especially that the digital divide has been considered as an influential factor and addressed & studied in many researches (Alomari, 2014; Alateyah, 2013; Al Hujran et al., 2013; Belanger and Carter, 2009; Abu-Samaha and Abdel Samad, 2007; Alomari, 2006; Reddick, 2005; Thomas and Streib, 2003; Tarawneh, 2003) in order to measure the level of influence. Accordingly, the digital divide factor is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 5 (H5): Digital divide has influence on the e-government citizens' adoption.

4.2.2.4 Website Design (WD)

The website design is defined as the ease of use and the information content of a government website making it functional and serviceable in order to deliver successfully citizens' centric services and information and reach user satisfaction (Alomari, 2014; Wang et al., 2005; Smith, 2001; Zhang and Dran, 2000). The different categories of website design, as identified by Wang et al. (2005), Moon (2004), Smith (2001) and Zhang and Dran (2000), includes the privacy, accessibility, visual appearance, user friendliness, and information content, accuracy and up-to-date. Many researchers (Alomari, 2014; Wangpipatwong et al., 2008; Kumar et al., 2007; Belanger and Carter, 2006; Dimitrova and Beilock, 2005; Evans and Yen, 2005; Davis, 1989) considered website design as a social factor under the accessibility category.

In our research, we will study the influence of website design factor on the e-government citizens' adoption especially that the Website Design has been considered as an influential factor and addressed & studied in many researches in developed and developing countries (Alghamdi and Beloff, 2016; Alomari, 2014; Alateyah, 2013; Akkaya, 2013; Kumar et al., 2007; Abanumi et al., 2005; Gilbert and Balestrini, 2004; Moon, 2004) in order to measure the level of influence. Accordingly, the website design factor is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 6 (H6): High level of website design has positive influence on the e-government citizens' adoption.

4.2.2.5 Internet & Computer Skills Confidence (ICSC)

The internet and computer skills confidence is defined as the users' awareness and understanding of the internet as well as the users' IT skills (Dugdale et al., 2005; Pons, 2004). This ICSC is a complimentary factor to the digital divide where the DD describes the users' accessibility to the

internet and computer and the ICSC describes the users' ability and skills to use internet and computer if available. The two main technological skills required to use e-government services are internet and computer (Alomari, 2011; Mossenburg et al., 2003).

In our research, we will study the influence of internet and computer skills confidence factor on the e-government citizens' adoption especially that the ICSC has been considered as an influential factor and addressed & studied in many researches in the developed and developing countries (Alghamdi and Beloff, 2016; Alomari, 2014; Al Hujran et al., 2013; Alateyah, 2013; Wangpipatwong et al., 2008; Carter and Weerakkody, 2008; Belanger and Carter, 2006; Vassilakis et al., 2005; Pons, 2004; Moon, 2004; Jaeger and Thompson, 2003; Welch and Hinnant, 2003; Aladwani, 2003) in order to measure the level of influence. Accordingly, the internet & computer skills confidence factor is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 7 (H7): High level of internet & computer skills confidence has positive influence on the e-government citizens' adoption.

4.2.2.6 Fear of Job Loss Belief (FJLB)

The belief is defined by Alomari (2014), Taylor and Todd (1995) and Fishbein & Ajzen (1975) as the "individual's subjective perception of the probability that performance of a given behaviour will result in a given consequence". The fear of job loss belief is defined as the users' certainty that if paper based work is replaced by electronic work there is a probability of losing their jobs (Alomari, 2014; Vassilakis et al., 2005). Vassilakis et al. (2005) considered the FJLB as a philosophical belief affecting the e-government adoption by creating a fear to the employees that such technology adoption in their organization will definitely conduct to a reduction in the

organization's job offering and an increase in the reliance on the online services toward the development of a fully automated environment.

In our research, we will study the influence of fear of job loss belief factor on the e-government citizens' adoption especially that the FJLB has been considered as an influential factor and addressed & studied in many researches (Alomari, 2014; Vassilakis et al., 2005) in order to measure the level of influence. Accordingly, the fear of job loss belief factor is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 8 (H8): Low level of fear of job loss belief has positive influence on the e-government citizens' adoption.

4.2.2.7 Religious Belief (RB)

As mentioned previously, the belief is defined by Alomari (2014), Taylor and Todd (1995) and Fishbein and Ajzen (1975) as the "*individual's subjective perception of the probability that performance of a given behaviour will result in a given consequence*". The religious belief is defined as the users' certainty that if internet and online services are used by the family members there is a probability of viewing and accessing immoral themes (Alomari, 2014). Harfouche (2010), Hofheinz et al. (2005), Al-Saggaf (2004) and Hill et al. (1998) considered the RB as an essential part of the citizens' life, mainly in the Arab countries, developing countries and some societies in the developed countries, creating an uncertainty around the benefit of using online services with a belief of the existence of harmful information that can be accessed easily online, and thus the RB can affect directly the citizens' willingness to use online services.

In our research, we will study the influence of religious belief factor on the e-government citizens' adoption especially that the RB has been considered as an influential factor and

addressed & studied in many researches (Alomari, 2014; Hofheinz, 2005; Evans and Yen, 2005; Dimitrova and Beilock, 2005; Leonard et al., 2004; Norton, 2002; Hill et al., 1998) in order to measure the level of influence. Accordingly, the religious belief factor is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 9 (H9): Low level of religious belief has positive influence on the e-government citizens' adoption.

4.2.2.8 Attitude (AT)

The attitude is defined by Alomari (2014), Taylor and Todd (1995) and Kerlinger (1984) as the *“positive or negative feeling that individuals might have toward interaction with the government online through its website”* and thus can be defined in our research as the positive or negative feeling of citizens toward using and adopting e-government services. Attitude has been inserted in many adoption theories including Technology Acceptance Model (Davis, 1989), Theory of Reasoned Action (Ajzen and Fishbein, 1980) and Theory of Planned Behaviour (Ajzen, 1991), and considered as an essential factor influencing the behavioural intention.

In our research, we will study the influence of attitude factor on the e-government citizens' adoption especially that the AT has been considered as an influential factor and addressed & studied in many researches in developed and developing countries (Williams et al., 2016; Alomari, 2014; Al Hujran et al., 2013; Susanto, 2013; Harfouche, 2010; AlAwadhi and Morris, 2008; Hung et al., 2006; Persaud and Sehgal, 2005; Chu and Wu, 2005; Pons, 2004; Charbaji and Mikdashi, 2003) in order to measure the level of influence. Accordingly, the attitude factor is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 10 (H10): High level of positive attitude has positive influence on the e-government citizens' adoption.

4.2.2.9 Trust in Internet (TI)

Trustworthiness is considered by Bicchieri et al. (2011) as a social norm. Trust is defined by Carter and Belanger (2008, 2005) as the citizens' confidence in the government as well as the security & privacy of the technologies considered as unfamiliar trustee. In addition, Warkentin et al. (2002) illustrates that "*Trust is a central defining aspect of many economic and social interactions*". As per Dutton and Shepherd (2003), the Trust in Internet is the "*Social Dynamics of an Experience Technology*". Usage of e-government services through Internet, considered as the essential online interaction medium between citizens and government, leads to many societal issue mainly citizens' trust in internet security and privacy (Scott et al., 2005). Internet security and privacy includes the web security (Al-Shafi and Weerakkody, 2009), the confidentiality of the personal information (Vassilakis et al., 2005), the financial security (Gilbert and Balestrini, 2004), the prohibited use of the logged information, the improper use of the private information (Scott et al., 2005; Layne and Lee, 2001; Verton, 2000) and the improper access and errors in data collection (Smith et al., 1996).

In our research, we will study the influence of trust in internet factor on the e-government citizens' adoption especially that many researchers introduced the TI in their frameworks and did an empirical study, in developed and developing countries, in order to measure the level of influence (Gupta et al., 2016; Alghamdi and Beloff, 2016; Alomari, 2014; Alateyah, 2013; Susanto, 2010; Al Hujran et al., 2013; Akkaya, 2013; Harfouche, 2010; Abu Nadi, 2008; AlAwadhi and Morris, 2008; Al-Shafi and Weerakkody, 2009; Kumar et al., 2007; Chang et al., 2005; Phang et al., 2005; Carter and Belanger, 2005; Chang et al., 2005; Gilbert and Balestrini,

2004; Pons, 2004; Rao, 2002; Warkentin et al., 2002). Accordingly, the trust in internet is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 11 (H11): High level of trust in internet has positive influence on the e-government citizens' adoption.

4.2.2.10 Trust in Government (TG)

As mentioned previously, the trustworthiness is a social norm (Bicchieri et al., 2011), the Trust is the citizens' confidence in the government and the security & privacy of the technologies considered as unfamiliar trustee (Carter and Belanger, 2008) and the "*Central defining aspect of many economic and social interactions*" (Warkentin et al. 2002). Trust in government can be defined as the citizens' assessment based on their opinion about the government's honesty and capability to offer services that gain the citizens' satisfaction (Alomari, 2014; Belanger and Carter, 2008; Levi and Stoker, 2002). The government positive image influences the citizens' trust mainly when we talk about IT services including e-services where the government authorities' cooperation, sharing of information and system standardization are key components to (i) provide better services that meet the citizens' expectations and (ii) develop & retain good government image and citizens' trust (Alomari, 2014).

In our research, we will study the influence of trust in government factor on the e-government citizens' adoption especially that many researchers introduced the TG in their frameworks and did an empirical study, in developed and developing countries, in order to measure the level of influence (Bwalya, 2017; Gupta et al., 2016; Alghamdi and Beloff, 2016; Alomari, 2014; Alateyah, 2013; Susanto, 2010; Al Hujran et al., 2013; Akkaya, 2013; Harfouche, 2010; Abu Nadi, 2008; AlAwadhi and Morris, 2008; Belanger and Carter, 2008; Welch et al., 2005; Van

Slyke et al., 2004; Pavlou, 2003). Accordingly, the trust in government is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 12 (H12): High level of trust in government has positive influence on the e-government citizens' adoption.

4.2.2.11 Resistance to Change (RTC)

Zander (1950) defines resistance to change as the "*Behavior which is intended to protect an individual from the effects of real or imagined change*". Many researchers considered the resistance to change as one of the main challenges facing the e-government adoption coming as a result of the people's negative belief on the changes that ICT can bring such as ICT is major reason of losing job (Alomari, 2014; Schwester, 2009; Kamal and Themistocleous, 2006; Ndou, 2004; Edmiston, 2003; Sathye, 1999).

In our research, we will study the influence of resistance to change factor on the e-government citizens' adoption especially that the RTC has been considered as an influential factor and addressed & studied in many researches in developed and developing countries (Alomari, 2014; Abu-Shanab, 2012; Schwester, 2009; Kamal and Themistocleous, 2006; Ndou, 2004; Edmiston, 2003; Sathye, 1999) in order to measure the level of influence. Accordingly, the resistance to change factor is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 13 (H13): Low level of resistance to change has positive influence on the e-government citizens' adoption.

4.2.3 Demographic Factors

The demographic factors are essential factors used in the majority of the technology adoption researches. The main and common demographic factors, as described by several academics and researchers (Bwalya, 2017; Asmi et al., 2017; Williams et al., 2016; Alghamdi and Beloff, 2016; Gupta et al., 2016; Haider et al., 2015; Voutinioti, 2013; Alateyah, 2013; Al Hujran et al., 2013; Susanto, 2013; Akkaya et al., 2013; Harfouche, 2010; Belanger and Carter, 2009; Abu Nadi, 2008; Al Awadhi and Morris, 2008; Patel and Jacobson, 2008; Alomari, 2006; Van Dijk, 2006; Dimitrova and Chen, 2006; Choudrie and Dwivedi, 2005; Thomas and Streib, 2003; Hart and Teeter, 2003), are Gender, Age, Level of Income and Level of Education.

4.2.3.1 Gender (GE)

The gender factor is defined by Jackson & Scott (2001) as “*a hierarchical separation between women and men embedded in both social institution and social practices*”. Many researchers studied the gender impact over the adoption of technology including e-government (Williams et al., 2016; Alomari, 2014; Susanto, 2013; Alateyah, 2013; Voutinioti, 2013; Belanger and Carter, 2009; Al-Shafi and Weerakkody, 2009; Carter and Weerakkody, 2008; Patel and Jacobson, 2008; Dwivedi and Lal, 2007; Choudrie and Papazafeiropoulou, 2006; Dimitrova and Chen, 2006; Choudrie and Dwivedi, 2005; Choudrie and Lee, 2004; Venkatesh et al., 2003; Thomas and Streib, 2003; Hart and Teeter, 2003; Jackson and Scott, 2001; Morris and Venkatesh, 2000; Venkatesh et al., 2000; Anderson and Young, 1999).

In our research, we will study the distribution of e-government services’ adopters and non-adopters according to the gender and thus the Gender is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 14 (H14): Male is more e-government adopter than female gender

4.2.3.2 Age (AG)

Many researchers studied the age factor impact over the adoption of technology including E-government (Williams et al., 2016; Alomari, 2014; Alateyah, 2013; Voutinioti, 2013; Al-Shafi and Weerakkody, 2009; Patel and Jacobson, 2008; Abu Nadi, 2008; Dwivedi and Lal, 2007; Dimitrova and Chen, 2006; Choudrie and Papazafeiropoulou, 2006; Choudri and Lee, 2006; Choudrie and Dwivedi, 2005; Thomas and Streib, 2003; Hart and Teeter, 2003; Venkatesh et al., 2003; Morris and Venkatesh, 2000).

In our research, we will study the distribution of e-government services' adopters and non-adopters according to the group of ages and thus the Age is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 15 (H15): Younger and middle age are more e-government adopters than older age groups

4.2.3.3 Level of Income (LI)

Many researchers studied the level of income factor impact over the adoption of technology including e-government (Alomari, 2014; Abu Nadi, 2008; Patel and Jacobson, 2008; Dimitrova and Chen, 2006; Choudrie and Dwivedi, 2005; Thomas and Streib, 2003; Hart and Teeter, 2003).

In our research, we will study the distribution of e-government services' adopters and non-adopters according to the level of education groups and thus the level of education is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 16 (H16): Higher level of income are more e-government adopters than lower level of income groups

4.2.3.4 Level of Education (LE)

Many researchers studied the level of education factor impact over the adoption of technology including e-government (Alomari, 2014; Susanto, 2013; Alateyah, 2013; Voutinioti, 2013; Al-Shafi and Weerakkody, 2009; Abu Nadi, 2008; Patel and Jacobson, 2008; Dwivedi et al., 2007; Dwivedi and Lal, 2007; Dimitrova and Chen, 2006; Choudrie and Papazafeiropoulou, 2006; Choudrie and Dwivedi, 2005; Choudrie and Lal, 2004; Thomas and Streib, 2003; Hart and Teeter, 2003; Venkatesh et al., 2000).

In our research, we will study the distribution of e-government services' adopters and non-adopters according to the level of education groups and thus the level of education is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 17 (H17): Higher level of education are more e-government adopters than lower level of education groups

4.2.4 Geographic Information Factor

Goodchild (1997, 2010) defined the Geographic Information (GI) as the location or information linked to a place or property on or near Earth and the knowledge about the location of something and its description at a specific time or time interval. The GI is identified as following:

- The Geographical Information System (GIS): Provide the geographic information with *“the infrastructure, tools and methods for tackling real world problems within acceptable timeframes”* (Maguire, 2010).
- The Geographic Information Science (GIScience): *“Allows us to consider the philosophical, epistemological and ontological contexts of geographic information”* (Maguire, 2010).

In this section, the author will describe the influence of the geographic information factor over the e-government citizens' adoption directly in addition to its influence over some of the identified e-government adoption influential factors including website design, perceived usefulness and perceived ease of use. For each one of those potential influential relations, a hypothesis will be developed describing the nature of this relationship.

4.2.4.1 GI impact over Website Design (WD)

Many researchers (Marson et al., 2015; Shah and Wani, 2015; Ijeh, 2014; Pandagale et al., 2014; Yan and Wang, 2012; Singh et al., 2011; Wray, 2011; Wei, 2011; Nair and Katiyar, 2011; Balogun et al., 2010; Baz et al., 2010; etc...) have studied the role of the geographic information in enhancing the website design of many e-government applications and services in Chapter 2 Table 2. 4 (Web GI Campus Information Application, Spatial Data Infrastructure Geo-portal, E-participation application, E-tourism Application).

In our research, we will study the impact of the geographic information factor on the website design factor in the e-government applications and accordingly the link between GI and WEB is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 18 (H18): The geographic information has influence over the website design of the e-government applications.

In addition, we will study the moderate impact of the geographic information factor over the relation of the website design factor on the e-government citizens' adoption factor and accordingly the moderate link is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 22 (H22): The geographic information increase the level of positive influence of the website design on the e-government citizens' adoption

4.2.4.2 GI impact over Perceived Usefulness (PU)

Many researchers (Aphane, 2015; Bediroğlu, 2015; Marson et al., 2015; Shah and Wani, 2015; Ijeh, 2014; Gupta et al., 2014; Pandagale et al., 2014; Everton et al., 2013; International IDEA, 2013; Protic and Nestorov, 2013; Wray, 2011; etc...) have studied the role of the geographic information in increasing the perceived usefulness of many e-government applications and services listed in Chapter 2 Table 2. 4 (E-land administration application, Spatial Data Infrastructure Geo-portal, E-tourism Application, E-elections Management Application, E-tax Application, Complaints Management System, etc...).

In our research, we will study the impact of the geographic information factor on the perceived usefulness factor in the e-government applications and accordingly the link between GI and PU is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 19 (H19): The geographic information has influence over the perceived usefulness of the e-government applications.

In addition, we will study the moderate impact of the geographic information factor over the relation of the perceived usefulness factor on the e-government citizens' adoption factor and accordingly the moderate link is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 23 (H23): The geographic information increase the level of positive influence of the perceived usefulness on the e-government citizens' adoption

4.2.4.3 GI impact over Perceived Ease of Use (PEOU)

Many researchers (Aphane, 2015; Bediroğlu, 2015; Marson et al., 2015; Shah and Wani, 2015; Ijeh, 2014; Gupta et al., 2014; Pandagale et al., 2014; Everton et al., 2013; International IDEA, 2013; Protic and Nestorov, 2013; Wray, 2011; etc...) have studied the role of the geographic information in increasing the perceived ease of use (or reducing the complexity) of many e-government applications and services in Chapter 2 Table 2. 4 (E-land administration application, Spatial Data Infrastructure Geo-portal, E-tourism Application, E-elections Management Application, E-tax Application, Complaints Management System, etc...).

In our research, we will study the impact of the geographic information factor on the perceived ease of use factor in the e-government applications and accordingly the link between GI and PEOU is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 20 (H20): The geographic information has influence over the perceived ease of use of the e-government applications.

In addition, we will study the moderate impact of the geographic information factor over the relation of the perceived ease of use factor on the e-government citizens' adoption factor and accordingly the moderate link is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 24 (H24): The geographic information increase the level of positive influence of the perceived ease of use on the e-government citizens' adoption

4.2.4.4 GI impact over E-government Citizens' Adoption

According to Kurwakumire (2013), O'Looney (2000) and Nedovic-Budic (1999), the geographic information, used to geo-enable the e-government applications, has been considered as a positive factor responding to the citizens' needs and facilitating their interaction with the government.

Based on the aforementioned and the various studies done by researchers at the level of the impact of GI over different potential e-government adoption influential factors, we will study in our research the influence of the geographic information factor on the e-government citizens' adoption and accordingly the link between GI and the e-government citizens' adoption is introduced in the proposed GE-government conceptual framework and will be tested based on the following hypothesis:

Hypothesis 21 (H21): Geographic information has positive influence on the e-government citizens' adoption.

4.3 E-government Citizens' Adoption Conceptual Framework

Based on the aforementioned literature review, all the potential influential e-government citizens' adoption factors were described including the proposed relationships between factors. The Figure 4. 1 illustrates the different elements of the GE-government (GI based e-government) citizens' adoption conceptual framework.

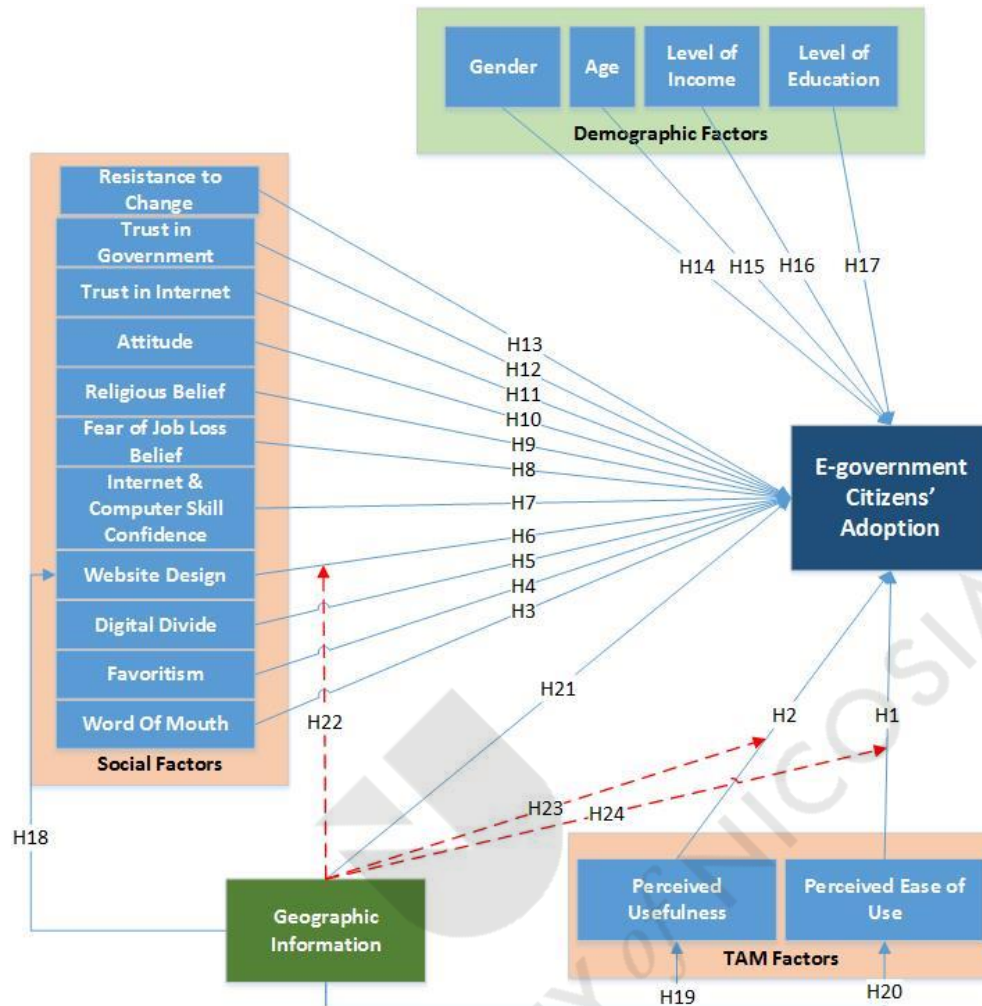


Figure 4. 1: GE-Government (GI based E-government) Citizens' Adoption conceptual framework

The Table 4. 1 summarizes the proposed hypotheses as well as the relevant independent and dependent factors following the table structure of Al Shafi (2009).

HN	Research Hypothesis	Independent Factor	Dependent Factor
H1	High level of Perceived Ease of Use has positive influence on the E-government citizens' adoption	Perceived Ease of Use (PEOU)	E-government Citizens' Adoption

H2	High level of Perceived Usefulness has positive influence on the E-government citizens' adoption	Perceived Usefulness (PU)	E-government Citizens' Adoption
H3	High level of positive Word of Mouth has positive influence on the E-government citizens' adoption	Word of Mouth (WOM)	E-government Citizens' Adoption
H4	Low level of Favouritism has positive influence on the E-government citizens' adoption	Favouritism (FA)	E-government Citizens' Adoption
H5	Digital Divide has influence on the E-government citizens' adoption	Digital Divide (DD)	E-government Citizens' Adoption
H6	High level of Website Design has positive influence on the E-government citizens' adoption	Website Design (WD)	E-government Citizens' Adoption
H7	High level of Internet & Computer Skills Confidence has positive influence on the E-government citizens' adoption	Internet & Computer Skills Confidence (ICSC)	E-government Citizens' Adoption
H8	Low level of Fear of Job Loss Belief has positive influence on the E-government citizens' adoption	Fear of Job Loss Belief (FJLB)	E-government Citizens' Adoption
H9	Low level of Religious Belief has positive influence on the E-government citizens' adoption	Religious Belief (RB)	E-government Citizens' Adoption

H10	High Level of positive Attitude has positive influence on the E-government citizens' adoption	Attitude (AT)	E-government Citizens' Adoption
H11	High Level of Trust in Internet has positive influence on the E-government citizens' adoption	Trust in Internet (TI)	E-government Citizens' Adoption
H12	High Level of Trust in Government has positive influence on the E-government citizens' adoption	Trust in Government (TG)	E-government Citizens' Adoption
H13	Low level of Resistance to change has positive influence on the E-government citizens' adoption	Resistance to Change (RTC)	E-government Citizens' Adoption
H14	Male is more E-government adopter than Female gender	Gender (GE)	E-government Citizens' Adoption
H15	Younger and middle Age are more E-government adopters than older age groups	Age (AG)	E-government Citizens' Adoption
H16	Higher Level of Income are more E-government adopters than lower Level of Income groups	Level of Income (LI)	E-government Citizens' Adoption
H17	Higher Level of Education are more E-government adopters than lower Level of Education groups	Level of Education (LE)	E-government Citizens' Adoption
H18	The Geographic Information has influence over the Website Design of	Geographic Information (GI)	Website Design (WD)

	the E-government applications		
H19	The Geographic Information has influence over the Perceived Usefulness of the E-government applications	Geographic Information (GI)	Perceived Usefulness (PU)
H20	The Geographic Information has influence over the Perceived Ease of Use of the E-government applications	Geographic Information (GI)	Perceived Ease of Use (PEOU)
H21	Geographic Information has positive influence on the E-government citizens' adoption	Geographic Information (GI)	E-government Citizens' Adoption
H22	The Geographic Information increase the level of positive influence of the Website Design on the E-government Citizens' Adoption	Geographic Information (GI)/Website Design (WD)	E-government Citizens' Adoption
H23	The Geographic Information increase the level of positive influence of the Perceived Usefulness on the E-government Citizens' Adoption	Geographic Information (GI)/Perceived Usefulness (PU)	E-government Citizens' Adoption
H24	The Geographic Information increase the level of positive influence of the Perceived Ease of Use on the E-government Citizens' Adoption	Geographic Information (GI)/Perceived Ease of Use (PEOU)	E-government Citizens' Adoption

Table 4. 1: Summary of proposed Hypotheses

The Table 4. 2 (see Appendix B) draws the relation between the different research components including the research questions, the research objectives, the research hypotheses and the research methodologies & methods.

The Table 4. 3 (see Appendix B) shows the relation of each research hypotheses to relevant survey question where we have listed for each hypothesis the correspondent independent, moderate & dependent factors along with their references in the literature review and for each question its initial sources and references.

4.4 Conclusion

In this chapter, we have proposed the GE-government (GI based e-government) citizens' adoption conceptual framework as well as all the hypothesis related to the identified factors from the literature review. In the next chapter, we will start the data analysis process according to the quantitative data collected through the research survey questionnaire.

ANALYTICAL APPROACH



UNIVERSITY of NICOSIA

Chapter 5: Data Analysis

In the Chapter 4, we have described all the potential e-government citizens' adoption influential factors and introduced the conceptual GE-government (GI based e-government) citizens' adoption framework with all its related hypotheses. This chapter will study and analyse the significance and impact of the identified influential factors over the e-government citizens' adoption as well as the demographic factors and therefore a full test over the GE-government citizens' adoption framework.

Data was selected using the survey questionnaire, described in the previous section. Data have been collected from 409 Lebanese citizens. The testing and analysis on the conceptual GE-government (GI based e-government) citizens' adoption were formalized and analysed using SPSS. Descriptive Analysis, Reliability Analysis, Exploratory Factor Analysis, Binary Logistic Regression, Chi-Square and Bivariate Correlation have been employed. The results and findings will be discussed and thus an acceptance or rejection of the various proposed hypotheses will be given.

5.1 Introduction

This research aims to assess the significant and influential role of the Geographic Information factor and the other identified factors over the e-government citizens' adoption such as Perceived ease of Use and Perceived Usefulness – Technology Adoption Model factors, Website Design, Trust in Government, Trust in Internet, Resistance to Change, Attitude, Religious Belief, etc.... and examine the validity of the proposed conceptual framework.

The research conceptual GE-government citizens' adoption framework, as described in the Chapter 4, comprises of all those identified factors including GI and TAM factors. The following section describes the survey sample's demographic characteristics.

To recap, the Research Questions (RQ) as defined in Chapter 3 are:

- What are the factors influencing the e-government citizens' adoption?
- What is the impact of the geographic information (GI) and the other identified influential factors on the adoption of the e-government services?
- What influential role has the geographic information (GI) in the e-government citizens' adoption (EGCA) influential factors?

The RQ1 was covered in the Chapter Two, Secondary Data Research – Systematic Literature Review. The RQ2 and RQ3 will be addressed in this Chapter in order to confirm the findings of the RQ1.

In addition, the Research Objectives (RO) as defined in Chapter 3 are:

1. To identify the factors influencing the e-government citizens' adoption.
2. To address the potential role of GI, as an influential factor, in the adoption of e-government services and validate the identified gap.
3. To explore all the GI related components that reflect the GI influence on the e-government services adoption.
4. To develop, test, validate and finalize the GI-based e-government (GE-government) citizens' adoption framework.
5. To study the GI direct impact on the e-government citizens' adoption.
6. To study the GI direct impact on some of the identified e-government citizens' adoption influential factors.

The RO1, RO2 and RO3 were covered in the Chapter Two, Secondary Data Research – Systematic Literature Review. The RO4, RO5 and RO6 will be addressed in this chapter in order to confirm the findings of the RO1, RO2 and RO3 and identify the e-government citizens' adoption influential factors and the GI direct and indirect impact role over the e-government citizens' adoption.

5.2 Sample Demographics & Survey Responses

5.2.1 Sample Demographics

In this survey, our targeted population were the employees from public and private sectors as well as business owners considered by Gil-Garcia (2012) as the major e-government services' users worldwide (57%). The number of employees in Lebanon is around 1.8 million according to the latest study published in 2007 by the Central Administration for Statistics in Lebanon (CASL). Given that the employment to population Rate in 2007 is 39.5% with a population of 4.5 million (CASL, 2007), Our research study sample size was 409 participants, exceeding the 386 participants which is the minimum acceptable sample size for a satisfactory confidence level of 95% and confidence interval of 5% as per The Research Advisors (2006), Sekaran (2003) and Fowler (2002). Based on the selection of participants from agencies that we have access to, the convenience sampling method was applied by distributing the questionnaire to the citizens employed in those agencies.

The survey data collection process was implemented taking under consideration local culture and work ethics: we started by approaching the directors or decision makers of the selected organizations to make sure we can get their permission for questionnaire distribution to the employees. The selected agencies are listed as per the Table 5. 1:

#	Organization	Sector	Services
1	Chamber of Commerce, Industry and Agriculture in North Lebanon	Private	Business
2	Business Incubator Association of Tripoli (BIAT)	Private	Business Incubator
3	Consolidated Engineering Company	Private	Engineering
4	CCG	Private	IT
5	Tragging	Private	Security
6	Gulftainer Lebanon	Private	Seaport Logistics
7	Lebanese International University	Private	Education
8	Lebanese Franco University	Private	Education
9	Manar University	Private	Education
10	Tripoli University	Private	Education
11	Medgulf Lebanon	Private	Insurance
12	North Lebanon Lawyers Association	Private/Business Owner	Legal
13	North Lebanon Dental Association	Private/Business Owner	Medical
14	North Lebanon Order of Engineers	Private/Business Owner	Engineering
15	North Lebanon Water Establishment	Public	Utility
16	La Kadisha Electricity Company	Public	Utility
17	Urban Community of Al Fayhaa	Public	Municipal

#	Organization	Sector	Services
18	Central Bank of Lebanon	Public	Banking

Table 5. 1: Surveyed Agencies

From (500) survey questionnaires distributed, (446) were collected with fully filled questions, during the period of October – November 2016 which represents a successful questionnaire collection rate of **89.2%**. From the (446) collected questionnaires, (409) were actually used for the analysis representing **91.7%** of the total collected questionnaires since the remaining (**8.3%**) belongs to participants who responded to be oblivious to any E-government services (**2.5%**) or be unaware of any Geographic Information or mapping services (**2.5%**) or both (**3.3%**).

From the (409) accepted participants who are aware of the E-government and Geographic Information, a percentage of (**83.4%**) used the E-government services previously whereas the rest (**16.6%**) did not. Furthermore, (**88%**) of our survey participants had used Geographic Information services before and (**12%**) did not.

The participants were (**55.3%**) male and (**44.7%**) female with a majority of respondents between 20 and 50 years old (**91.6%**) as per Table 5. 2:

Demographic Category	Demographic Sub-category	Frequency	Percentage
Age (in Years)	Less than 20	8	2.0
	20 – 29	223	54.5
	30 – 39	82	20.0
	40 – 49	70	17.1
	50 and More	26	6.4
	Total	409	100.0
Level of Income (in USD)	Less than 500	30	7.3
	500 – 1,500	223	54.5
	1,500 – 2,500	103	25.2
	2,500 – 3,500	36	8.8
	More than 3,500	17	4.2
	Total	409	100.0

Level of Education	Secondary School	19	4.6
	College	28	6.8
	Bachelor	110	26.9
	Higher Education	233	57.1
	Other	19	4.6
	Total	409	100.0
Occupation	Employee in Public Sector	59	14.4
	Employee in Private Sector	227	55.5
	Business Owner	58	14.2
	Other	65	15.9
	Total	409	100.0
Tools used for E-Gov. Transactions	Desktop	47	11.5
	Mobile	173	42.3
	Tablet	20	4.9
	Laptop	121	29.6
	Other	48	11.7
	Total	409	100.0

Table 5. 2: Demographics Distribution

As per Table 5. 2, the majority of the respondents have a level of income between 500 and 2,500 USD (**79.7%**). In addition, the majority of the respondents are well educated with a minimum College degree (**90.9%**), where **57.1%** participants are holders of Higher Education degree. The religion of the participants was **66.7%** Muslims, **26.5%** Christians and **6.8%** decided not to disclose their religion.

As per Table 5. 2, we can realize also that (**55.5%**) of the respondents are working in the private sector and around (**15.9%**) selected the “**Other**” response option corresponding to an “**Employee in Public or Private Sector**” participant’s owner of a small business. (**69.9%**) of the respondents live in Cities or urban areas and (**30.1%**) live in villages or rural areas. Almost all the respondents have internet access in their region of residence (**98.8%**).

The survey shows that (44.4%) of the respondents prefer the use of internet at home, (16.4%) at work and the (39.6%) chose the “Other” response option which means **No preference**. In addition, (55.6%) of the respondents prefer to execute their e-government transactions at home, (20%) at work and (24.4%) chose the “Other” response option which means **No preference**. Finally, we can realize that the majority of respondents prefer to use the tools that offer mobility such as Mobile, Tablet and Laptop (76.8%), (11.5%) prefer to use the Desktop and (11.7%) has **No preference**.

To explore if there is a relation between the EGov Awareness, GI Awareness and Demographics, we used the Pearson Chi-square to test the relationships between the EGov Awareness and the GI Awareness, the Demographics and the EGov Awareness as well as the Demographics and the GI Awareness. The **Pearson Chi-square** is a statistical tool that tests the relationship between two categorical variables whether they are binary (two categories) or more than two categories (Malhotra et al., 2013).

5.2.2 EGov Awareness and GI Awareness Correlation

As stated above, the sample size was 446, including the 37 questionnaires who responded by either not aware of EGov or not aware of GI or not aware of both. The Chi-square was applied to test the relation between the EGov Awareness and the GI Awareness factors.

The Table 5. 3 shows a significant correlation between the EGov Awareness and GI Awareness with an Asymp. Sig. 2-sided (0.000) lower than acceptable threshold (0.05) and Pearson Chi-square value of (135.275) along with significant (0.000) Contingency Coefficient value of (0.482) which shows also good association strength between the EGov Awareness and GI Awareness variables.

Factor1	Factor2	Asymp. Sig. 2-sided (P)	Pearson Chi-Square Value	Contingency Coefficient	
				Approx. Sig.	Value
EGov Awareness	GI Awareness	0.000	135.275	0.000	0.482

Table 5. 3: EGov Awareness & GI Awareness Correlation

5.2.3 EGov & GI awareness correlation with Demographics

In this study also, the sample size was considered 446, including the 37 questionnaires who responded by either not aware of EGov or not aware of GI or not aware of both, in order to test if there is any relation between the EGov & GI Awareness factors responses and the demographic factors.

5.2.3.1 EGov & GI Awareness Correlations with Gender

The Table 5. 4 shows no significant correlation between the EGov Awareness and the Gender with an Asymp. Sig. 2-sided (**0.185**) and a Pearson Chi-square value of (**1.759**). Furthermore, there is no significant correlation between the GI Awareness and the Gender with an Asymp. Sig. 2-sided (**0.083**) and a Pearson Chi-square value of (**3.007**).

Awareness Factor	Demographic Factor	Asymp. Sig. (P)	Pearson Chi-square
EGov Awareness	Gender	0.185	1.759
GI Awareness	Gender	0.083	3.007

Table 5. 4: EGov & GI Awareness Correlation with Gender

5.2.3.2 EGov & GI Awareness Correlations with Age

The Table 5. 5 shows significant correlation between the EGov Awareness and the Age with an Asymp. Sig. 2-sided (**0.026**) and a Pearson Chi-square value of (**11.046**) along with significant (**0.026**) Contingency Coefficient value of (**0.155**) which shows weak association strength between the EGov Awareness and Age variables. Furthermore, there is no significant

correlations between the GI Awareness and the Age with an Asymp. Sig. 2-sided (**0.170**) and a Pearson Chi-square value of (**6.421**).

Factor1	Factor2	Asymp. Sig. 2-sided (P)	Pearson Chi-Square Value	Contingency Coefficient	
				Approx. Sig.	Value
EGov Awareness	Age	0.026	11.046	0.026	0.155
GI Awareness	Age	0.170	6.421	-	-

Table 5. 5: EGov & GI Awareness Correlation with Age

		Age					Total
		1.00	2.00	3.00	4.00	5.00	
EGov Awareness	1.00	0	21	0	2	3	26
	2.00	8	230	85	71	26	420
Total		8	251	85	73	29	446

Table 5. 6: EGov Awareness and Age Cross Tabulation

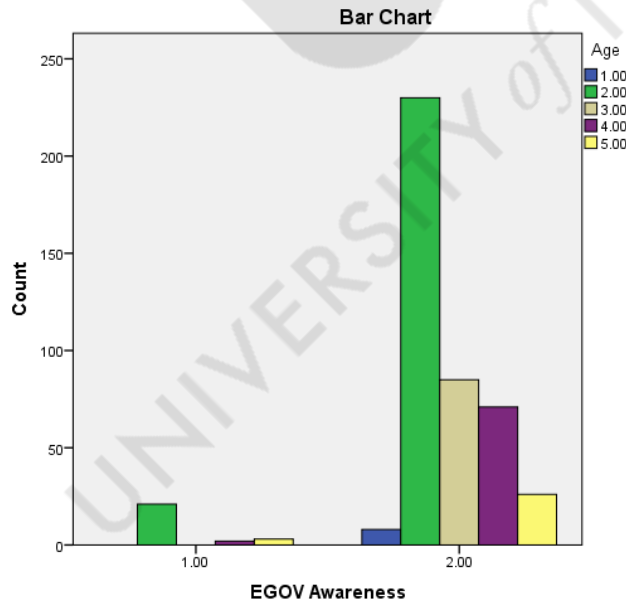


Figure 5. 1: EGov Awareness and Age Cross Tabulation Bar Chart

The awareness on e-government differs between Age groups since there is a statistical significance with a Sig value of (**0.026**). Based on the Table 5. 6 and Figure 5. 1, the majority of

e-government adopters are between group 2, 3 and 4 which represents the age between 20 and 49 years old and accordingly the younger and middle age respondents are the more aware of e-government.

5.2.3.3 EGov & GI Awareness Correlations with Level of Income

The Table 5. 7 shows no significant correlation between the EGov Awareness and the Level of Income with an Asymp. Sig. 2-sided (**0.657**) and a Pearson Chi-square value of (**2.431**). Furthermore, there is no significant correlations between the GI Awareness and the Level of Income with an Asymp. Sig. 2-sided (**0.628**) and a Pearson Chi-square value of (**2.591**).

Awareness Factor	Demographic Factor	Asymp. Sig. (P)	Pearson Chi-square
EGov Awareness	Level of Income	0.657	2.431
GI Awareness	Level of Income	0.628	2.591

Table 5. 7: EGov & GI Awareness Correlation with Level of Income

5.2.3.4 EGov & GI Awareness Correlations with Level of Education

The Table 5. 8 shows no significant correlation between the EGov Awareness and the Level of Education with an Asymp. Sig. 2-sided (**0.974**) and a Pearson Chi-square value of (**0.495**). Furthermore, there is no significant correlations between the GI Awareness and the Level of Education with an Asymp. Sig. 2-sided (**0.993**) and a Pearson Chi-square value of (**0.253**).

Awareness Factor	Demographic Factor	Asymp. Sig. (P)	Pearson Chi-square
EGov Awareness	Level of Education	0.974	0.495
GI Awareness	Level of Education	0.993	0.253

Table 5. 8: EGov & GI Awareness Correlation with Level of Education

5.2.3.5 EGov & GI Awareness Correlations with Religion

The Table 5. 9 shows no significant correlation between the EGov Awareness and the Religion with an Asymp. Sig. 2-sided (**0.922**) and a Pearson Chi-square value of (**0.163**). Furthermore,

there is no significant correlations between the GI Awareness and the Religion with an Asymp. Sig. 2-sided (**0.922**) and a Pearson Chi-square value of (**0.163**).

Awareness Factor	Demographic Factor	Asymp. Sig. (P)	Pearson Chi-square
EGov Awareness	Religion	0.922	0.163
GI Awareness	Religion	0.922	0.163

Table 5. 9: EGov & GI Awareness Correlation with Religion

5.2.3.6 EGov & GI Awareness Correlations with Occupation

The Table 5. 10 shows no significant correlation between the EGov Awareness and the Occupation with an Asymp. Sig. 2-sided (**0.063**) and a Pearson Chi-square value of (**7.293**). Furthermore, there is no significant correlations between the GI Awareness and the Occupation with an Asymp. Sig. 2-sided (**0.205**) and a Pearson Chi-square value of (**4.585**).

Awareness Factor	Demographic Factor	Asymp. Sig. (P)	Pearson Chi-square
EGov Awareness	Occupation	0.063	7.293
GI Awareness	Occupation	0.205	4.585

Table 5. 10: EGov & GI Awareness Correlation with Occupation

5.2.4 Survey Responses

The Table 5. 11 describes the participants' response rate on the questions related to the following potential influential factors: Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Word of Mouth (WOM), Favouritism (FA), Website Design (WD), Internet & Computer Skills Confidence (ICSC), Fear of Job Loss Belief (FJLB), Religious Belief (RB), Attitude (AT), Trust in Internet (TI), Trust in Government (TG), Resistance to Change (RTC), GI Influence on the Website Design in General (GIWDWeb), GI Influence on the e-government Website Design (GIWDEGov), GI Influence on the Website Perceived Usefulness in General (GIPUWeb), GI Influence on the e-government Perceived Usefulness (GIPUEGov), GI Influence on the Website

Perceived Ease of Use in General (GIPEOUWeb), GI Influence on the e-government Perceived Ease of Use (GIPEOUEGov), GI Influence on e-government Adoption (GIEGovAdop) and Citizens' e-government Adoption (EGovAdop).

Factor	Question	N	Mean	Standard Deviation	Response Rate (in %)				
					Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
PEOU	I would like to use the Online Government Services since it facilitates the access to the governmental services.	409	4.1834	0.84198	1.2	3.2	11	45.2	39.4
PU	The more useful Online Government Services are, the more they are valuable to be used.	409	4.2934	0.74556	0.2	2.0	10	43.8	44
WOM	I would highly recommend the use of the Online Government Services.	409	4.1271	0.87921	1.0	4.6	13.2	43	38.1
FA	I prefer to use the Online Government Services instead of the traditional services that rely on interpersonal relationship.	409	4.0098	1.04783	3.2	6.6	15.4	35.7	39.1
WD	I would be more confident while using the Online Government Services if they are designed in a user friendly way.	409	4.2543	0.79452	0.7	2.7	9.5	44.5	42.5
ICSC	If I have internet and computer skills, I will definitely feel capable of using the Online Government Services.	409	4.2518	0.83587	1.2	3.9	6.4	45.5	43
FJLB	I have a negative attitude towards the Online Government Services because it may replace some people's job.	409	2.7897	1.11794	12.2	32	26.7	22.7	6.4
RB	My concerns of immoral content and views on the internet, potentially conflict with my religious and personal belief, which would prevent me from using the Online Government Services.	409	2.2958	1.10392	28.6	31.1	26.4	10	3.9
AT	Using the Online Government Services to interact with government is an appealing idea that I like and thus leads me to easily adapt to any changes that may cause (ex. Ogero online Bill payment service).	409	4.1222	0.85447	1.7	2.7	12.7	47.4	35.5
TI	Faster and more secure internet will make me feel more comfortable and confident when using the Online Government Services.	409	4.4841	0.77672	1.5	2.0	2.9	34	59.7

Factor	Question	N	Mean	Standard Deviation	Response Rate (in %)				
					Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
TG	Advanced government technological capabilities would encourage me to use the Online Government Services.	409	4.3081	0.71603	0.0	1.7	9.8	44.5	44
RTC	I can easily adapt from traditional governmental services to electronic services (ex. Online bill payment service).	409	4.0636	0.84649	0.2	5.1	15.9	45.5	33.3
GIWDWeb	Websites/Web & Mobile Apps enabled by Map based Services (like Google map) are more attractive and appealing to users (ex. Bank ATM or Branch location information).	409	4.0905	0.79158	0.2	3.4	15.4	48.9	32
GIWDEGov	The Online Government Services are more attractive and appealing to users when enabled by the Map based Services (ex. MTC or Alfa retail store or Branch location information).	409	4.0758	0.77119	0.5	2.7	15.2	52.1	29.6
GIPUWeb	The Map based Services increase the usefulness of the Websites/Web & Mobile Apps.	409	3.9756	0.76337	1.0	2.9	15.6	58.4	22
GIPUGov	The Online Government Services are more useful when enabled by the Map based Services.	409	3.9584	0.75455	0.5	2.7	19.6	55	22.2
GIPEOUWeb	The Map based Services increase the ease of use of the Websites/Web & Mobile Apps.	409	3.9560	0.76889	0.5	2.7	20.8	52.8	23.2
GIPEOUEGov	The Online Government Services are more easy to use when enabled by Map based Services.	409	3.8973	0.81000	0.7	4.2	21.5	51.8	21.8
GIEGovAdop	As a user, I prefer to use the Online Government Services enabled by Map based Services when interacting with the government.	409	3.9804	0.76991	1.2	1.5	18.8	55	23.5
EGovAdop	I will use the Online Government Services to interact with the government.	409	0.8875	0.31633	No		Yes		
					11.2		88.8		

Table 5. 11: Influential Factors Participants' Statistics and Response Rate

In this section, we described the sample demographics and survey responses. In the next sections, we will present the survey's data analysis and the associated results.

5.3 Results

5.3.1 Descriptive Statistics

The Table 5. 11 provided a summary of the descriptive statistics of the main factors in our research study. The descriptive statistics includes the Mean and the Standard Deviation of the factors which are based in majority on a Five Likert Scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) and only one factor (the dependent factor EGovAdop) based on a Binary Scale of 0 for No/Reject or 1 for Yes/Accept.

The average response score (Mean) of the factors PEOU, PU, WOM, FA, WD, ICSC, AT, TI, TG, RTC, GIWDWeb, GIWDEGov are significantly higher than (4.0 – **AGREE** response) since they are ranging between (4.0098) to (4.4841) in addition to the EGovAdop dependent factor having a high average score of (0.8875) where the maximum score is 1.0 (**YES** response). The average response score of the GIPUWeb, GIPUEGov, GIPEOUWeb, GIPEOUEGov and GIEGovAdop factors are slightly below (4.0 – **AGREE** response) ranging between (3.8973) and (3.9804). The average response score of the Rev. FA, FJLB and RB are below (3.0 – **NEUTRAL** response) ranging between (2.2958) and (2.7897).

5.3.2 Reliability & Validity

5.3.2.1 Reliability

The research questionnaire reliability was tested using the Reliability Analysis test in SPSS which calculate the Cronbach's coefficient alpha values for the overall questionnaire and the research framework's factors. According to Field (2005) and Hinton et al. (2004), the Cronbach's coefficient alpha measures the reliability and examines the inter-consistency of the data collected. Moreover, Hinton et al. (2004) proposed four reliability categories based on a

value range: Excellent Reliability (above 0.9), High Reliability (0.7-0.9), High Moderate Reliability (0.5-0.7) and Low Reliability (below 0.50).

The overall questionnaire Cronbach's coefficient alpha value, based on 20 standardized items/questions, is 0.846 considered as High Reliability value. The Table 5. 12 shows the Cronbach's coefficient alpha values for the questionnaire's items and the research framework's factors.

Research Framework Factor	Number of items	Cronbach's Alpha (α) if item deleted	Reliability
Ease of Use (PEOU)	1	0.799	High
Usefulness (PU)	1	0.804	High
Word of Mouth (WOM)	1	0.803	High
Favouritism (FA)	1	0.809	High
Website Design (WD)	1	0.806	High
Internet & Computer Skills Confidence (ICSC)	1	0.816	High
Fear of Job Loss (FJLB)	1	0.847	High
Religious Belief (RB)	1	0.852	High
Attitude (AT)	1	0.803	High
Trust in Internet (TI)	1	0.803	High
Trust in Government (TG)	1	0.805	High
Resistance to Change (RTC)	1	0.804	High
GI Influence on Website design in general (GIWDWeb)	1	0.801	High
GI Influence on Website design in EGov (GIWDEGov)	1	0.803	High
GI Influence on Usefulness in general (GIPUWeb)	1	0.803	High
GI Influence on Usefulness in EGov (GIPUEGov)	1	0.796	High
GI Influence on Ease of Use in general (GIPEOUWeb)	1	0.800	High
GI Influence on Ease of Use in EGov (GIPEOUEGov)	1	0.802	High
GI Influence on EGov Adoption (GIEGovAdop)	1	0.798	High
EGov Adoption (EGovAdop)	1	0.814	High
Research Questionnaire	20	0.846	High

Table 5. 12: Reliability Analysis

The research questionnaire's factors have Cronbach's coefficient alpha values, if item/factor deleted, ranging between 0.798 and 0.847 which shows a factors' internal consistency and reliability when measured (Field 2005).

5.3.2.2 Validity

In our study, we have applied three validity techniques: Content Validity, Face Validity and Construct Validity. The content validity technique, described previously in the methodology chapter as part of the Pre-test phase, was first applied where we have met with 3 academic experts in the field of e-government and Geographic Information to review the drafted survey questionnaire in order to guarantee a high content validity. Afterwards, the Face Validity technique, described also in the methodology chapter, was second applied during the pilot study phase where we met with 10 respondents and requested to check the survey questionnaire. During the Face-to-face review meeting, they have provided their feedback and opinion on whether the addressed questions are clear enough for them, then we discussed their suggested corrections and enhancements in order to be introduced in the survey questionnaire. The Construct Validity technique was applied as following: we have introduced the Rev. FA construct, the reverse of the FA construct, with a Mean of 2.5306 and Standard Deviation of 1.21052, only to have two constructs that represent two reverse questions for the purpose of checking the validity of the participants' responses. The comparison between the average responses' scores (Mean) of FA and Rev. FA confirms the validity of the survey questionnaire participants' responses where the calculated scores are considered as reverse scores with 4.0098 for FA (Agree response) and 2.5306 for Rev. FA (Close to Disagree response). Furthermore, the correlation between the FA and Rev. FA, using the Bivariate Correlation Analysis, is highly significant with a significance (2-tailed) value of (0.000) and Pearson Correlation value of (-

0.530) which shows a negative moderate correlation between the FA and Rev. FA (value between 0.4 – 0.59) according to Evans (1996).

5.3.3 Exploratory Factor Analysis (EFA)

To identify the factors' potential grouping according to their correlation, the Exploratory Factor Analysis (EFA) was executed using the Principal Component Analysis (PCA) extraction method with the Varimax – Kaiser Normalization Rotation Method. The EFA will help in identifying the factors that can be grouped together in common components, having relationships between each other, in order to be analysed separately using the Binary Logistic Regression Analysis. The EFA performed on the 16 independent variables or 5 – Likert Scale items, proposed as the potential influential factors over the dependent variable EGovAdop in the Literature Review, shows a KMO (Kaiser-Meyer-Olkin) of (**0.812**) considered as high and acceptable, since it exceeds the (0.5) minimum value required to accept the PCA Factor Analysis results, and a Bartlett's Test of Sphericity with high significance (**0.000**).

The EFA results discovered the existence of 16 components where only 4 components have eigenvalues exceeding 1, considered as important components for analysis according to Hair et al. (1998). The Table 5. 13 shows the initial eigenvalues and the total variance of the 4 components extracted.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.687	29.296	29.296	4.687	29.296	29.296	2.536	15.853	15.853
2	1.545	9.658	38.954	1.545	9.658	38.954	2.358	14.736	30.589
3	1.387	8.669	47.623	1.387	8.669	47.623	2.298	14.361	44.950
4	1.072	6.697	54.320	1.072	6.697	54.320	1.499	9.370	54.320
5	.944	5.901	60.221						
6	.904	5.647	65.869						

7	.845	5.279	71.147						
8	.783	4.896	76.043						
9	.680	4.249	80.292						
10	.628	3.928	84.220						
11	.527	3.296	87.516						
12	.501	3.134	90.650						
13	.435	2.721	93.371						
14	.380	2.377	95.748						
15	.371	2.319	98.068						
16	.309	1.932	100.000						

Table 5. 13: Initial Eigenvalues & Total Variance with 16 Items

The Figure 5. 2 draws the scree plot of the identified components.

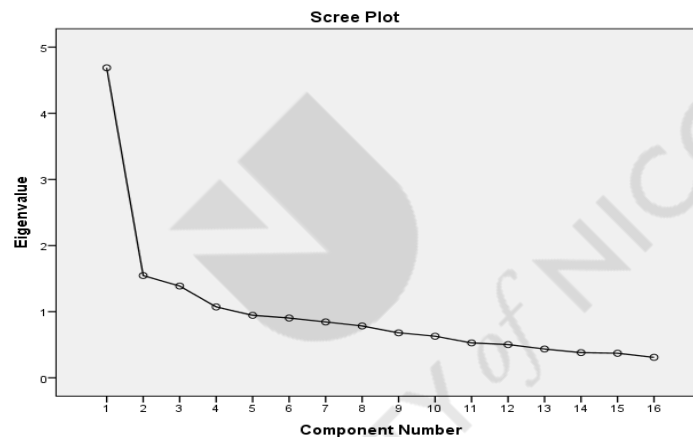


Figure 5. 2: Scree Plot of the Identified Components with 16 Items

The Table 5. 14 shows the distribution of the 16 factors across the four extracted components having a factor loading of above (0.4), defined as the minimum preferable in the IS research (Carter et al., 2008; Dwivedi et al., 2006; Straub et al., 2004) except for the ICSC factor (0.388), and with no cross-loading of the variables where none exceeds the (0.4) in the other components.

Factors	Component			
	1	2	3	4
Perceived Ease of Use	0.723			
Perceived Usefulness	0.769			
Word of Mouth	0.609			
Favouritism	0.595			

Website Design	0.490			
Internet & Computer Skills Confidence			0.388	
Fear of Job Loss				0.839
Religious Belief				0.794
Attitude			0.692	
Trust in Internet			0.548	
Trust in Government			0.666	
Resistance to Change			0.677	
GI Influence on Website Design in EGov		0.515		
GI Influence on Usefulness in EGov		0.716		
GI Influence on Ease of Use in EGov		0.836		
GI Influence on EGov Adoption		0.761		

Table 5. 14: EFA Factors Loading with 16 Items

For double checking the factors' distribution across the four identified components, we have removed the Internet & Computer Skills Confidence (ICSC) independent variable, having a factor loading less than (0.4), and executed again the Exploratory Factor Analysis (EFA) using the Principal Component Analysis (PCA) extraction method with the Varimax – Kaiser Normalization Rotation Method on the remaining 15 independent variables. The calculated KMO (Kaiser-Meyer-Olkin) is of (0.816), previously was (0.812), considered as high and acceptable since it exceeds the (0.5) minimum value required to accept the PCA Factor Analysis results, and a Bartlett's Test of Sphericity with high significance (0.000).

The following Table 5. 15, Figure 5. 3 and Table 5. 16 show the new EFA results where again we have 4 components extracted with eigenvalues greater than 1.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.605	30.702	30.702	4.605	30.702	30.702	2.461	16.406	16.406
2	1.540	10.264	40.966	1.540	10.264	40.966	2.341	15.603	32.009
3	1.379	9.191	50.157	1.379	9.191	50.157	2.288	15.256	47.265
4	1.065	7.097	57.254	1.065	7.097	57.254	1.498	9.988	57.254

5	.904	6.024	63.278						
6	.845	5.633	68.911						
7	.783	5.222	74.133						
8	.682	4.545	78.678						
9	.629	4.193	82.871						
10	.539	3.590	86.461						
11	.504	3.363	89.824						
12	.455	3.033	92.857						
13	.380	2.536	95.392						
14	.376	2.506	97.898						
15	.315	2.102	100.000						

Table 5. 15: Initial Eigenvalues & Total Variance with 15 Items

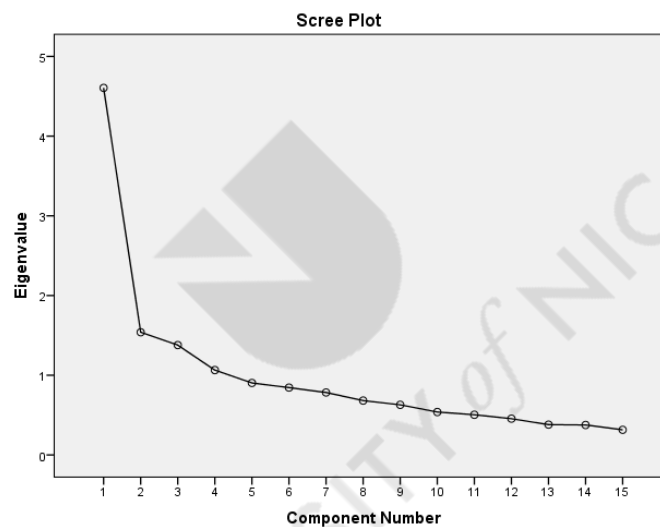


Figure 5. 3: Scree Plot of the Identified Components with 15 Items

Factors	Component			
	1	2	3	4
Perceived Ease of Use	0.712			
Perceived Usefulness	0.757			
Word of Mouth	0.629			
Favouritism	0.586			
Website Design	0.497			
Fear of Job Loss				0.836
Religious Belief				0.798
Attitude			0.714	
Trust in Internet			0.572	
Trust in Government			0.681	

Resistance to Change			0.683	
GI Influence on Website Design in EGov		0.528		
GI Influence on Usefulness in EGov		0.720		
GI Influence on Ease of Use in EGov		0.848		
GI Influence on EGov Adoption		0.761		

Table 5. 16: EFA Factors Loading with 15 Items

The Table 5. 16 shows a similar distribution of the 15 factors across the four extracted components as per the Table 5. 14 (EFA Factors loading with 16 items) where all the 15 factors have a factor loading of above (0.4) and with no cross-loading of the variables, where none exceeds the (0.4) in the other components.

Accordingly, the above analysis indicates the following:

- The **Component 1** groups the Technology Adoption Model (TAM) factors PEOU & PU with WOM, FA and WD social factors.
- The **Component 2** groups the GI based factors, GIWDEGov, GIPUEGov, GIPEOUEGov and GIEGovAdop, related directly to the dependent EGovAdop.
- The **Component 3** groups the Trustworthiness social factors TI & TG with AT and RTC social factors, and the ICSC will be removed from the Component 3 factors as having a factor loading less than (0.4).
- The **Component 4** groups only the Belief social FJLB and RB factors together.
- All the components except the Component2 are totally or partially of social factors.
- All the factors, with factor loading exceeding 0.4 and no cross-load across the other components, are valid and thus the data collected and the results can be considered as reliable and valid.

5.3.4 Framework Testing

In this section, we tested the e-government Citizens' Adoption Framework through various testing method on the framework's influential factors:

1. The four components extracted from the EFA – PCA were tested using the Binary Logistic Regression.
2. The Pearson Chi-square was performed to check the correlation between the GI independent factor and the other three independent factors (WD, PU and PEOU).
3. The Pearson Chi-square was applied in order to examine the relation between the Demographics' factors and the EGovAdop dependent factor.

All the tested factors were analysed according to their relevant proposed hypotheses in Chapter 4 – Conceptual Framework.

The overall e-government Citizens' Adoption Framework was tested with a df (number of factors tested) equal to 15 representing the independent factors defined as potential influential factors over the e-government Citizens' Adoption (EGovAdop) dependent factor. The model significance (Sig.) was equal to **(0.000)** with a Chi-square value of **(113.639)**, the model -2 Log likelihood was equal to **(174.008)**, the Cox-Snell R^2 was equal to **(0.243)** adjusted by Nagelkerke R^2 having a value of **(0.480)**. All the aforementioned results shows that the model fits well with research data.

The Sig. value, calculated for the overall model and for the components based on the Omnibus tests of model Coefficient, represents the P value that should be less than (0.05) to consider the factor, component or model significant. The -2 Log likelihood, that should be a small value close to 0, reflects how much the model or the component fits. The Cox-Snell R^2 , ranging from 0 to 1, measures how well the prediction of the dependent factor based on the independent factors and

should be bigger enough from 0 in addition to the Nagelkerke R^2 , ranging from 0 to 1, considered as “an adjusted version of the Cox-Snell R^2 that adjusts the scale of the statistic to cover the full range from 0 to 1” (IBM, 2017).

5.3.4.1 Binary Logistic Regression Modelling Analysis (BLRMA)

As stated in Chapter 3 – 3.4.3.4 Data validity, reliability & analysis section, the **Binary Logistic Regression Modelling Analysis (BLRMA)**, applied to test the relationship between one dependent variable (binary variable) and multiple independent variables, will follow in order to analyse the relation between the e-government citizens’ adoption dependent variable (binary variable) and the independent variables (Social except digital divide, TAM and GI) identified in the conceptual framework. The main null hypothesis in the BLRMA is that there is no relationship between two variables. The BLRMA will consider a significance level of 0.05 which indicates a 5% risk of concluding that a correlation exists when there is no actual correlation. If the Sig (P) value is less or equal to 0.05, we can consider that there is statistically significant correlation between two variables. If the the Sig (P) value is greater than 0.05, we cannot conclude that there is a statistically significant correlation between the two variables.

Component 1

The component 1 extracted from the EFA – PCA in the previous section comprises of the following factors: TAM factors – Perceived Ease of Use (PEOU) and Perceived Usefulness (PU), in addition to the social factors – Word of Mouth (WOM), Favoritism (FA) and Website Design (WD). The Component 1 factors are significantly correlated according to the Bivariate Pearson Correlation Analysis as shown in the Table 5. 17.

Component 1 Factor		PEOU	PU	WOM	FA	WD
PEOU	Pearson Correlation	1	0.547	0.439	0.465	0.381
	Sig. (2-tailed)		0.000	0.000	0.000	0.000

PU	Pearson Correlation	0.547	1	0.407	0.316	0.412
	Sig. (2-tailed)	0.000		0.000	0.000	0.000
WOM	Pearson Correlation	0.439	0.407	1	0.360	0.199
	Sig. (2-tailed)	0.000	0.000		0.000	0.000
FA	Pearson Correlation	0.465	0.316	0.360	1	0.327
	Sig. (2-tailed)	0.000	0.000	0.000		0.000
WD	Pearson Correlation	0.381	0.412	0.199	0.327	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	

Table 5. 17: Component 1 Factors Bivariate Pearson Correlation

The overall e-government Citizens' Adoption Framework (df=15, Sig=0.000, -2 Log likelihood=174.001, Nagelkerke R^2 =0.480) as well as the component 1 (df=5, Sig=0.000, -2 Log likelihood=237.804, Nagelkerke R^2 =0.227), tested against the binary EGovAdop factor using the BLRMA function in SPSS 20, gave excellent significant Sig. values and fits well as model & component. Furthermore, each factor of the component 1, considered as linear factor with a scale ranging from 1 to 5, was tested and analysed against the EgovAdop binary factor according to the BLRMA.

The Table 5. 18 summarizes the results of the BLRMA and highlights the factors that are classified as significant:

HN	Factors	Coef. (B)	df	Sig. (P)	Odd Ratio (Exp. B)	Confidence (95%) Interval	
						Lower	Upper
H1	PEOU	-0.095	1	0.688	0.909	0.570	1.449
H2	PU	0.553	1	0.033	1.738	1.045	2.888
H3	WOM	0.631	1	0.002	1.879	1.265	2.791
H4	FA	0.301	1	0.074	1.352	0.972	1.880
H6	WD	0.281	1	0.202	1.324	0.860	2.040

Table 5. 18: Component 1 Binary Logistic Regression Extract

The Table 5. 18 indicates that the PU & WOM factors are significant with Sig values (0.033) and (0.002) consequently.

The H2 hypothesis stated that the “High level of Perceived Usefulness has positive influence on the e-government citizens’ adoption”. The BLRMA Sig. value of PU confirms the acceptance of the H2 hypothesis.

In addition, the H3 hypothesis stated that the “High level of positive Word of Mouth has positive influence on the e-government citizens’ adoption”. The BLRMA Sig. value of WOM confirms the acceptance of the H3 hypothesis.

As for the rest of the proposed hypotheses, the BLRMA Sig. values of PEOU, FA and WD are higher than 0.05 and accordingly the H1, H4 and H5 hypotheses are rejected.

Based on the BLRMA results with Coef. (B) Value of (0.553) and Odd Ratio (Exp. B) Value of (1.738), the Perceived Usefulness (PU) is considered a significant key factor having a positive influence over the e-government citizens’ adoption and the likelihood of citizens’ e-government adoption being influenced by PU factor is 1.738 times likely.

Furthermore, with a Coef. (B) Value of (0.631) and Odd Ratio (Exp. B) Value of (1.879), the Word of Mouth (WOM) is considered a significant key factor having a positive influence over the e-government citizens’ adoption and the likelihood of citizens’ e-government adoption being influenced by WOM factor is 1.879 times likely.

Component 2

The component 2 extracted from the EFA – PCA in the previous section comprises of the Geographic Information (GI) based factors: Geographic Information (GI), GI associated to WD impact on E-gov. (GIWDEGov), GI associated to Perceived Usefulness impact on E-gov.

(GIPUEGov) and GI associated to Perceived Ease of Use impact on E-gov. (GIPEOUEGov), related directly to the dependent E-gov. Adoption (EGovAdop).

The Component 2 factors are significantly correlated according to the Bivariate Pearson Correlation Analysis as shown in the Table 5. 20.

Component 2 factors		GIWDEGov	GIPUEGov	GIPEOUEGov	GI
GIWDEGov	Pearson Correlation	1	0.380	0.389	0.386
	Sig. (2-tailed)		0.000	0.000	0.000
GIPUEGov	Pearson Correlation	0.380	1	0.526	0.556
	Sig. (2-tailed)	0.000		0.000	0.000
GIPEOUEGov	Pearson Correlation	0.389	0.526	1	0.543
	Sig. (2-tailed)	0.000	0.000		0.000
GIEGovAdop	Pearson Correlation	0.386	0.556	0.543	1
	Sig. (2-tailed)	0.000	0.000	0.000	

Table 5. 19: Component 2 Factors Bivariate Pearson Correlation

The overall e-government Citizens' Adoption Framework (df=15, Sig=0.000, -2 Log likelihood=174.008, Nagelkerke R^2 =0.480) as well as the component 2 (df=4, Sig=0.000, -2 Log likelihood=239.801, Nagelkerke R^2 =0.219), tested against the binary EGovAdop factor using the BLRMA function in SPSS 20, gave excellent significant Sig. values and fits well as model & component. Furthermore, each factor of the component 2, considered as linear factor with a scale ranging from 1 to 5, was tested and analysed against the EgovAdop binary factor according to the BLRMA.

The Table 5. 20 summarizes the results of the BLRMA and highlights the factors that are classified as significant:

HN	Factors	Coef.	df	Sig.	Odd Ratio (Exp.	Confidence (95%) Interval
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		(B)		(P)	B)	Lower	Upper
H21	GI	1.202	1	0.000	3.328	1.941	5.704
H22	GIWDEGov	0.673	1	0.002	1.960	1.277	3.010
H23	GIPUEGov	-0.185	1	0.491	0.831	0.490	1.407
H24	GIPEOUEGov	-0.063	1	0.816	0.939	0.553	1.595

Table 5. 20: Component 2 Binary Logistic Regression Extract

The Table 5. 20 indicates that the GI & GIWDEGov factors are significant with Sig. values of (0.000) and (0.002) consequently.

The H21 hypothesis stated that the “Geographic Information has positive influence on the e-government citizens’ adoption”. The BLRMA Sig. value of GI confirms the acceptance of the H21 hypothesis.

In addition, the 22 hypothesis stated that the “The Geographic Information increase the level of positive influence of the Website Design on the e-government Citizens' Adoption”. The BLRMA Sig. value of GIWDEGov confirms the acceptance of the H3 hypothesis.

As for the rest of the proposed hypotheses, the BLRMA Sig. values of GIPUEGov and GIPEOUEGov are higher than 0.05 and accordingly the H23 and H24 hypotheses are rejected.

Based on the BLRMA results with High Coef. (B) Value of (1.202) and Odd Ratio (Exp. B) Value of (3.328), the Geographic Information (GI) is considered a significant key factor having a positive influence over the e-government citizens’ adoption and the likelihood of citizens’ e-government adoption being influenced by GI factor is 3.328 times likely.

Furthermore, with a Coef. (B) Value of (0.673) and Odd Ratio (Exp. B) Value of (1.960), the GI associated to WD impact on E-gov. (GIWDEGov) is considered a significant key factor having a positive influence over the e-government citizens’ adoption and the likelihood of citizens’ e-government adoption being influenced by TG factor is 1.960 times likely.

The non-significant WD factor over the e-government citizens' adoption, as per the findings of Table 5. 18, when associated to the GI factor became a significant influential factor over the e-government citizens' adoption which shows the impact and moderate role of the GI onto the influence of the WD factor over the EGovAdop factor.

Component 3

The component 3 extracted from the EFA – PCA in the previous section comprises of the following factors: Trustworthiness social factors – Trust in Internet (TI) and Trust in Government (TG) in addition to the Attitude (AT) and Resistance to Change (RTC) social factors.

The Component 3 factors are significantly correlated according to the Bivariate Pearson Correlation Analysis as shown in the Table 5. 21.

Component 3 Factors		AT	TI	TG	RTC
AT	Pearson Correlation	1	.405	.359	.474
	Sig. (2-tailed)		.000	.000	.000
TI	Pearson Correlation	.405	1	.454	.363
	Sig. (2-tailed)	.000		.000	.000
TG	Pearson Correlation	.359	.454	1	.332
	Sig. (2-tailed)	.000	.000		.000
RTC	Pearson Correlation	.474	.363	.332	1
	Sig. (2-tailed)	.000	.000	.000	

Table 5. 21: Component 3 Factors Bivariate Pearson Correlation

The overall e-government Citizens' Adoption Framework (df=15, Sig=0.000, -2 Log likelihood=174.008, Nagelkerke R^2 =0.480) as well as the component 3 (df=4, Sig=0.000, -2 Log likelihood=237.092, Nagelkerke R^2 =0.231), tested against the binary EGovAdop factor using the BLRMA function in SPSS 20, gave excellent significant Sig. values and fits well as model & component. Furthermore, each factor of the component 3, considered as linear factor with a scale ranging from 1 to 5, was tested and analysed against the EgovAdop binary factor according to the BLRMA.

The Table 5. 22 summarizes the results of the BLRMA and highlights the factors that are classified as significant:

HN	Factors	Coef. (B)	df	Sig. (P)	Odd Ratio (Exp. B)	Confidence (95%) Interval	
						Lower	Upper
H10	AT	0.525	1	0.011	1.690	1.127	2.535
H11	TI	-0.332	1	0.172	0.718	0.446	1.156
H12	TG	0.882	1	0.000	2.415	1.490	3.914
H13	RTC	0.556	1	0.010	1.744	1.141	2.666

Table 5. 22: Component 3 Binary Logistic Regression Extract

The Table 5. 22 indicates that the AT, TG & RTC factors are significant with Sig. values of (0.011), (0.000) and (0.010) consequently.

The H10 hypothesis stated that the “High Level of positive Attitude has positive influence on the e-government citizens’ adoption”. The BLRMA Sig. value of AT confirms the acceptance of the H10 hypothesis.

In addition, the H12 hypothesis stated that the “High Level of Trust in Government has positive influence on the e-government citizens’ adoption”. The BLRMA Sig. value of TG confirms the acceptance of the H12 hypothesis.

Furthermore, the H13 hypothesis stated that the “Low level of Resistance to change has positive influence on the e-government citizens’ adoption”. The BLRMA Sig. value of RTC confirms the acceptance of the H13 hypothesis.

As for the rest of the proposed hypotheses, the BLRMA Sig. values of TR are higher than 0.05 and accordingly the H11 hypotheses is rejected.

Based on the BLRMA results with Coef. (B) Value of (0.525) and Odd Ratio (Exp. B) Value of (1.690), the Attitude (AT) is considered a significant key factor having a positive influence over the e-government citizens’ adoption and the likelihood of citizens’ e-government adoption being influenced by AT factor is 1.690 times likely.

Furthermore, with Coef. (B) Value of (0.882) and Odd Ratio (Exp. B) Value of (2.415), the Trust in Government (TG) is considered a significant key factor having a positive influence over the e-government citizens’ adoption and the likelihood of citizens’ e-government adoption being influenced by TG factor is 2.415 times likely.

Finally, with Coef. (B) Value of (0.556) and Odd Ratio (Exp. B) Value of (1.744), the Resistance to Change (RTC) is considered a significant key factor with lower level of RTC having positive influence over the e-government citizens’ adoption and the likelihood of citizens’ e-government adoption being influenced by the lower level of RTC factor is 1.744 times likely.

Component 4

The component 4 extracted from the EFA – PCA in the previous section comprises of the following factors: Fear of Job Loss Belief (FJLB) and Religious Belief (RB) social factors.

The Component 4 factors are significantly correlated according to the Bivariate Pearson Correlation Analysis as shown in the Table 5. 23.

Component 4 factors		FJLB	RB
FJLB	Pearson Correlation	1	0.420
	Sig. (2-tailed)		0.000
RB	Pearson Correlation	0.420	1
	Sig. (2-tailed)	0.000	

Table 5. 23: Component 4 Factors Bivariate Pearson Correlation

The overall e-government Citizens' Adoption Framework (df=15, Sig=0.000, -2 Log likelihood=174.008, Nagelkerke R^2 =0.480) as well as the component 4 (df=2, Sig=0.000, -2 Log likelihood=265.587, Nagelkerke R^2 =0.104), tested against the binary EGovAdop factor using the BLRMA function in SPSS 20, gave excellent significant Sig. values and fits well as model & component. Furthermore, each factor of the component 4, considered as linear factor with a scale ranging from 1 to 5, was tested and analysed against the EgovAdop binary factor according to the BLRMA.

The Table 5. 24 summarizes the results of the BLRMA and highlights the factors that are classified as significant:

HN	Factors	Coef. (B)	df	Sig. (P)	Odd Ratio (Exp. B)	Confidence (95%) Interval	
						Lower	Upper
H8	FJLB	-0.475	1	0.003	0.622	0.452	0.855
H9	RB	-0.320	1	0.032	0.726	0.542	0.972

Table 5. 24: Component 4 Binary Logistic Regression Extract

The Table 5. 24 indicates that the FJLB & RB factors are significant with Sig. values of (0.003) and (0.032) consequently.

The H8 hypothesis stated that the “Low level of Fear of Job Loss Belief has positive influence on the e-government citizens' adoption”. The BLRMA Sig. value of FJLB confirms the acceptance of the H8 hypothesis.

In addition, the H9 hypothesis stated that the “Low level of Religious Belief has positive influence on the e-government citizens’ adoption”. The BLRMA Sig. value of RB confirms the acceptance of the H9 hypothesis.

Based on the BLRMA results with Coef. (B) Value of (-0.475) and Odd Ratio (Exp. B) Value of (0.622), the Fear of Job Loss Belief (FJLB) is considered a strong significant key factor with higher level of FJLB having negative influence over the e-government citizens’ adoption and the likelihood of citizens’ e-government adoption being influenced by FJLB factor is 0.622 times likely.

Furthermore, with Higher Coef. (B) Value of (-0.320) and Odd Ratio (Exp. B) Value of (0.726), the Religious Belief (RB) is considered a significant key factor with higher level of RB having a negative influence over the e-government citizens’ adoption and the likelihood of citizens’ e-government adoption being influenced by RB factor is 0.726 times likely.

5.3.4.2 Pearson Chi-square for GI-Web factors correlation with WD, PU and PEOU

As stated in Chapter 3 – Data Analysis section, the Pearson Chi-square was used to test the relationships between the GI independent factors GIWDWeb, GIPUWeb and GIPEOUWeb with the other three independent factors (WD, PU and PEOU).

In this study, the sample size is again as initially stated as 409, excluding all the 37 questionnaires from the overall 446 questionnaires who responded by either not aware of EGov or not aware of GI or not aware of both. We tested GI factor correlation with the two TAM factors – PEOU and PU as well as the GI factor correlation with the WD factor.

GIPEOUWeb Correlation with PEOU

The Table 5. 25 shows a significant strong correlation between the GI and the PEOU with an Asymp. Sig 2-sided (**0.000**) and Strong Pearson Chi-Square value of (**125.254**) along with a

Significant (**0.000**) Contingency Coefficient value of (**0.484**) which shows also good association strength between the GIPEOUWeb and PEOU variables.

Factor1	Factor2	Asymp. Sig. 2 sided (P)	Pearson Chi- Square Value	Contingency Coefficient	
				Approx. Sig.	Value
GIPEOUWeb	PEOU	0.000	125.254	0.000	0.484

Table 5. 25: GIPEOUWeb Correlation with PEOU

Accordingly, the H20 hypothesis (The Geographic Information has influence over the Perceived Ease of Use of the e-government applications) was accepted.

GIPIUWeb Correlation with PU

The Table 5. 26 shows a significant correlation between the GI and the PU with an Asymp. Sig 2-sided (**0.007**) and Pearson Chi-Square value of (**33.089**) along with a Significant (**0.007**) Contingency Coefficient value of (**0.274**) which shows an association strength between the GIPIUWeb and PU variables.

Factor1	Factor2	Asymp. Sig. 2 sided (P)	Pearson Chi- Square Value	Contingency Coefficient	
				Approx. Sig.	Value
GIPIUWeb	PU	0.007	33.089	0.007	0.274

Table 5. 26: GIPIUWeb Correlation with PU

Accordingly, the H19 hypothesis (The Geographic Information has influence over the Perceived Usefulness of the e-government applications) was accepted.

GIWDWeb Correlation with WD

The Table 5. 27 shows a significant strong correlation between the GI and the PU with an Asymp. Sig 2-sided (**0.000**) and Pearson Chi-Square value of (**205.506**) along with a Significant (**0.000**) Contingency Coefficient value of (**0.578**) which shows also good association strength between the GIWDWeb and WD variables.

Factor1	Factor2	Asymp. Sig. 2-sided (P)	Pearson Chi-Square Value	Contingency Coefficient	
				Approx. Sig.	Value
GIWDWeb	PU	0.000	205.506	0.000	0.578

Table 5. 27: GIWDWeb Correlation with WD

Accordingly, the H18 hypothesis (The Geographic Information has influence over the Website Design of the e-government applications) was accepted.

5.3.4.3 Pearson Chi-square for EGovAdop correlation with Demographics and D. Divide

As described also in Chapter 3 – 3.4.3.4 Data validity, reliability & analysis section, the Pearson Chi-square was used to explore the impact of the Demographic and Digital Divide variables (independent categorical variables) on the e-government citizens' adoption (binary variable).

EGovAdop Correlation with Gender

The Table 5. 28 shows no significant correlation between the EGov Adop and Gender with an Asymp. Sig. 2-sided (**0.079**) and a Pearson Chi-square value of (**3.087**).

Factor	Demographic Factor	Asymp. Sig. (P)	Pearson Chi-square
EGov Adop	Gender	0.079	3.087

Table 5. 28: EGovAdop Correlation with Gender

The e-government adopters did not differ significantly between the male and female groups since there is no statistical significance with a Sig value of (**0.079**). Accordingly, no correlation between the gender of the respondents & the e-government Adoption factors and thus the H14 hypothesis (Male is more e-government adopter than Female gender) was rejected.

EGovAdop Correlation with Age

The Table 5. 29 shows significant correlation between the EGov Adop and Age with an Asymp. Sig. 2-sided (**0.000**) and a Pearson Chi-square value of (**31.947**) along with significant (**0.000**) Contingency Coefficient value of (**0.269**) which shows good association strength between the EGov Adop and Age variables.

Factor1	Factor2	Asymp. Sig. 2-sided (P)	Pearson Chi-Square Value	Contingency Coefficient	
				Approx. Sig.	Value
EGov Adop	Age	0.000	31.947	0.000	0.482

Table 5. 29: EGovAdop Correlation with Age

		Age					Total
		1.00	2.00	3.00	4.00	5.00	
EGov Adoption	No	0	22	3	10	11	46
	Yes	8	201	79	60	15	363
Total		8	223	82	70	26	409

Table 5. 30: EGovAdop and Age Cross Tabulation

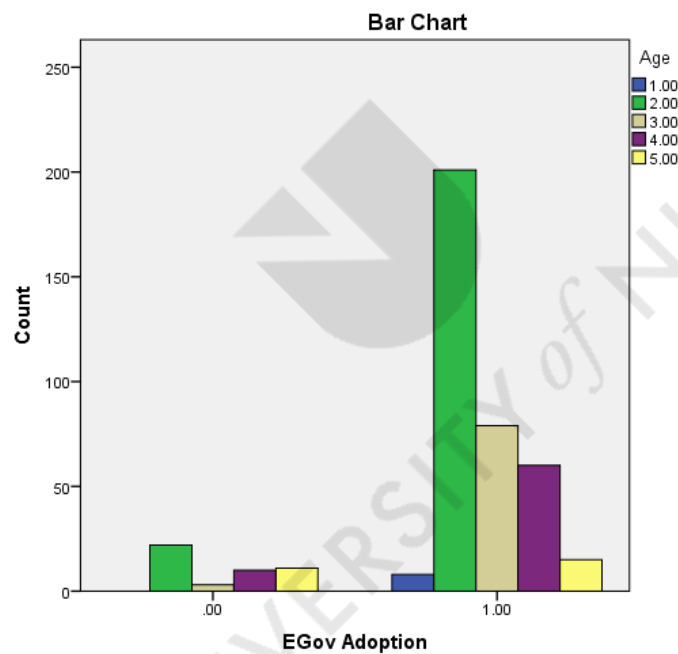


Figure 5. 4: EGov Adop and Age Cross Tabulation Bar Chart

The e-government adopters differ significantly between Age groups since there is a statistical significance with a Sig value of (**0.000**). Based on the Table 5. 30 and Figure 5. 4, the majority of e-government adopters are between group 2, 3 and 4 which represents the age between 20 and 49 years old and accordingly the younger and middle age respondents are the more e-government

adopters and thus the H15 hypothesis (Younger and middle Age are more e-government adopters than older age groups) was accepted.

EGovAdop Correlation with Level of Income

The Table 5. 31 shows no significant correlation between the EGov Adop and Level of Income with an Asymp. Sig. 2-sided (**0.536**) and a Pearson Chi-square value of (**3.135**).

Factor	Demographic Factor	Asymp. Sig. (P)	Pearson Chi-square
EGov Adop	Level of Income	0.536	3.135

Table 5. 31: EGovAdop Correlation with Level of Income

The e-government adopters did not differ significantly between the Level of Income groups since there is no statistical significance with a Sig value of (**0.536**). Accordingly, no correlation between the Level of Income of the respondents & the e-government Adoption factors and thus the H16 hypothesis (Higher Level of Income are more e-government adopters than lower Level of Income groups) was rejected.

EGovAdop Correlation with Level of Education

The Table 5. 32 shows significant correlation between the EGov Adop and Level of Education with an Asymp. Sig. 2-sided (**0.000**) and a Pearson Chi-square value of (**47.325**) along with significant (**0.000**) Contingency Coefficient value of (**0.322**) which shows an association strength between the EGov Adop and Level of Education variables.

Factor1	Factor2	Asymp. Sig. 2-sided (P)	Pearson Chi-Square Value	Contingency Coefficient	
				Approx. Sig.	Value
EGov Adop	Level of Education	0.000	47.325	0.000	0.322

Table 5. 32: EGovAdop Correlation with Level of Education

	Level of Education	Total
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		1.00	2.00	3.00	4.00	5.00	
EGov Adoption	No	6	12	7	16	5	46
	Yes	13	16	103	217	14	363
Total		19	28	110	233	19	409

Table 5. 33: EGovAdop and Level of Education Cross Tabulation

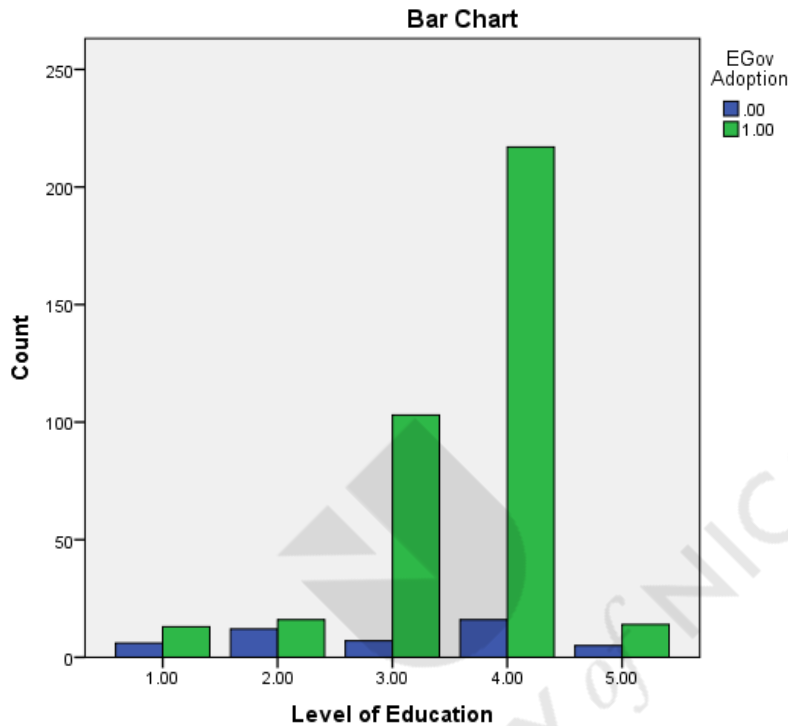


Figure 5. 5: EGov Adop and Level of Education Cross Tabulation Bar Chart

The e-government adopters differ significantly between the five Level of Education groups (Secondary School, College, Bachelor, Higher Education, Other) with a Sig. value of (**0.000**). Based on the results of Table 5. 33 and Figure 5. 5, the majority of the e-government adopters are in Group 3 and 4, holders of Bachelor and Higher Education degrees and the minority are in the groups 1, 2 and 5. The higher level of education respondents (Bachelor and Higher Education) are more e-government adopters than the lower level of education respondents. Accordingly, we realized that there is a correlation between the Level of Education respondents & the e-government Adoption factors and the H17 hypothesis (Higher Level of Education are more e-government adopters than lower Level of Education groups) was accepted.

EGovAdop Correlation with Region of Residence

The Table 5. 34 shows no significant correlation between the EGov Adop and Region of Residence with an Asymp. Sig. 2-sided (**0.955**) and a Pearson Chi-square value of (**0.003**).

Factor	Demographic Factor	Asymp. Sig. (P)	Pearson Chi-square
EGov Adop	Region of Residence	0.955	0.003

Table 5. 34: EGovAdop Correlation with Region of Residence

The e-government adopters did not differ significantly between the City and Village groups since there is no statistical significance with a Sig value of (**0.955**). Accordingly, no correlation between the Region of Residence of the respondents & the e-government Adoption factors.

EGovAdop Correlation with Digital Divide

As defined in Chapter 4, the influence of the Digital Divide factor will be studied over the e-government adoption according to the main citizens' demographic elements including Level of Income, Level of Education, Age and Region of Residence. The Hypothesis 5 (H5) stated that Digital Divide has influence on the e-government citizens' adoption. As we need to study the relation between Digital Divide (DD) and e-government Adoption (EGovAdop) factors, we tested the correlation between them based on the already tested correlations between Level of Income, Level of Education, Age and Region of Residence factors with the EGovAdop factor. The Table 5. 35 shows the previously tested correlations between the 4 factors and the EGovAdop factor.

Digital Divide Factors	Pearson Chi-square	Asymp. Sig.	Correlation with EGovAdop
Age	31.947	0.000	YES
Level of Income	3.135	0.536	NO
Level of Education	47.325	0.000	YES
Region of Residence	0.003	0.955	NO

Table 5. 35: Digital Divide Factors Correlation with EGovAdop

Accordingly, the Digital Divide factor was considered having a correlation with the EGovAdop in terms of Age and Level of Education and thus the H5 was accepted.

EGovAdop Correlation with Religion

The Table 5. 36 shows no significant correlation between the EGov Adop and Religion with an Asymp. Sig. 2-sided (**0.410**) and a Pearson Chi-square value of (**0.003**).

Factor	Demographic Factor	Asymp. Sig. (P)	Pearson Chi-square
EGov Adop	Religion	0.410	1.782

Table 5. 36: EGovAdop Correlation with Religion

The e-government adopters did not differ significantly between adopters' Religion since there is no statistical significance with a Sig value of (**0.410**). Accordingly, no correlation between the Religion of the respondents & the e-government Adoption factors.

EGovAdop Correlation with Occupation

The Table 5. 37 shows no significant correlation between the EGov Adop and Occupation with an Asymp. Sig. 2-sided (**0.215**) and a Pearson Chi-square value of (**4.470**).

Factor	Demographic Factor	Asymp. Sig. (P)	Pearson Chi-square
EGov Adop	Occupation	0.215	4.470

Table 5. 37: EGovAdop Correlation with Occupation

The e-government adopters did not differ significantly between adopters' Occupations since there is no statistical significance with a Sig value of (**0.215**). Accordingly, no correlation between the Occupation of the respondents & the e-government Adoption factors.

EGovAdop Correlation with Internet Availability in RoR

The Table 5. 38 shows significant correlation between the EGov Adop and Internet Availability in RoR with an Asymp. Sig. 2-sided (**0.041**) and a Pearson Chi-square value of (**4.192**) along

with significant (**0.041**) Contingency Coefficient value of (**0.101**) which shows weak association strength between the EGov Adop and Internet Availability in Region of Residence variables.

Factor1	Factor2	Asymp. Sig. 2-sided (P)	Pearson Chi-Square Value	Contingency Coefficient	
				Approx. Sig.	Value
EGov Adop	Internet Availability in RoR	0.041	4.192	0.041	0.101

Table 5. 38: EGovAdop Correlation with Internet Availability in RoR

The e-government adopters differ significantly between adopters' Internet Availability in their Region of Residence since there is a statistical significance with a Sig value of (**0.041**). Accordingly, there is a significant correlation between the Internet availability in Region of Residence of the respondents & the e-government Adoption factors.

EGovAdop Correlation with Internet Use Location Preference

The Table 5. 39 shows no significant correlation between the EGov Adop and Internet Use Location Preference with an Asymp. Sig. 2-sided (**0.5**) and a Pearson Chi-square value of (**1.387**).

Factor	Demographic Factor	Asymp. Sig. (P)	Pearson Chi-square
EGov Adop	Internet Use Location Preference	0.5	1.387

Table 5. 39: EGovAdop Correlation with Internet Use Location Preference

The e-government adopters did not differ significantly between adopters' Internet Use Location Preference since there is no statistical significance with a Sig value of (**0.5**). Accordingly, no correlation between the Internet Use Location Preference of the respondents & the e-government Adoption factors.

EGovAdop Correlation with E-gov. Transaction Execution Location Preference

The Table 5. 40 shows no significant correlation between the EGov Adop and E-gov. Transaction Execution Location Preference with an Asymp. Sig. 2-sided (**0.548**) and a Pearson Chi-square value of (**1.202**).

Factor	Demographic Factor	Asymp. Sig. (P)	Pearson Chi-square
EGov Adop	E-gov. Transaction Execution Location Preference	0.548	1.202

Table 5. 40: EGovAdop Correlation with E-gov. Transaction Execution Preferred Location

The e-government adopters did not differ significantly between adopters' E-gov. Transaction Execution Location Preference since there is no statistical significance with a Sig value of (**0.548**). Accordingly, no correlation between the E-gov. Transaction Execution Location Preference of the respondents & the e-government Adoption factors.

EGovAdop Correlation with E-gov. Transaction Execution Tool Preference

The Table 5. 41 shows significant correlation between the EGov Adop and E-gov. Transaction Execution Tool of Preference with an Asymp. Sig. 2-sided (**0.000**) and a Pearson Chi-square value of (**20.643**) along with significant (**0.000**) Contingency Coefficient value of (**0.219**) which shows an association strength between the EGov Adop and E-gov. Transaction Execution Tool Preference variables.

Factor1	Factor2	Asymp. Sig. 2-sided (P)	Pearson Chi-Square Value	Contingency Coefficient	
				Approx. Sig.	Value
EGov Adop	E-gov. Transaction Execution Tool Preference	0.000	20.643	0.000	0.219

Table 5. 41: EGovAdop Correlation with E-gov. Transaction Execution Preferred Tool

		EGov Transaction Execution Via					Total
		1.00	2.00	3.00	4.00	5.00	
EGov Adoption	No	14	16	0	13	3	46
	Yes	33	157	20	108	45	363
Total		47	173	20	121	48	409

Table 5. 42: EGovAdop and E-gov. Transaction Tool Cross Tabulation

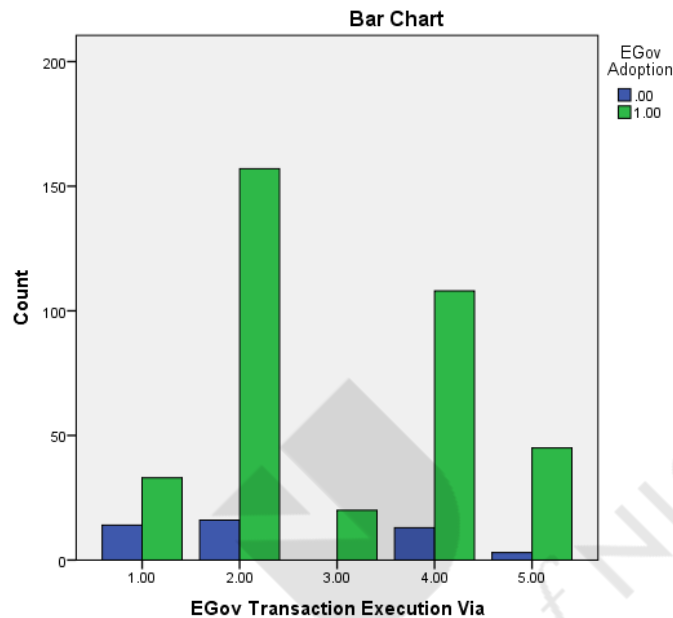


Figure 5. 6: EGov Adop and E-gov. Transaction Preferred Tool Cross Tabulation Bar Chart

The e-government adopters differ significantly between the five E-gov. Transaction Execution Preferred Tool groups (Desktop, Mobile, Tablet, Laptop, Other) with a Sig. value of (**0.000**). Based on the results of Table 5. 42 and Figure 5. 6, the majority of the e-government adopters are in the Groups 2 and 4 (Mobile and Laptop) who are users of mobility tools. The respondents who had mobility tools' preferences are more e-government adopters than the respondents who prefer the desktop tool. This is totally aligned with many researchers' studies (SUNY, 2016; Raja et al., 2012; Al-Hadidi and Rezgui, 2010; Shin, 2007) which stated that citizens are expecting to be more independent from the physical location when looking to execute government e-services and thus increase the e-government adoption through what is called M-government (Mobile

Government). Accordingly, we realized that there is a correlation between the E-gov. Transaction Execution Preferred Tool of the respondents & the e-government Adoption factors.

5.4 Summary of Results

In this study, we have tested and identified, through various analysis tools such as Exploratory Factor Analysis – PCA, Binary Logistic Regression and Pearson Chi-Square, the factors that have significant influence over the e-government Adoption and the accepted proposed hypothesis as defined in Chapter 4. The Table 5. 43 shows the proposed hypotheses along with the test result which classify every hypothesis as accepted or rejected hypothesis.

HN	Research Hypothesis	Independent Factor	Dependent Factor	Hypothesis Accepted
H1	High level of Perceived Ease of Use has positive influence on the E-government citizens' adoption	Perceived Ease of Use (PEOU)	E-government Citizens' Adoption	NO
H2	High level of Perceived Usefulness has positive influence on the E-government citizens' adoption	Perceived Usefulness (PU)	E-government Citizens' Adoption	YES
H3	High level of positive Word of Mouth has	Word of Mouth (WOM)	E-government Citizens'	YES

	positive influence on the E-government citizens' adoption		Adoption	
H4	Low level of Favouritism has positive influence on the E-government citizens' adoption	Favouritism (FA)	E-government Citizens' Adoption	NO
H5	Digital Divide has influence on the E-government citizens' adoption	Digital Divide (DD)	E-government Citizens' Adoption	YES
H6	High level of Website Design has positive influence on the E-government citizens' adoption	Website Design (WD)	E-government Citizens' Adoption	NO
H7	High level of Internet & Computer Skills Confidence has positive influence on the E-government citizens' adoption	Internet & Computer Skills Confidence (ICSC)	E-government Citizens' Adoption	NO

H8	Low level of Fear of Job Loss Belief has positive influence on the E-government citizens' adoption	Fear of Job Loss Belief (FJLB)	E-government Citizens' Adoption	YES
H9	Low level of Religious Belief has positive influence on the E-government citizens' adoption	Religious Belief (RB)	E-government Citizens' Adoption	YES
H10	High Level of positive Attitude has positive influence on the E-government citizens' adoption	Attitude (AT)	E-government Citizens' Adoption	YES
H11	High Level of Trust in Internet has positive influence on the E-government citizens' adoption	Trust in Internet (TI)	E-government Citizens' Adoption	NO
H12	High Level of Trust in Government has positive influence on the E-	Trust in Government (TG)	E-government Citizens' Adoption	YES

	government citizens' adoption			
H13	Low level of Resistance to change has positive influence on the E-government citizens' adoption	Resistance to Change (RTC)	E-government Citizens' Adoption	YES
H14	Male is more E-government adopter than Female gender	Gender (GE)	E-government Citizens' Adoption	NO
H15	Younger and middle Age are more E-government adopters than older age groups	Age (AG)	E-government Citizens' Adoption	YES
H16	Higher Level of Income are more E-government adopters than lower Level of Income groups	Level of Income (LI)	E-government Citizens' Adoption	NO
H17	Higher Level of Education are more E-government adopters than lower Level of Education groups	Level of Education (LE)	E-government Citizens' Adoption	YES

H18	The Geographic Information has influence over the Website Design of the E-government applications	Geographic Information (GI)	Website Design (WD)	YES
H19	The Geographic Information has influence over the Perceived Usefulness of the E-government applications	Geographic Information (GI)	Perceived Usefulness (PU)	YES
H20	The Geographic Information has influence over the Perceived Ease of Use of the E-government applications	Geographic Information (GI)	Perceived Ease of Use (PEOU)	YES
H21	Geographic Information has positive influence on the E-government citizens' adoption	Geographic Information (GI)	E-government Citizens' Adoption	YES
H22	The Geographic Information increase the level of positive influence of the Website Design on	Geographic Information (GI)/Website Design (WD)	E-government Citizens' Adoption	YES

	the E-government Citizens' Adoption			
H23	The Geographic Information increase the level of positive influence of the Perceived Usefulness on the E- government Citizens' Adoption	Geographic Information (GI)/Perceived Usefulness (PU)	E-government Citizens' Adoption	NO
H24	The Geographic Information increase the level of positive influence of the Perceived Ease of Use on the E-government Citizens' Adoption	Geographic Information (GI)/Perceived Ease of Use (PEOU)	E-government Citizens' Adoption	NO

Table 5. 43: Summary of Tested Hypotheses

Based on the Table 5. 43 findings, the GI based e-government (GE-government) Citizens' Adoption conceptual framework was adjusted and the final GI based e-government (GE-government) Citizens' Adoption framework is illustrated in the Figure 5. 7.

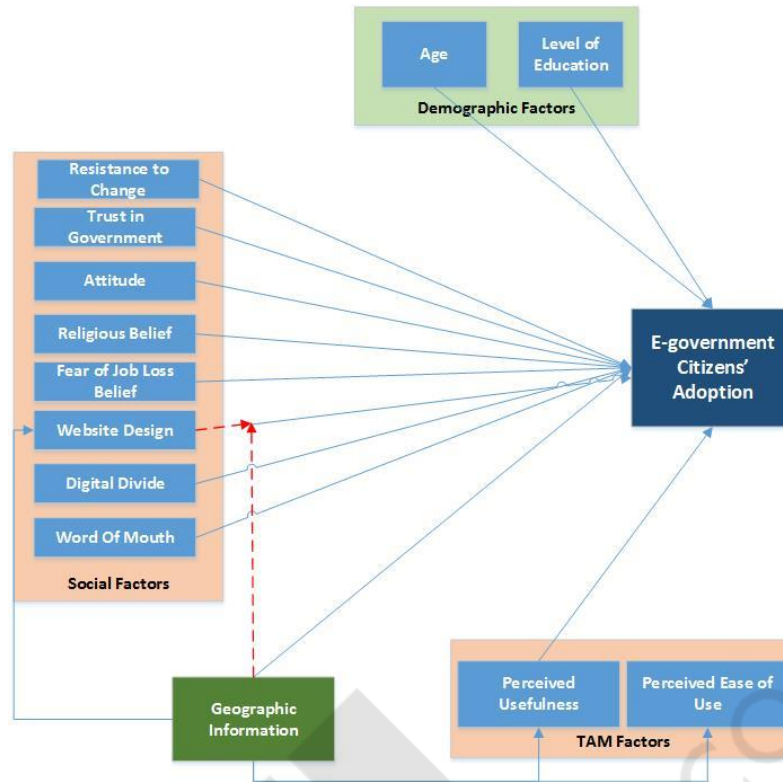


Figure 5. 7: Final GE-Government Citizens' Adoption Framework

5.5 Conclusion

In this chapter, we have tested the proposed GI based e-government (GE-government) citizens' adoption conceptual framework as well as all the related hypothesis, identified the accepted hypothesis and finalized the GI based e-government (GE-government) citizens' adoption framework. In the next chapter, we will execute an interpretation and discussion around the data analysis' results and findings.

Chapter 6: Research Contributions and Conclusion

In this study, we started with a main question in mind regarding the “Geographic Information (GI) influential role in enriching the e-services citizens’ adoption mainly the e-government”. The identified gap has been presented in chapter one and accordingly an extensive literature review on the gap and the relevant topics including e-government, adoption theories, e-government adoption models, geographic information and its adoption in e-government were executed in chapter two. In chapter three, we have set the overall research philosophy, design, methodology, tools and methods, and defined the research aim, gap, questions and objectives in order to find an answer about the potential influential role of GI in the e-government citizens’ adoption. According to the findings of chapter two, the full proposed GI based e-government (G-government) citizens’ adoption framework, including all the potential e-government citizens’ adoption influential factors, was described in chapter four along with all related hypotheses and research survey questionnaire. Chapter five studied and analysed the significance and impact of the identified influential factors on the e-government citizens’ adoption as well as the demographic factors and therefore tested the proposed G-government citizens’ adoption conceptual framework and got tangible results ready for interpretation.

This chapter summarizes the overall research background, discusses and compares the findings of the literature review, the research results and its implications, highlights the contribution to e-government citizens’ adoption as well as the research limitations, and suggests a future research agenda.

6.1 Research Overview

As aforementioned, the aim of this research is to assess the impact of the geographic information factor and the other identified factors on the e-government citizens' adoption such as perceived ease of use and perceived usefulness – technology adoption model – factors, website design, trust in government, trust in internet, resistance to change, attitude, religious belief, etc.... and examine the validity of the proposed G-government conceptual framework.

In chapter one, we identified briefly the e-government, technology adoption and geographic information. We highlighted the importance of understanding the causes, conditions and factors that affects the citizens' intention to adopt the e-government services. We described briefly what potential effect could the GI have on the e-government adoption process. We described in brief Lebanon, as case study of our research.

In chapter two, we undertook an extensive systematic literature review on various topics related to our research. We started with the e-government including its definitions, dimensions, staging theories and maturity models, benefits and barriers/challenges. An overview of the main adoption theories was performed including the technology adoption ones such as the Diffusion of Innovations (Rogers, 1995), The Diffusion and Rejection of Innovations (Abrahamson, 1991), Technology Acceptance Model (Davis, 1985), Unified Theory of Acceptance and Use of Technology – UTAUT (Venkatesh et al., 2003), Technology Organization and Environment Framework – TOE (Tornatzky and Fleischer, 1990) and many others. The identification of the adoption theories was followed by a thorough review on existing e-government citizens' adoption models. Sixteen (16) e-government citizens' adoption models were identified as per Table 2. 3, seven (7) from developed countries and the rest from developing countries. An analysis on the identified models (see Table 2. 3, Figure 2.54, Figure 2.55), supported by many

researchers' opinions and recommendations, shows that the TAM technology adoption model is as the most well-established, well-tested, powerful, robust and parsimonious model for predicting user acceptance of technology (Venkatesh and Davis, 2000) and the most popular amongst all the existing technology adoption models (Chuttur, 2009; Venkatesh and Davis, 2000; Gefen and Straub, 2000; Taylor and Todd, 1995) especially at the individual level. Hence, TAM was used as the basis of our conceptual GI based e-government (G-government) citizen's adoption model extended by the trustworthiness, mainly by integrating the trust in government and trust in internet factors into the TAM model. The e-government's detailed literature review was followed by the geographical information (GI) literature review including its definition and applications, including the Geographical Information System (GIS) as a tool and the Geographical Information Science (GIScience) as a Science, in addition to the GI implementation's benefits. Finally, a thorough research on the GI adoption, as an enabler of many e-government services, identified thirteen (13) GI enabled e-government applications and showed the positive impact of the e-services' GI enabling on improving the citizens' adoption of the e-services, according to the authors' highlighted GI positive impact on a set of e-government citizens' adoption influential factors especially the website design, the perceived ease of use and perceived usefulness (see Table 2. 4, Figure 2.61). Thus, based on the literature review, the GI factor is considered as an essential e-government citizens' adoption factor: However, we could not get an evidence of any published e-government citizens' adoption models considering (i) the GI factor as an independent factor having a direct impact on the citizens' adoption of the e-government Services (ii) and its influence on many other identified factors like website design, perceived ease of use and perceived usefulness. Therefore, we have identified an important gap

and realized the need to develop and test a new framework that assesses the role of the GI factor in the E-government citizens' adoption.

Given the findings of the literature review, we have developed our research philosophy, design, methodology and methods of the study work that should be undertaken. We have applied in our study the positivist research paradigm since it is considered as an IS related research and there is a need to develop from (i) existing technology adoption models and theories, (ii) existing research studies relevant to those models and (iii) an identified gap according to the conducted literature review a new conceptual e-government (categorized under Information System) citizens' adoption framework. This framework should be (a) fully developed based on TAM (Davis, 1989) model using the same defined, independent and measurable factors/variables, (b) amended by adding existing independent and measurable influential e-government citizens' adoption factors/variables in addition to the new defined GI factor and (c) tested through a citizens' survey to assess and analyse the citizens' adoption of the e-government services (see Table 3. 3). We followed in our study the descriptive research type, as it studies the citizens' behaviour on the e-government adoption and the impact of the GI and the existing influential factors on the citizens' adoption decision-making, following a pre-planned and structured design (Sekaran, 2003; Malhotra and Birks, 2000). We applied mainly the deductive research approach in order to (i) identify a clear gap, which is the non-consideration of the GI in any exiting e-government citizens' adoption model as an independent influential factor, (ii) propose a new theory, which is the GI factor improving the e-government citizens' adoption process, and (iii) develop a new framework based on the existing mature technology adoption model (TAM) and the identified influential e-government citizens' adoption factors, to be tested afterward based on a well-defined research methodology and methods. However, an initial inductive research

approach was required in order to gain some qualitative understanding of the influencing factors needed for developing and verifying the survey questionnaire with local culture in mind (Saunders et al., 2003). The research questions and objectives were set in order to provide better understanding of the study execution. The Research questions (RQ) are listed as following:

1. What are the factors influencing the e-government citizens' adoption?
2. What is the impact of the geographic information (GI) on the adoption of the e-government services?
3. What influential role has the geographic information (GI) in the Ee-government citizens' adoption (EGCA) influential factors?

The RQ1 was covered in chapter two, secondary data research – systematic literature review.

The RQ2 and RQ3 will be addressed in this chapter in order to confirm the findings of the RQ1.

In addition, we have set the research objectives (RO):

1. To identify the factors influencing the E-government Citizens' adoption.
2. To address the potential role of GI, as an influential factor, in the adoption of E-government services and validate the identified gap.
3. To explore all the GI related components that reflect the GI influence on the e-government services adoption.
4. To develop, test, validate and finalize the GI-based e-government (G-government) citizens' adoption framework.
5. To study the GI direct impact on the e-government citizens' adoption.

To study the GI direct impact on some of the identified e-government citizens' adoption influential factors.

The Table 3. 4 described the research methodology and methods applied in order to respond to the research questions and objectives which include secondary data research – systematic literature review and quantitative primary data research – structured questionnaire survey along with the data analysis methods that include the descriptive statistics, exploratory factor analysis, binary logistic regression modelling and Pearson Chi-square analysis (see Figure 3.5).

The proposed conceptual GI based e-government (G-government) citizens' adoption framework was introduced in chapter four (see Figure 4. 1) along with a description of all TAM, social, demographic and GI factors, and all their relevant hypotheses. The Table 4. 1 and Table 4. 2 summarizes the relation between the proposed hypotheses and the proposed dependent and independent factors as well as the relation between three (3) research questions, six (6) objectives, twenty four (24) hypotheses and the selected methodology & methods.

In chapter five, the proposed conceptual GI based e-government (G-government) citizens' adoption framework was tested according to the research methodology and methods against the proposed research hypotheses in order to (i) find answers to the research question and objectives, (ii) accept or reject the proposed hypotheses and (iii) assess the significance and the correlation strength between each of the identified dependent and independent variables as described in Table 4. 1. According to the results of the data analysis, nine hypotheses were rejected and, therefore, the new GI based e-government (G-government) citizens' adoption framework was presented showing (i) a significant influential role of many social and demographic factors in the e-government citizens' adoption responding to the research question one, (ii) a significant influential role of the GI on the e-government citizens' adoption that responds to the research question two, (iii) a significant influential role of the GI in other e-government citizens' adoption influential factors and (iv) a moderate impact of the GI on the influential role of the website

design in the e-government citizens' adoption responding to the research question three (see Table 5. 43, Figure 5. 7).

6.2 Research Findings and Implications

The research has reviewed, explored and analysed the influence of various factors, including TAM, social and demographic factors, on the e-government citizens' adoption in addition to the GI factor influence on the e-government citizens' adoption as well as other influential factors which represent the main purpose of our research. The overall research findings on the various factors are summarized in this chapter in order to indicate which of those factors were found significant in terms of the correlation with the dependent variable, e-government citizens' adoption, and what implications those significant factors, mainly the geographic information, could have on the citizens' intention to adopt the government e-services and what G-government citizens' adoption final framework could be introduced. The following subsections give an interpretation on the significant influence of TAM, demographic and social factors over the e-government citizens' adoption then a full interpretation of the GI significant influence on the e-government citizens' adoption and other influential factors including website design, perceived ease of use and perceived usefulness.

6.2.1 TAM factor – perceived ease of use

This research highlighted that citizens do not believe that the e-government services and applications ease of use will improve their e-government adoption where the analysis showed no significant impact of the perceived ease of use (PEOU) on the citizens' intention to adopt e-government services (EGov Adop). Thus, the proposed hypothesis related to PEOU – high level of Perceived Ease of Use has positive influence on the E-government citizens' adoption – was

rejected. This result is inconsistent with some researchers' findings on PEOU (Asmi et al., 2017; Bwalya, 2017; Alateyah et al., 2013; AlHujran et al., 2013; Hung et al., 2006), but it is totally in line with other e-government researchers (Alghamdi and Beloff, 2016; Alomari, 2014; Carter and Belanger, 2004) who stated that one of the main reasons to have a non-significant impact of the PEOU on the e-government adoption could be the nature of the sample used in the primary research – questionnaire survey– whether it is based on frequent internet users' population or not. Thus, having highly educated sample which holds in its majority at least a college degree and categorized under electronic services and internet users using mobility (mobile, laptop, tablet) or desktop tools to execute E-government transactions, we can confirm that the study results are consistent with Alomari (2014) and Carter and Belanger (2004)'s findings and interpretations. Moreover, given that the e-government platform in Lebanon, where we did our case study, is currently emerging from the interaction stage (mainly informative) to the transaction stage (online operations) within the E-Government Maturity Staging model, the e-government users are not facing at this stage difficulties in reaching the needed information and most of the offered transactional services are simple to execute. Accordingly, future studies and investigations will be needed to have more insights into the role of PEOU in E-government citizens' adoption.

6.2.2 TAM factor – perceived usefulness

This research highlighted that citizens believe in the major role of the usefulness of the E-government services and applications in improving their e-government adoption where the analysis showed significant impact of the perceived usefulness (PU) on the citizens' intention to adopt e-government services (EGov Adop). Thus, the proposed hypothesis related to PU – high level of perceived usefulness has positive influence on the e-government citizens' adoption –

was accepted. This result is consistent with many researchers' findings on PU (Asmi et al., 2017; Bwalya, 2017; Alghamdi and Beloff, 2016; Alomari, 2014; Alateyah et al., 2013; AlHujran et al., 2013) who concluded that the citizens' intention to adopt the e-government increases when they start believing in the usefulness of the government websites and electronic services to facilitate their government transactions. Therefore, the government should offer useful electronic services through efficient and reliable websites with high availability of accurate government information and needed transactions within a high IT quality standards.

6.2.3 Social factor – word of mouth

This research identified the citizens' belief in the importance of people opinion and feedback sharing, regarding the e-government services and applications, in enhancing their e-government adoption where the analysis showed significant impact of the word of mouth (WOM) on the citizens' intention to adopt e-government services (EGov Adop). Therefore, the proposed hypothesis related to WOM – High level of positive word of mouth has positive influence on the e-government citizens' adoption – was accepted. This result is consistent with many researchers' findings on WOM (Alomari, 2014; Kim and Prabhakar, 2004) who concluded that the citizens' intention to adopt the E-government increases when they receive positive message or feedback from their peers about the e-government websites or applications' benefits and advantages. Therefore, the government should increase the citizens' awareness on e-government in order to let people understand the advantages of using the e-services and share their experience. Accordingly, future studies and investigations will be needed to assess the role of the marketing strategies and tools, used by the private sector to promote its products such as, but not limited to, traditional marketing practices, incentives, multiple internet access tools (mobile, tablet, laptop, etc...) or social media in increasing the citizens' e-government awareness.

6.2.4 Social factor – favouritism

This research showed that the favouritism or “Wasta”, as known in the Arabic countries, is not an important factor affecting the citizens’ intention to use the e-government services and applications where the analysis determined no significant impact of favouritism (FA) on the citizens’ intention to adopt e-government services (EGov Adop) and, thus, the proposed hypothesis related to FA – low level of favouritism has positive influence on the E-government citizens’ adoption – was rejected. This result is inconsistent with many researchers’ findings on FA (Alghamdi and Beloff, 2016; Alomari, 2014; Al Awadhi and Morris, 2009) who stated that the reduction of the face to face interaction will limit the favouritism and interpersonal network dependency, and will encourage people to execute their daily operations and transactions with the government through reliable e-government services. This inconsistency could be explained by the fact that citizens do not believe in the interdependency between e-government adoption and favouritism factors, especially in the developing countries, where many e-government adopters or supporters still believe in the importance of the interpersonal relationships to finalize some government transactions quickly and not legally through higher priority among others. This was identified by Makhoul and Harrison (2004) who considered favouritism as a psychological manner used widely in many countries including Lebanon to pass over barriers and obstacles in order to get any permit, to be hired for a job or even to facilitate any governmental transaction.

6.2.5 Social factor – digital divide

This research highlighted the citizens’ belief in the role of the digital divide, specifically through the age and level of education components, in improving the usage of the e-government services and applications where the analysis showed significant impact of the age and level of education on the citizens’ intention to adopt e-government services (EGov Adop). Thus, the proposed

hypothesis related to digital divide (DD) – digital divide has influence on the e-government citizens' adoption – was accepted. This result is consistent with many researchers' findings on DD (Alomari, 2014; Alateyah, 2013) who concluded that digital divide, through age and level of education factors, affect positively the citizens' intention to adopt the e-government especially with highly-educated people and young to middle aged. Hence, such results should be taken into consideration by any government when preparing their e-government's awareness marketing roadmap and campaigns especially in the selection of the targeted groups and people to which they want to address and introduce their government e-services. Regarding the other two digital divide components, level of income and region of residence, no significant impact of both factors on the e-government citizens' adoption were identified. This is probably due to the availability of Internet all over the country, Lebanon as case study, and its accessibility in very acceptable prices where according to the Internet World Stats (IWS) the number of Internet users in Lebanon is around 4,545,000 in 2016 representing 75.9% of the population (including Lebanese citizens and Syrian and Palestinian refugees). Such a high Internet users' rate justifies the non-significant role of the region of residence and level of income in the Internet usage and, thus, in the E-government citizens' adoption. Consequently, future studies and investigations will be needed to assess the role of the region of residence and level of income through surveys and analysis in other countries and regions where the Internet accessibility is limited by the Internet cost and its availability especially in rural areas.

6.2.6 Social factor – website design

This research highlighted that citizens do not believe in the role of traditional website design in improving the usage of the e-government services and applications where the analysis showed no significant impact of website design (WD) on the citizens' intention to adopt e-government

services (EGov Adop) and thus the proposed hypothesis related to WD – high level of website design has positive influence on the E-government citizens’ adoption – was rejected. This result is inconsistent with some researchers’ findings on WD (Alateyah, 2013; Alomari, 2010) but is totally in line with many other e-government researchers like Alghamdi and Beloff (2016), Alomari (2014), and Akkaya (2013). This result is logical especially if (i) we consider the existing significant and positive relation (Pearson Chi-Square Sig. value (0.000) and Coef. value: (125.497)) between the design and the easiness of a website (Alghamdi and Beloff, 2016; Alomari, 2014; Akkaya, 2013; etc...) and (ii) we look at the impact of the perceived ease of use factor on the e-government citizens’ adoption which has been considered as not significant. We can conclude that the nature of the sample selected in the primary research – questionnaire survey– whether it is based on frequent internet users’ population or not, could be a logical reason for getting such result. Moreover, the other reasons addressed for the perceived ease of use factor, including the users’ education and the current maturity stage of the e-government platform in Lebanon which requires traditional website design, could be considered valid for the website design factor as potential reasons for having the WD as non-significant factor over the e-government citizens’ adoption. Accordingly, future studies and investigations will be needed in order to have more insights into the positive correlation between PEOU and WD as well as the role of WD in e-government citizens’ adoption through other samples that take into consideration the uneducated citizens, the unemployed citizens and the low skilled labours in addition to other surveys and analysis covering other regions or countries with higher e-government maturity stage.

6.2.7 Social factor – Internet and computer skills confidence

This research excluded the Internet and computer skills confidence (ICSC) social factor from the analysis since it showed low level of factor loading in the exploratory factor analysis (EFA) with a value of (0.388) lower than (0.4) considered as the minimum preferable in the IS research (Carter et al., 2008; Dwivedi et al., 2006; Straub et al., 2004). Thus, the proposed hypothesis related to ICSC – high level of Internet and computer skills confidence has positive influence on the e-government citizens' adoption – was automatically rejected. This factor was considered significant by some researchers' findings (Alghamdi and Beloff, 2016; Alomari, 2014; Al Hujran et al., 2013; Alateyah, 2013). Accordingly, future studies and investigations will be needed to assess the role of the Internet and computer skills confidence in the e-government citizens' adoption with more diversified samples that should include uneducated citizens, unemployed citizens and low skilled labours.

6.2.8 Social factor – fear of job loss belief

This research identified the citizens' fear of losing their job if the e-government services and applications will be widely adopted for executing government transactions where the analysis showed significant negative impact of the fear of job loss belief (FJLB) on the citizens' intention to adopt e-government services (EGov Adop) and thus the proposed hypothesis related to FJLB – low level of fear of job loss belief has positive influence on the e-government citizens' adoption – was accepted. This result is consistent with many researchers' findings on FJLB (Alomari, 2014; Vassilakis et al., 2005) who concluded that the citizens' intention to adopt the e-government increases when they feel safe about their job stability and its independency from the e-government adoption. Therefore, the government should increase the citizens' confidence in the e-government adoption advantages in facilitating their daily job and life tasks. Accordingly,

future studies and investigations will be needed to assess the role of the marketing strategies and tools such as traditional marketing practices, incentives, multiple internet access tools (mobile, tablet, laptop, etc...), social media or public workshops in increasing the employees' confidence in e-government adoption advantages.

6.2.9 Social factor – religious belief

This research identified the citizens' fear of using the e-government services and applications because of their religious belief which prohibits them from using any Internet based technology to avoid viewing and accessing any immoral contents. The analysis showed significant negative impact of the religious belief (RB) on the citizens' intention to adopt e-government services (EGov Adop) and, thus, the proposed hypothesis related to RB – low level of religious belief has positive influence on the e-government citizens' adoption – was accepted. This result is consistent with many researchers' findings on RB (Alomari, 2014; Hofheinz, 2005; Evans and Yen, 2005; Dimitrova and Beilock, 2005) who concluded that the citizens' intention to adopt the e-government increases when they get confident that the Internet and the e-government applications will be totally protected from any appearance of immoral contents. Therefore, the government should increase the citizens' confidence in the e-government website content and its full protection from any kind of malicious or anti-religious contents. Accordingly, future studies and investigations will be needed to assess the role of the marketing strategies and tools such as traditional marketing practices, incentives, multiple internet access tools (mobile, tablet, laptop, etc...) social media or public workshops in increasing the employees' confidence in the e-government website content.

6.2.10 Social factor – attitude

This research identified the citizens' belief in the importance of the positive feelings toward the usage of the e-government services and applications to increase their intention to adopt e-government. The analysis showed significant impact of the attitude (AT) on the citizens' intention to adopt e-government services (EGov Adop) and, thus, proposed hypothesis related to WOM – high level of positive attitude has positive influence on the e-government citizens' adoption – was accepted. This result is consistent with many researchers' findings on AT (Williams et al., 2016; Alomari, 2014; Al Hujran et al., 2013; Susanto, 2013) who concluded that the citizens' intention to adopt the e-government increases when they have positive feelings toward the usage of the e-government websites and applications. Therefore, the government should improve the positive image of the e-government as well as develop an e-government supportive community in order to build up a positive environment around the e-government, which will help citizens in gaining e-government positive thoughts and, consequently, positive feelings. Hence, future studies and investigations will be needed to assess the role of the marketing strategies and tools such as traditional marketing practices, incentives, multiple internet access tools (mobile, tablet, laptop, etc...), social media or public workshops in increasing the citizens' e-government positive attitude toward E-government.

6.2.11 Social factor – trust in internet

This research highlighted that the citizens do not believe in the role of the internet security and privacy to prevent them using the e-government services and applications since the analysis showed no significant impact of trust in Internet (TI) on the citizens' intention to adopt e-government services (EGov Adop) and, thus, the proposed hypothesis related to TI – high level of trust in internet has positive influence on the e-government citizens' adoption – was rejected.

This result is inconsistent with some researchers' findings on TI (Gupta et al., 2016; Alomari, 2014; Al Hujran et al., 2013; Alateyah, 2013) but is in line with other e-government studies (Alghamdi & Beloff, 2016; Alomari, 2010). This result could be considered as logical and expected since the research's demographic results showed high level of educated people (90.8%) and high Internet and computer usage through desktop and mobility tools to execute e-government transactions (88.3%) within the selected study sample (employed citizens). This is in addition to the high Internet usage rate in Lebanon reaching 75.9% of the Lebanon population (IWS, 2016), which shows a high usage of Internet to perform the e-government transactions regardless of the trust in its security and privacy. Consequently, future studies and investigations will be needed to assess the role of the trust in Internet in the e-government citizens' adoption with more diversified samples that should include uneducated citizens, unemployed citizens and low skilled labours, in addition to other surveys and analysis covering other countries and regions where the level of citizens' sensitivity in internet security and privacy is much higher.

6.2.12 Social factor – trust in government

This research highlighted the citizens' belief in the role of the trust in government's honesty and capability to offer citizens reliable and satisfactory services to increase their usage of the e-government services and applications since the analysis showed significant impact of trust in government (TG) on the citizens' intention to adopt e-government services (EGov Adop) and, thus, the proposed hypothesis related to TG – high level of trust in government has positive influence on the e-government citizens' adoption – was accepted. This result is consistent with many researchers' findings on TG (Bwalya, 2017; Gupta et al., 2016; Alomari, 2014; Al Hujran et al., 2013; Alateyah, 2013) who concluded that the citizens' intention to adopt the e-government increases when they start believing in the government's capability of offering

trustful and satisfactory websites and electronic services to facilitate their government transactions. Therefore, the government should develop and empower their electronic services through secure, efficient and reliable websites and applications with high availability and services 24/7 and within a high IT quality standards.

6.2.13 Social factor – resistance to change

This research identified citizens' resistance behaviour to use new online government services and applications due to their fear of changing their traditional way of executing government transaction and the possibility of facing problems when using new advanced services. The analysis showed significant negative impact of the resistance to change (RTC) on the citizens' intention to adopt e-government services (EGov Adop) and, thus, the proposed hypothesis related to RTC – low level of resistance to change has positive influence on the e-government citizens' adoption – was accepted. This result is inconsistent with some researchers' findings on RTC (Alomari, 2014; Abu-Shanab, 2012) but is consistent with some other studies (Schwester, 2009; Kamal and Themistocleous, 2006; Ndou, 2004) who concluded that the citizens' intention to adopt the e-government increases when they become able to over pass the resistance behaviour's barriers. Therefore, the government should develop a well-defined contribution plan to increase the awareness of the citizens on the e-government services advantages, their familiarity with the government electronic and online websites and applications and their confidence in their capability of using those websites and applications with minimum efforts and errors. Accordingly, future studies and investigations will be needed to assess the role of the marketing programs, the social media, the public workshops, the training programs or any other facilitator/accelerator programs that should assist the government in reducing the citizens' resistance towards the e-government services adoption.

6.2.14 Demographics – gender

This research showed no significant difference between male and female regarding the usage of the government e-services and applications. The analysis showed no significant impact of the gender (GE) on the citizens' intention to adopt e-government services (EGov Adop) and, thus, the proposed hypothesis related to GE – male is more e-government adopter than female gender – was rejected. This result is inconsistent with some researchers' findings on GE (Williams et al., 2016; Alateyah, 2013; Voutinioti, 2013; Al-Shafi and Weerakkody, 2009) but is consistent with some other studies (Alomari, 2014; Susanto, 2013) who concluded that the citizens' gender is not affecting significantly the intention to adopt the e-services. This result is logical due to the nature of the sample which includes, in its majority, educated and employed participants and the nature of the country, Lebanon as a case study, where the male and female have equality in the overall rights and their internet accessibility and availability is guaranteed anywhere and anytime. Consequently, future studies and investigations will be needed to assess the role of the gender in the e-government citizens' adoption with more diversified samples that should include uneducated citizens, unemployed citizens and low skilled labours, in addition to other surveys and analysis covering other countries and regions where the difference in overall rights between male and female exists.

6.2.15 Demographics – age

As described previously in the section 6.2.5. (social factor – digital divide), this research highlighted the citizens' belief in the role of the young and middle age people in increasing the usage of the e-government services and applications. The analysis showed significant impact of the age on the citizens' intention to adopt e-government services (EGov Adop) and, thus, the proposed hypothesis related to age (AG) – younger and middle age are more e-government

adopters than older age groups – was accepted. This result is consistent with many researchers' findings on AG (Williams et al., 2016; Alomari, 2014; Alateyah, 2013; Voutinioti, 2013; Al-Shafi and Weerakkody, 2009) who concluded that age affects positively the citizens' intention to adopt the e-government mainly with young to middle aged people. Hence, such results should be taken into consideration by any government when preparing their e-government's awareness marketing roadmap and campaigns especially in the selection of the targeted groups and people to which they want to address and introduce their government e-services.

6.2.16 Demographics – level of income

As described previously in the section 6.2.5. (social factor – digital divide), this research highlighted that the citizens do not believe in the role of people income in increasing the usage of the E-government services and applications. The analysis showed no significant impact of the level of income on the citizens' intention to adopt e-government services (EGov Adop) and thus the proposed hypothesis related to level of income (LI) – higher level of income are more e-government adopters than lower level of income groups – was accepted. This result is inconsistent with some researchers' findings on LI (Abu Nadi, 2008) but is consistent with some other studies (Alomari, 2014) who concluded that the citizens' level of income does not affect significantly the intention to adopt the e-services and this is probably due to the availability of Internet all over the country, Lebanon as case study, and its accessibility in very acceptable prices where according to the Internet World Stats (IWS) the number of internet users in Lebanon is around 4,545,000 in 2016 representing 75.9% of the population (including Lebanese citizens and Syrian & Palestinian refugees). Such a high Internet users' rate justifies the non-significant role of the level of income in the Internet usage and, thus, in the e-government citizens' adoption. Consequently, future studies and investigations will be needed to assess the

role of the level of income through surveys and analysis in other countries and regions where the Internet accessibility is limited by the internet cost.

6.2.17 Demographics – level of education

As described previously in the section 6.2.5. (social factor – digital divide), this research highlighted the citizens' belief in the role of the highly educated people in increasing the usage of the e-government services and applications. The analysis showed significant impact of the level of education on the citizens intention to adopt e-government services (EGov Adop) and, thus, the proposed hypothesis related to level of education (LE) – higher level of education are more e-government adopters than lower level of education groups – was accepted. This result is consistent with many researchers' findings on AG (Alomari, 2014; Susanto, 2013; Alateyah, 2013; Voutinioti, 2013; Al-Shafi and Weerakkody, 2009; Abu Nadi, 2008) who concluded that the level of education affects positively the citizens' intention to adopt the e-government mainly with high-level educated people. Hence, such results should be taken into consideration by any government when preparing their e-government's awareness marketing roadmap and campaigns especially in the selection of the targeted groups and people to which they want to address and introduce their government e-services.

6.2.18 Geographic information

The main objective of his research is to assess the role of the geographic information (GI) in improving the e-government citizens' adoption. Therefore, we will describe our research findings on the influence of the geographic information factor (i) on the e-government citizens' adoption directly (ii) in addition to its influence on some of the identified e-government adoption influential factors including website design, perceived usefulness and perceived ease of use (iii)

as well as its moderate influence on the impact of those factors on the e-government citizens' adoption.

6.2.18.1 GI impact over website design (WD)

This research highlighted the citizens' belief in the role of the geographic information, through its services and system components such as the mapping component, in enhancing the government website design. The analysis showed significant impact of GI on the website design of the E-government applications and, thus, the proposed hypothesis related to GI and WD – the geographic information has influence over the website design of the e-government applications – was accepted. This result is consistent with the findings of different researchers, like Marson et al. (2015), Shah and Wani (2015), Ijeh (2014) and Pandagale et al., (2014), who identified a major role of the GI in improving the website design of many e-government applications and services (Web GI Campus Information Application, Spatial Data Infrastructure Geo-portal, E-participation application, E-tourism Application, etc...).

Furthermore, an additional influential role of the GI on the WD was identified. The analysis showed that people believe in the impact of the website design, if enabled by the GI services and systems mainly the mapping services, in improving the usage of the government e-services and applications. Accordingly, we recognized a significantly moderate role of the GI in the relation between WD and EGovAdop where the WD, considered as non-significant factor in the E-government adoption (EGovAdop), enabled by GI became significant factor in the e-government citizens' adoption. Thus, the additional proposed hypothesis related to GI and WD/EGovAdop – the geographic information increase the level of positive influence of the website design on the e-government citizens' adoption – was accepted. Those two accepted hypotheses should bring the

attention of any government, looking for better usage of their e-services, into the necessity of introducing the GI components and services in all government's websites design.

6.2.18.2 GI impact over perceived usefulness (PU)

This research highlighted the citizens' belief in the role of the geographic information, through its services and system components such as the mapping component, in enhancing the government websites and applications usefulness. The analysis showed significant impact of GI on the perceived usefulness of the E-government applications and, thus, the proposed hypothesis related to GI and PU – the geographic information has influence over the perceived usefulness of the e-government applications – was accepted. This result is consistent with the findings of different researchers, like Aphane (2015), Bediroğlu (2015) Marson et al. (2015), Shah and Wani (2015), Ijeh (2014), Gupta et al. (2014), and Pandagale et al. (2014) who identified a major role of the GI in improving the websites usefulness of many e-government applications and services (E-land administration application, Spatial Data Infrastructure Geo-portal, E-tourism Application, E-elections Management Application, E-tax Application, Complaints Management System, etc...).

The further analysis of the role of the GI in the relation between PU and the e-government adoption did not show any influential moderate role of GI. The analysis showed that people's belief in GI to improve the usefulness of the E-government services but not in PU, is considered as a significant factor in the e-government adoption (EGovAdop), if enabled by GI to affect positively or increase their usage. Accordingly, the additional proposed hypothesis related to GI and PU/EGovAdop – the geographic information increase the level of positive influence of the perceived usefulness on the e-government citizens' adoption – was rejected. Those two accepted hypotheses should bring the attention of any government, looking for better usage of their e-

services, into the necessity of introducing the GI components and services in all government's websites design. Hence, such results require future studies and investigations with more diversified samples to assess the moderate role of GI in the significant impact of PU on e-government adoption especially that GI has direct significant impact on PU.

6.2.18.3 GI impact over perceived ease of use (PEOU)

This research highlighted the citizens' belief in the role of the geographic information, through its services and system components such as the mapping component, in enhancing the government websites and applications ease of use where the analysis showed significant impact of GI on the perceived usefulness of the e-government applications and, thus, the proposed hypothesis related to GI and PEOU – the geographic information has influence over the perceived ease of use of the e-government applications – was accepted. This result is consistent with the findings of different bodies of research (Aphane, 2015; Bediroğlu, 2015; Marson et al., 2015; Shah and Wani, 2015; Ijeh, 2014; Gupta et al., 2014; Pandagale et al., 2014) which identified a major role of the GI in improving the websites easiness of many e-government applications and services (E-land administration application, Spatial Data Infrastructure Geo-portal, E-tourism Application, E-elections Management Application, E-tax Application, Complaints Management System, etc...).

The further analysis of the role of the GI on the relation between PEOU and the e-government adoption did not show any influential moderate role of GI. The analysis showed people believe in GI to improve the easiness of the e-government services but not in PEOU, which is already considered as non-significant factor in the e-government adoption (EGovAdop), if enabled by GI to become significant factor in the e-government adoption. Accordingly, the additional proposed hypothesis related to GI and PEOU/EGovAdop – the geographic information increase the level

of positive influence of the perceived ease of use on the e-government citizens' adoption – was rejected. Hence, those results indicate participants' conviction on the non-existence of a significant relation between the easy use of the e-government websites and their adoption. Accordingly, future studies and investigations are required with more diversified samples to have more insights into the role of PEOU in e-government citizens' adoption and to assess the moderate role of GI in the potential relation between PEOU and e-government adoption.

6.2.18.4 GI impact over e-government citizens' adoption

This research highlighted the citizens' belief in the role of the geographic information, through its services and system components such as the mapping component, in enhancing the government websites and applications usage. As for the analysis, it showed significant impact of the geographic information on the citizens' intention to adopt e-government services (EGov Adop) and, thus, the proposed hypothesis related to geographic information (GI) – geographic information has positive influence on the e-government citizens' adoption – was accepted. Considering all the above results related to GI especially the moderate role of GI in the relation between WD and EGovAdop along with the direct impact of GI on EGovAdop, a new influential factor in e-government adoption has been identified. We can consider that such results should open the door widely for further related studies and investigations elsewhere, in developed and developing countries, especially that it is consistent with the findings of some research (Kurwakumire, 2013; O'Looney, 2000; Nedovic-Budic, 1999) which stated that the geographic information, when used to geo-enable the e-government applications, has positive impact on the e-government adoption, responds to the citizens' needs and facilitates their interaction with the government, aligning with the governments' initiatives to introduce the geographic information in their e-government platform.

6.3 Contribution to the E-government Citizens' Adoption

In this chapter, we can confirm the research key question about the existence of a significant relation between the geographic information and the e-government citizens' adoption. This research identified a new factor, geographic information, considered as influential on the citizens' adoption of the government e-services and, thus, introduced the G-government (GI based e-government) adoption framework considered as a new framework in the e-government study area to be examined further in the future. This research has contributed in theory and practice to the e-government through many perspectives.

6.3.1 Contribution to Theory

In our research, we have set various objectives that cover all the research aspects including the introduction of a new e-government adoption framework and identification of all the e-government adoption influential significant factors. Between the conceptual (see Figure 4. 1) and the final (see Figure 5. 7) e-government citizens' adoption research framework, many hypotheses were rejected, some proposed factors were removed and the remaining factors were retained and identified as significant influential factors according to the study executed in Lebanon.

Introduction Of A New E-Government (GE-Government) Citizens' Adoption Framework

The first theoretical contribution of our research is about the design, development and introduction of a new e-government adoption framework that is based on the TAM technology adoption model but is extended by multiple social and demographic factors identified in the literature review, in addition to the main targeted GI factor considered as the new identified influential factor introduced for the first time in an e-government adoption framework. Accordingly, the research e-government adoption framework should be used as the base for any

future studies on the e-government adoption that assesses the role of multiple factors including GI.

Confirmation on the Geographic Information Influential Role Over E-Government Adoption

The second theoretical contribution exists within the final e-government citizens' adoption framework, which saved the GI as an essential influential factor through its various direct and moderate roles in the E-government adoption. The GI factor shows a strong direct influence on the e-government adoption, strong direct influence on the website design, perceived ease of use and less over the perceived usefulness, and finally a strong moderate indirect role on the website design which has been considered as non-influential, standalone factor but turned into influential factor when associated to GI. Therefore, the GI should be considered and included as a potential influential factor in any new e-government proposed conceptual frameworks to assess and examine its influential role in the e-government adoption in both developed and developing countries. Indeed, GI showed strong significant, direct and moderate role in various factors in the Lebanese case study categorized under eastern developing countries but sharing many cultural beliefs and attitudes with the western countries.

Identification of a Relation between Website Design & Perceived Ease Of Use Factors

The third theoretical contribution occurs in the identification of a significant and positive relation between the website design and the perceived ease of use factors in the e-government context. This relation, highlighted by some researchers like Alghamdi and Beloff (2016), Alomari (2014) and Akkaya (2013) among others, should be further studied not only for e-government but also for any Internet or online-based technology. This is to show that this strong correlation is not only at the level of impact of one on the other but it goes beyond to reach the level of predicting

the impact of any one of them on the technology adoption when having the impact outcome of the other which has been denoted in our research by getting insignificant impact of both factors on the e-government adoption.

Identification of a Relation between Fear Of Job Loss & Religious Beliefs Factors

The fourth theoretical contribution appears in the identified relation between the fear of job loss and religious beliefs factors, significantly correlated and forming together the component 4 in the exploratory factor analysis, where both have been characterized as negative significant predictors on the e-government adoption. This strong correlation between FJLB and RB can be justified since people, in the countries having economy or security instability in addition to a strong addiction to the religious thoughts, are always suspicious or in fear of anything untraditional or new that could contradict their beliefs or habits, which leads indirectly to the resistance to change identified also in our research as significant predictor of the e-government adoption.

Identification of a Relation between Attitude, Trust In Government & Resistance To Change Factors

The final theoretical contribution exists in the identified relation among attitude, trust in government and resistance to change factors, significantly correlated within the component 3 in the exploratory factor analysis. On one hand, this relation shows a strong role of trust in government in increasing the positive attitude of citizens towards the e-government and reducing the citizens' resistance to change towards the adoption of e-government services. On the other hand, the citizens' positive attitude towards e-government definitely reduces the citizens' resistance to change and affects positively the trust in government services.

6.3.2 Managerial Contributions

In the practice, the research contributes in two main perspectives.

GE-Government Framework Availability To Guarantee E-Government Successful Adoption

The first practical perspective is about the availability of a new GE-government framework ready to be tested in developed and developing countries to evaluate the impact of various factors mainly the GI in order to build an e-government implementation plan, before any new e-services' implementations or upgrades that guarantee citizens' adoption.

Geographic Information to Improve E-Government Adoption & Website Design

The second practical contribution lies mainly in the role of the geographic information in improving the e-government adoption and enhancing the e-government websites design, simplicity and usefulness. The research shows a strong citizens' intention to use the e-government websites if empowered by the GI components, mainly mapping component, since it gives a more appealing design to the users. The GI for users is an added value that enhances the efficiency and effectiveness of the e-government websites. Although there are many initiatives from various countries to implement GI components and services to facilitate some e-government transactions, governments need to think deeply about the strong citizens' intention to use e-government if GI enabled, consider the GI as a booster of the e-government adoption and thus introduce it within the e-government development strategies and implementation plans as a core component taking into account all the technical requirements that guarantee the successful implementation and adoption of the e-government services.

Identification of the Targeted E-Government Adopters

The final practical contribution lies in the identification of the group of people that the government should target when promoting its services or preparing its e-government's awareness

marketing roadmap and campaigns, showing a concentration within the young to middle aged citizens' groups having at least a college degree or higher.

6.4 Research Limitations and Future Research Agenda

In this section, a list of identified research limitations have been identified and well defined future research agenda has been proposed. This research studied various factors that might have impact on the e-government adoption where multiple factors have been identified as significant. The inconsistency between the literature review and the explored results of those non-significant factors could be related to some research limitations.

For example, the perceived ease of use (TAM factor), website design, Internet and computer skills confidence and trust in Internet (social factors) and gender (demographic factor) were non-significant for the e-government adoption. Those results might be due to the limitation in the sample selected where the majority of the participants are employed and educated, which eliminated the unemployed citizens and did not focus on the low skilled or uneducated people.

Another limitation in our research is the concentration of the sample's participant in Lebanon, as a case study, mainly in the major cities. We might need to extend our surveys to some rural areas in Lebanon where the level of citizens' sensitivity to internet security and privacy is much higher, the internet and computer literacy is much lower, the internet accessibility is much lower and the difference between male and female exists in the level of full human rights, which, consequently, affects directly the analysis of the impact of trust in Internet, Internet and computer skills confidence and gender factors over the e-government adoption.

Moreover, the new G-government citizens' adoption framework should be tested in other developing and developed countries where various conditions could differ such as the people's culture, attitudes and beliefs, the level of e-government maturity, the cost of Internet, the Internet

availability and many others which might affect the level of impact of the various potential influential factors, especially the social ones, on the e-government adoption.

Furthermore, running such tests on the G-government citizens' adoption framework through additional surveys in Lebanon and other countries, either developing or developed, with more diversified samples will be very important to confirm the research findings especially the positive analysis results on the direct significant GI impact on the e-government adoption, the moderate GI impact on the relation between WD and EGov. Adoption and the direct GI impact on WD, PEOU and PU. Consequently, the moderate GI impact on the relation between PEOU, PU, and EGov. Adoption factors will be investigated considering the region or country conditions.

In this research, the assessment of the impact of the various factors on the e-government adoption reflects the intention to adopt and not the real adoption or use of e-government services. Having the TAM model as the basis of our G-government adoption framework, the study explored the factors that influence people's intention to adopt e-government and, thus, an additional study on the exact adoption of the e-government services will be required. This future research will lead to an extension and update of our framework in order to cover factors, intention to adopt and real adoption.

In addition to the identified limitations and their relevant suggested future research, various interesting findings were extracted during our research data analysis leading to some proposed future research and investigations that might affect positively the e-government adoption.

The significant role of the word of mouth, fear of job loss, religious belief, resistance to change, attitude and the digital divide, mainly the age and the level of education, over the e-government adoption highlighted the need to increase the e-government awareness and later on the e-

government usage of the e-services. The e-government awareness improvement will require a further study and investigation to assess the role of the marketing strategies and tools that include, but are not limited to, traditional marketing practices, incentives, multiple internet access tools (mobile, tablet, laptop, etc...), social media, workshops or public campaigns in increasing the citizens' e-government awareness. When preparing the e-government's awareness marketing roadmap and campaigns, the age and education level categories should be taken into consideration so as to select the targeted groups and people to which the government want to address and introduce its e-services. Such E-government awareness will increase the citizens' confidence in e-government adoption advantages and e-government website content, reduce the negative attitude toward e-government and decrease the citizens' resistance towards the e-government services adoption.

Moreover, the strong correlation between the e-government awareness and the GI awareness, identified in our research, in addition to the strong impact of GI on the E-government adoption, demonstrates that there is a necessity to study the importance of introducing and presenting GI based e-government services in the e-government awareness marketing roadmap and campaigns because of their positive effect on people's understanding of the usefulness of the proposed e-government services with a high familiarity and awareness of people on the GI services such as Google maps.

6.5 Conclusion

The main purpose of this research to identify the potential role of the geographic information factor over the E-government citizens' adoption as well as over other influential factors having impact over the E-government adoption. The author succeeded in identifying the existence of a role of the geographic information as a new significant predictor over the e-government citizens'

adoption and other influential factors like website design, perceived ease of use and perceived usefulness and identified also a set of other important influential factors including social, demographics and technology adoption factors. An extensive systematic literature review, on (i) e-government with all its aspects, (ii) technology adoption theories and models, (iii) e-government citizens' adoption models along with their related influential factors and (iv) finally the geographic information and its applications on the e-government, was executed by the author in order to identify those potential influential factors. The author was able to define the research gap related to the potential existence of GI influence on the citizens' adoption of the e-government services through its impact on other e-government citizens' adoption influential factors like website design, perceived ease of use, perceived usefulness, and the evidence of any published e-government citizens' adoption models considering the GI as an independent factor having an impact on the e-government citizens' adoption which is the main focus of our study. Based on the findings of the literature review, the author was able to propose a new GI based E-government (GE-government) citizens' adoption framework along with 24 hypotheses to be tested describing the potential influential role of the geographic information and the other identified influential factors over the E-government citizens' adoption.

A set of research questions and objectives were developed based on a clear research gap and well defined research aim, where the author applied the quantitative research methodology using the questionnaire survey method with convenient sampling and did an extensive data analysis of the information collected from the questionnaires using various analytical tools especially the exploratory factor analysis with principal component analysis, multiple regression analysis (binary regression) and Pearson Chi-square in order to assess the existence of a significant correlation between independent and dependent variables as well as between various

independent variables and accordingly to accept or reject the proposed hypotheses and finalize the proposed conceptual GE-government citizens' adoption framework.

This research data analysis, applied to the Lebanese context, shows that the geographical information, as a concept with all its relevant tools and services, has a strong influence on the citizens' intention to adopt the government e-services. It also has an influence on the e-government adoption process starting from the e-government awareness to the e-government adoption. The geographic information has also a strong influence over the website design, perceived ease of use and perceived usefulness. Moreover, additional strong influential role of the geographic information associated to the website design over the e-government citizens' adoption where the GI enabling of the website design turned out the website design independent factor from a non-significant factor over the e-government citizens' adoption to a significant factor when associated to the geographic information.

The new GI influential role identified in literature review, tested and confirmed through the data analysis along with the identification and confirmation of the other factors influential role, offered a new GI based E-government (GE-government) citizens' adoption framework that is going beyond the role of the GI to cover the impact of many social and demographic as well as technology adoption factors on the e-government adoption. This framework could be applicable elsewhere to test the potential causes affecting the citizens' intention to use the government e-services.

Furthermore, this research identified a relation between the Fear of Job Loss and Religious Beliefs factors, significantly correlated where both have been characterized as negative significant predictors over the E-government adoption. In addition, a significant correlation between Attitude, Trust in Government and Resistance to Change factors has been identified

showing a role of the positive attitude on increasing the citizens' trust in government and reducing the citizens' resistance to change.

Finally, this research could be a starting point for many researchers to investigate further in depth the role of geographic information as well as other social factors such as word of mouth and favouritism in the adoption of e-government or other technology tools and solutions introduced within a reliable framework that can be used in multiple developed and developing countries since Lebanon, as a middle eastern developing country, combines many eastern and western cultural and behavioural aspects as well as multiple developing and developed countries' characteristics due to its community spread around the globe.



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Appendix A: Survey Questionnaire

Appendix B: Tables

Perspective	Definition	Authors
Information Technology/Benefits/E-government dimensions/Relation with Partners	“E-government is defined as a matrix of stakeholders: government to government, government to business and government to citizens, using information and communications technology to deliver and consume services.”	Alateyah <i>et al.</i> (2013)
Information Technology/Benefits/E-government dimensions/Relation with Partners	“The application of information and communications technology to improve government services delivery and promote transparency and accountability in dealing with citizens, government, employees and businesses.”	Altaany and Al-Zoubi (2013)
Information Technology/Reforming Public Sector	“E-government is using the internet as a tool for information and communications technology (ICT) to accomplish better government.”	Alghamdi <i>et al.</i> (2011)
Information Technology/Reforming Public Sector	“E-government is defined as the use of ICT to make government more accessible, effective, and accountable.”	Wangpipatwong (2009), InfoDev and CDT (2002)
Information Technology	“E-government refers to the delivery of [government] information and services online through the internet or other digital means.”	Bwalya (2009), Kumar <i>et al.</i> (2007), Muir and Oppenheim (2002)
Process/Information Technology/E-government dimensions / Reforming Public Sector/ Relation with Partners	“E-government refers to strategies, organizational forms and processes, as well as information technology employed so as to enhance access to and delivery of government information and services to citizens, businesses, government employees and other agencies.”	Kefallinos <i>et al.</i> (2009)
Information Technology/Process/Political Reasons	“Government is the use of ICTs in public administrations combined with organizational change and new skills in order to improve public services and democratic processes and strengthen support to public policies.”	Akesson <i>et al.</i> (2009), commission of the European communities (2003)
Information Technology/Reforming Public Sector/Dimensions	“E-government is defined as the combination e-administration and e-democracy to achieve the objective of balanced e-government.”	Bwalya (2009), Coleman (2006)
Benefits/ E-government dimensions/Relation with Partners	“E-government is the delivery of fast services to citizens, businesses, and other members of the society.”	Bwalya (2009), Kumar <i>et al.</i> (2007)
Process/Information Technology/E-government	“E-government is the process whereby the use of information and communication	Otubu (2009)

Perspective	Definition	Authors
dimensions /	technology (ICT) and services is deployed and employed by the government in the delivery of services to members of the public and the use of same in the internal running and linkages among different governmental agencies.”	
Information Technology/Citizens Focus	“E-government refers to the use by state authorities of ICT, in particular, the Internet and web-based technology, to deliver information and services and to encourage civic participation.”	Luk (2008)
Information Technology/ E-government dimensions	“E-government is simply a facility using Information Technology (IT) to deliver public services directly to the customer, where the customers are citizens, business or other government entity.”	Ghapanchi <i>et al.</i> (2008), Metaxiotis and Psarras (2005)
Information Technology/Citizens Focus	“Utilizing the internet and the world-wide web for delivering government information and services to citizens.”	Al-Shafi and Weerakkody (2007), United Nations (2003)
Information Technology/Reforming Public Sector	“The use of information and communication techniques to improve the activities of public sector organizations, of course impacts on the strategy and operations of our agency.”	Van Der Molen and Wubbe (2007)
Phenomena/ Reforming Public Sector/ Citizens Focus/ Relation with Partners	“E-government offers an opportunity for governments to re-organize themselves, get closer to the citizen and co-operate with a variety of societies.”	Margetts and Dunleavy (2002), Al-Shehry <i>et al.</i> (2006), Caldow (1999)
Dimensions	“E-government should be divided into four distinct areas of activity, namely e-democracy, e-service provision, e-management and e-governance.”	Perri (2004), Al-Shehry <i>et al.</i> (2006)
Process	“E-government is the process of offering better government service to the public.”	Sridhar (2005)
Information Technology /Benefits/Relation with Partners/Dimensions	“E-Government refers to the strategic application of ICT to “provide citizens and organizations with more convenient access to government information and services; and to provide delivery of public services to citizens, business partners and suppliers, and those working in the public sector”.	Phang <i>et al.</i> (2005), Turban <i>et al.</i> (2002), Gronlund (2001)
Information Technology/Reforming Public	“E-government refers to the use of IT by government agencies (such as wide area	World Bank Group (2004)

Perspective	Definition	Authors
Sector/Relationship with partners/ Benefits/ Dimensions/ Political Reasons/Citizens Focus	networks, the internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of 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. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions.”	
Information Technology/ Benefits	“E-government involves access to government information and services 24 hours a day, 7 days a week, in a way that is focused on the needs of our citizens and businesses. E-government relies heavily on agency use of the internet and other emerging technologies to receive and deliver information and services easily, quickly, efficiently and inexpensively.”	Ke and Wei (2004)
Information Technology/Change Management/ Political Reasons	“E-government is the use of information and communication technologies in public administrations combined with organizational change and new skills in order to improve public services and democratic processes.”	EU (2004)
Information Technology/ Citizen Focus	“E-government as seamless service delivery to citizens or governments’ efforts to provide citizens with the information and services they need by using a range of technological solutions.”	Burn and Robins (2003)
Information Technology/ Relationship with partners/ Political reasons/ Dimensions	“E-government is the term used to reflect the use of ICT in public administration in an attempt to ease access to governmental information and services for citizens, business and government agencies. Furthermore, there is always a target to improve the quality of the services and to provide greater opportunities for participating in democratic institutions and processes.”	Lambrinoudakis <i>et al.</i> (2003)
Information Technology/	“Electronic government is the use of	Scholl (2003)

Perspective	Definition	Authors
Benefits	information technology to support government operations, engage citizens, and provide government services.”	
Information Technology/ Reforming Public Sector/ Benefits	“The use of ICTs, and particularly the internet, as a tool to achieve better government.”	OECD (2003)
Benefits/ Citizens Focus	“E-government is the continuous optimization of service delivery channel, citizen’s participation and governance.”	Fang (2002), Baum and Di Maio (2000)
Information Technology/ Benefits/Relation with Partners/ Political reasons	“E-government can be defined as a way for governments to use the most innovative information and communication technologies, 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.”	Fang (2002)
Information Technology/ Relationship with partners/ Benefits	“E-government is the use of Information Technology to support government operations, engage citizens, and provide government services.”	Cook <i>et al.</i> (2002)
Information Technology/ Relationship with partners/ Process/ Benefits	“the use by the Government of web-based Internet applications and other information technologies, combined with processes that implement these technologies, to a) enhance the access to and delivery of government information and services to the public, other agencies, and other government entities or b) bring about improvements in Government operations that may include effectiveness, efficiency, service quality, or transformation.”	U.S. Congress (2002)
Relationship with Partners/ Benefits	“E-government means exploiting the power of information to help transform the accessibility, quality and cost-effectiveness of public services and to help revitalize the relationship between customers and citizens and public bodies who work on their behalf.”	Aldrich <i>et al.</i> (2002)
Information Technology/	“E-government encompasses applications	Turban <i>et al.</i> (2002)

Perspective	Definition	Authors
Relationship with partners/ Benefits/ Dimensions	of various technologies to provide citizens and organizations with more convenient access to government information and services; and to provide delivery of public services to citizens, business partners and suppliers, and those working in the public sector.”	
Information Technology/ Citizens Focus/ Political reasons/ Benefits	“Although governments use a variety of information technologies, the use of the internet has become a key component of enhanced service delivery. E-government, the delivery of government services online, provides the opportunity to increase citizens’ access to government, reduce government bureaucracy, increase citizen participation in democracy, and enhance agency responsiveness to citizens’ needs.”	Gant and Gant (2002)
Information Technology/ Citizen Focus	“Utilizing the internet and the world wide web for delivering government information and services to citizens.”	UNDPEPA/ASPA (2002)
Information Technology/ Relationships with partners/ Benefits/ Dimensions/ Citizens Focus	“Electronic government refers to government’s use of technology, particularly web-based Internet applications to enhance the access to and delivery of government information and service to citizens, business partners, employees, other agencies, and government entities. It has the potential to help build better relationships between government and the public by making interaction with citizens smoother, easier, and more efficient.”	Layne and Lee (2001)
Information Technology/ Single Point Access	“E-government is usually explained as a way of improving the delivery of government services by making them available through a single point of access on the internet, i.e. also called as one stop shop’ shopping.”	Mitchinson (2001)
Phenomena/ Reforming Public Sector	“Indeed, e-government is a concept that exists without a firm definition. To some, it represents traditional government “with an ‘e’ “, providing an alternative delivery method for government services. For others, it is a social, economic and	Riley (2001)

Perspective	Definition	Authors
	political phenomenon, which promises to re-engineer the nature of democratic government itself.”	
Information technology/ Citizen Focus	“An e-government is a government that makes full use of the potential of technology to help put its citizens at the centre of everything it does, and which makes its citizens its purpose.”	Waller <i>et al.</i> (2001)
Information Technology/ Benefits	“E-government includes the employment of all information and communication technologies from fax machines to wireless palm pilots, to facilitate the daily administration of government.”	UNASPA (2001)
Information Technology/ Relationship with partners/ Benefits/ Dimensions	“E-government is the use of technology to enhance the access to, and delivery of, government services to benefit citizens, business partners and employees.”	Silcock (2001)
Information Technology/ Process	“Electronic government, or (e-government), is the process of transacting business between the public and government through the use of automated systems and the internet network, more commonly referred to as the world wide web.”	Legislative Analyst's Office (2001)
Process	“Electronic government refers to the processes and structures pertinent to the electronic delivery of government services to the public.”	Okot-Uma (2001)
Information Technology/ Benefits/ Dimensions/ Relationship with partners	“E-government is defined as the implementation of cost-effective models for citizens, industry, federal employees, and other stakeholders to conduct business transactions online. The concept integrates strategy, process, organization and technology.”	Whitson and Davis (2001)
Information Technology/ Dimensions	“E-government is simply using Information Technology to deliver government services directly to the customer at any time. The customer can be a citizen, a business or even another government entity.”	Duffy (2000)

Table 2. 5: E-Government Definition/Perspective

Stage	Perception	Reference
2 Stage Model		
Stage 1: Cataloguing Stage 2: Transactions	<ul style="list-style-type: none"> Information about the government and its activities is presented on the web. Citizens can make transactions over the web. Furthermore, one stop shops are considered as a desired feature at this stage of maturity. 	Reddick (2004)
3 Stage Model		
Stage 1: Publish Stage 2: Interact Stage 3: Transact	<ul style="list-style-type: none"> Information about activities of government available online. Enables citizens to have simple interactions with their governments such as sending e-mail or 'chat rooms'. Provides citizens with full benefits from transactions over the internet, such as applying for programs and services, purchasing licenses and permits, etc. 	Howard (2001)
Stage 1: Publishing Stage 2: Interactivity Stage 3: Completing Transaction	<ul style="list-style-type: none"> Government disseminates information to citizen through website. Government interacts with citizen. Citizen/users can use the opportunity of the available technically enhanced website to conduct complete and secure transactions on-line. 	World Bank (2003)
Stage 1: Information interaction Stage 2: Transaction efficiency Stage 3: Transformation Citizen Centric	<ul style="list-style-type: none"> It features departmental Web sites, legislative posting, public notices, online forms, webcasting and personalized e-portals. It is a citizen self-service e-portal that can include electronic payments like online taxes and e-procurement. The administrative services at this stage are consolidated and shared across various government jurisdictions. 	Cisco (2007)
Stage 1: Catalogue Stage 2: Transaction Stage 3: Vertical Integration	<ul style="list-style-type: none"> There is an online presence on the web. It features presentation catalogue and downloadable forms. Features working databases supporting online transactions. Services and online forms are also made available. Features vertical integration with higher levels within similar 	Chen (2011)

Stage	Perception	Reference
	jurisdictions.	
4 Stage Model		
Stage 1: Web Presence Stage 2: Interaction Stage 3: Transaction Stage 4: Transformation	<ul style="list-style-type: none"> • Website to share governmental information to the public. • Users can interact with governmental authorities through websites, for example e-mails, downloadable documents, ... • Users can execute many online transactions like procurement or license application. • Government operational processes transformation for an effective, incorporated, and tailored service. 	Baum and Di Maio (2000)
Stage 1: Billboard Stage 2: Partial Service Delivery Stage 3: Full Integrated Service Delivery Stage 4: Interactive democracy with public outreach and accountability	<ul style="list-style-type: none"> • Focuses on functionality and citizen-centric. • Gives fairly little consideration security (technical and non-technical) as a specific issue. • Considers the potential benefit of political changes at its highest stage 	West (2004)
Stage 1: Cataloguing Stage 2: Transaction Stage 3: Vertical Integration Stage 4: Horizontal Integration	<ul style="list-style-type: none"> • Creating websites and making government information and services available online. • Enables citizens to interact with their governments electronically. • Focuses on integrating, disparate at different levels. • Focuses on integration of government services for different functions horizontally. 	Layne and Lee (2001)
Stage 1: Information Stage 2: Interaction Stage 3: Transaction Stage 4: Integration	<ul style="list-style-type: none"> • Delivery of government services online. One-way communication between government and citizens. • Simple interaction between citizens and governments. • Services that enable transactions of value between citizens and government. • Integration of services across the agencies and departments of government. 	Chandler and Emanuel (2002)

Stage	Perception	Reference
Stage 1: Simple Web site Stage 2: Online government Stage 3: Integrated government Stage 4: Transformed government	<ul style="list-style-type: none"> • Features static pages with downloadable forms. • Features interaction mechanisms such as emails, Web forms, help and FAQs. • Features end to end transactions. Moreover, information is shared between departments at this stage. • The services are customer centric and organized according to citizens' needs and segmented according to population groups and life events. Vertical and horizontal integration is also present at this stage. 	Windley (2002)
Stage 1: Promote Access and Connectivity Stage 2: Provide Service Online Stage 3: Transform the Enterprise Stage 4: Next Generation Government	<ul style="list-style-type: none"> • Focusing on developing infrastructure. • Implementing simple services that enhance the E-government presence to the existing services. • Increasing the importance of having an automated back office processes and improve the integration within and between services. • Highlighting on the next government generation, where we need to do business process re-engineering and IS/IT systems collaboration over organisation. 	Murphy (2005).
Stage 1: Cultivation Stage 2: Extension Stage 3: Maturity Stage 4: Revolution	<ul style="list-style-type: none"> • Horizontal and vertical integration is present along with the use of intranet by governments • There is an extensive use of intranet and it features customized Web interfaces and extensive use of intranet. • The organization is mature and the processes are transparent. • Data can be shared between organizations and also applications can be shared across vendors. 	Anderson and Henriksen (2006)
Stage 1: Presence on the web Stage 2: Interaction between the citizen and the government	<ul style="list-style-type: none"> • The e-portal provides only information. • The user can download and email forms to the concerned authority. • The citizens are able to complete entire 	Alhomod <i>et al.</i> (2012)

Stage	Perception	Reference
Stage 3: Complete transaction over the web Stage 4: Integration of services	<ul style="list-style-type: none"> tasks over the internet. Various departments share information with each other. 	
Stage 1: Emerging information services Stage 2: Enhanced information services Stage 3: Transactional services Stage 4: Connected services	<ul style="list-style-type: none"> E-government websites provide static information. The presence is enhanced with one way or simple two way communication. A two-way interaction with citizens is possible. Web sites are proactive in requesting Citizens' feedback via Web 2.0 tools. Government agencies are citizen centric and services are customer centric. 	UN (2012)
5 Stage Model		
Stage 1: Simple Information Age Stage 2: Request and Response Stage 3: Service and Financial Stage 4: Integration Stage 5: Political Participation	<ul style="list-style-type: none"> Representing a basic form of e-government uses e.g. disseminating information by posting it on the web sites. Facilitation of citizen and government interaction. Transactions occur both between governments and individuals (e.g. obtaining visa), and between governments and businesses (i.e. ordering office facilities). This is similar to the last two stages in the Layne and Lee (2001) four-stage model. This stage refers to integrating separate systems at different levels (vertical) and from different departments (horizontal). Promotion of political participation through services such as online voting and surveys. 	Hiller and Bélanger (2001)
Stage 1: One way communication Stage 2: Two way communication Stage 3: Transformation Stage 4: Vertical and Horizontal Integration	<ul style="list-style-type: none"> Similar to Hiller and Bélanger model with only one difference in the stage one 	Moon (2002)

Stage	Perception	Reference
Stage 5: Political Participation		
Stage 1: Basic site Stage 2: Electronic publishing Stage 3: e-publishing Stage 4: Transactional Stage 5: Joined e-governance	<ul style="list-style-type: none"> • Few pages are available in the Web site which give basic information about the agency. • The Web site contains many pages. • Features personalization options and customizable search tools. Some forms can be submitted online and others can be downloaded. Moreover, there is an extensive use of emails and the responses are timely. Besides that, email alerts to notify the users about new content is an offered functionality. • The users make secure transactions over the web. • Features one stop shops and joined up governments (vertical and horizontal integration). 	Dunleavy (2002)
	<ul style="list-style-type: none"> • The 1st stage features online websites with department information. • The 2nd stage features FAQs and email systems. • The 3rd stage features forums and opinion surveys. • The 4th stage features online services such as: license renewals and payment of fines. • The 5th stage features one stop shops. The citizens can vote, contribute in online discussions and make comments on policy and legislation proposals. 	Netchaeva (2002)
Stage 1: Online Presence Stage 2: Basic Capability Stage 3: Service availability Stage 4: Mature delivery Stage 5: Service transformation	<ul style="list-style-type: none"> • Information is published online. • Security and certification is developed. The online presence is broad. • Many services are available in the e-portal. It features cross agency cooperation. Moreover, the services are designed to meet customer needs. • The services are clustered. There is a clear ownership and authority – CIO (Chief Information Officer) or central agency. The customer is involved in the process of e-government and the 	Accenture (2003)

Stage	Perception	Reference
	<p>services are marketed.</p> <ul style="list-style-type: none"> Improved customer service delivery is the target. This stage also features multichannel integration. 	
Stage 1: Web Presence Stage 2: Interaction Stage 3: Transaction Stage 4: Transformation Stage 5: e-democracy	<ul style="list-style-type: none"> Websites contain only static information. Provides a simple interaction like forms download and features basic search engines and email systems. The users can perform complete transactions over the web. Includes vertical and horizontal integration. The governments provide a single unified e-portal. It features tools for online voting, polling and surveys to enable political participation and citizen engagement. 	Siau and Long (2005)
Stage 1: Online presence Stage 2: Interaction Stage 3: Transaction Stage 4: Fully integrated and transformed E-government Stage 5: Digital democracy	<ul style="list-style-type: none"> Information is published online. Citizens can interact with governments by emailing officials and downloading forms. The users at this stage can conduct secure transactions like payments and tax filling. Government services are organized as a single point of contact. It features online voting, public forums and opinion surveys. 	Shahkooh <i>et al.</i> (2008)
Stage 1: Web Presence Stage 2: Interaction Stage 3: Transaction Stage 4: Integration Stage 5: Continuous improvement	<ul style="list-style-type: none"> Features simple and limited information available on the web. Features search engines and downloadable forms. Features online transactions with the possibility of electronic payments. Features horizontal and vertical integration. Moreover, performance can be measured at this stage using statistical techniques. Features political activities. Besides that, there is a great focus on continuous improvements. 	Kim and Grant (2010)
Stage 1: Initial conditions Stage 2: Data	<ul style="list-style-type: none"> One way static interaction with the citizen. It is only used for broadcasting information to the public. 	Lee and Kwak (2012)

Stage	Perception	Reference
Transparency Stage 3: Open Participation Stage 4: Open collaboration Stage 5: Ubiquitous engagement	<ul style="list-style-type: none"> • The use of social media is limited. Feedback is get from the public on usefulness and data quality. • It features social media tools to increase open participation. Input from the public is welcomed and used in policy decisions. It includes also e-Voting and e-Petitioning. • It features interagency collaboration by sharing data and public input. Public contests are organized and data is analyzed for obtaining new insights and improving decision-making. • Data is easily accessed by mobile devices and tablets. Data is vertically and horizontally integrated. Besides that, data analytics is used for decision making processes. The agencies are focused on enabling continuous improvements. 	
6 Stage Model		
Stage 1: Information Publish/Dissemination Stage 2: Official Two-way Transaction Stage 3: Multi-purpose Portals Stage 4: Portal Personalization Stage 5: Clustering of Common Services Stage 6: Full Integration/Enterprise Transaction	<ul style="list-style-type: none"> • Increasing users' access to the government information. • Increasing ICT use to facilitate the interaction between governments and users like using the digital signatures and security keys. • Offering a single portal to provide service across departments. • Offering to the users the capability of customising the portals. • Enhancing the collaboration and reducing the mediators between operational processes to deliver a unified and seamless service. • Provide stylish, unified and tailored services that meets the customer's needs and preferences. 	Deloitte and Touche (2001)
Stage 1: Setting up an email system and internal network Stage 2: Enabling inter-organizational and public access to information	<ul style="list-style-type: none"> • Government systems focuses on internal processes that supports basic administrative functions such as e-mails and payroll. • Developing systems that will help in managing its workflow from paper 	Wescott - Asia Pacific (2001)

Stage	Perception	Reference
Stage 3: Allowing 2-way Communication Stage 4: Allowing exchange of value Stage 5: Digital democracy Stage 6: Joined-up government	based to electronic format (inter-organizational). <ul style="list-style-type: none"> • Citizen (public) are able to access government information through the use of internet. • Government and the citizen (public) use ICT as enabler for communication. • ICT is used to support development of more flexible and convenient ways for citizens to conduct business with the government. • Citizen use ICT as an enabler that can potentially support participatory and democratic processes. • There is both vertical and horizontal integration of service delivery, a webportal integrates information and services from various government bodies/agencies 	
Stage 1: Presence Stage 2: Information Stage 3: Interaction Stage 4: Transaction Stage 5: Integration Stage 6: Political Participation	<ul style="list-style-type: none"> • The website contains static and limited information • Information is frequently updated and there is a greater number of available webpages. • The users can download forms and communicate with the government by mail. • It features secure online Web services with the possibility of payments. • It offers a one stop shop to the citizens. • Users can vote and participate in opinion surveys and public forums. 	Almazan and Gil-Garcia (2008)

Table 2. 6: E-Government Maturity Models

Category	Benefit	Beneficiary	Authors
Efficiency and Cost Reduction	Improve internal efficiency of public administrations, by streamlining information and administrative process management.	Government	Caldow (2001)
	Offer great benefits regarding economizing and improving of governments service operations, including efficiency and reduced transactional costs.	Government, Businesses, Citizens	Cohen and William (2002)
	Improve the government daily operations in an improved and economic manner.	Government	Edmiston (2003)
	Reduce delivery costs for information and services. Improve work efficiency (shorten delivery times, reduce crowdedness of government agency offices, reduce personnel, decrease the number of complaints and the employee-time devoted to handling them).	Government	Sorin Kertesz (2003)
	Increase the efficiency of public administration.	Government	Haldenwang (2003)
	Reduce the customers and organizations' time, effort and costs.	Businesses, Citizens	Noie (2003)
	Reduce corruption in government functions.	Government, Businesses, Citizens	The Economist (2003)
	Improve efficiency of government agencies in processing of data.	Government	OECD (2003)

Category	Benefit	Beneficiary	Authors
	Improve services through better understanding of users' requirements.		
	Reduce the processing costs of many activities compared to the traditional way of managing operations.	Government	Ndou (2004)
	Overcome administrative obstacles between businesses and government. Reduce transactions' cost for the businesses and government; Increase revenue collection.	Government, Businesses	Bhatnagar (2004)
	Improve the performance of government agencies and deliver the public service effectively and efficiently for all customers.	Government, Businesses, Citizens	Rubin and Wang (2004)
	Improve the efficiency of the governmental services; Deliver precise and effective services; Reduce cost and time for the frequent administrative tasks executed by the government employees.	Government, Businesses, Citizens	Jaeger (2003), Gil-García and Pardo (2005)
	Reduce defects and improve the productivity by offering standardized tasks.	Government, Businesses, Citizens	Carter and Belanger (2005), Gil-García and Pardo (2005), Basu (2004)

Category	Benefit	Beneficiary	Authors
	Reduce cost and levels of organizational processes by streamlining and re-organizing operating Procedures.	Government	Seifert (2005)
	Reduce the government's expenditure by providing a direct communication channel within the government and with the private sector in addition to the integration between multiple government authorities' systems over a single web portal.	Government, Businesses, Citizens	Al-Khourri and Bal (2007)
Accountability and transparency	Deliver improved services to citizens, businesses, and other members of the society through drastically changing the way governments manage information.	Businesses, Citizens	Accenture (2002)
	Increase the transparency and the services for citizen.	Government, Businesses, Citizens	Cohen and William (2002)
	Offer a reputable channel to improve the government transparency and accountability as well as empowering the citizens.	Citizens	Kumar (2003), La Porte <i>et al.</i> (2002)
	Improve service delivery and citizens' satisfaction.	Government, Businesses, Citizens	Noie (2003)
	Improve transparency and decrease government bureaucracy.	Government, Businesses, Citizens	Sorin Kertesz (2003)

Category	Benefit	Beneficiary	Authors
	Strengthen the openness and transparency of political processes.	Government, Businesses, Citizens	Haldenwang (2003)
	<p>Improve transparency, accuracy and facilitate information exchange between government and customers.</p> <p>Help in building trust between governments and citizens, an essential factor in good governance by using internet-based strategies to involve citizens in the policy process, illustrating government transparency and accountability.</p>	Government, Businesses, Citizens	OECD (2003)
	Offer interactive technology to enhance government accountability, so offering better responsiveness to the citizens' needs and demands.	Citizens	Welch and Hinnant (2003), Wong and Welch (2004)
	<p>Increase the transparency and accountability of the decision-making process;</p> <p>Offer better citizens' services.</p>	Government Businesses, Citizens	Jaeger (2003), Ndou (2004)
	Support citizens' participation in the decision-making; citizens can share their recommendations using the forums and the online communities.	Citizens	Ndou (2004)

Category	Benefit	Beneficiary	Authors
	Capability of government to answer public clarifications about its services' performance.	Citizens	Wong and Welch (2004)
	Provide e-government transparency and support the decentralization of the administration in government authorities.	Citizens	Carter and Belanger (2005)
	Increase public satisfaction and improve the offered services to be more accessible and transparent, and thus guarantee the user and the public-private sector collaboration.	Businesses, Citizens	Al-Khouri and Bal (2007)
	Provide flow of information easily to citizens in order to improve the government and allow the citizens to closely inspect the government's performance; The information availability will help citizens to monitor the performance of public organizations.	Citizens	Al Shafi and Weerakkody (2009)
Citizen centric focus	Offer a partnership relationship between government and citizens.	Citizens	Silcock (2001)
	Provision of 24/7 services that improve the level of satisfaction among citizens and enhance their acceptance of the public sector.	Citizens	Stiftung (2002)

Category	Benefit	Beneficiary	Authors
	Help in building trust between governments and citizens, an essential factor in good governance by using internet-based strategies to involve citizens in the policy process, illustrating government transparency and accountability.	Citizens	OECD (2003)
	More self-service; Customer (citizen) satisfaction; Better relationship between government and customer; more interaction and feedback.	Citizens	Sorin Kertesz (2003)
	Enable citizens' incorporation in policy designing processes which facilitate processes acceptance and adoption; Guarantee the management plans implementation; Enhance the relation between management authorities and public administration;	Citizens	Irvin and Stansbury (2004)
	Create the virtual government and citizen's interface.	Citizens	Wong and Welch (2004), Navarra and Cornford (2005)
	Provide citizens more control on how and when they interact with the government.	Citizens	Kumar <i>et al.</i> (2007)

Category	Benefit	Beneficiary	Authors
Economic development	Help businesses move online and assist them to use online tools.	Businesses	Reynolds and Regio (2001)
	Assist a government's economic policy objectives by promoting productivity gains inherent in ICT and e-commerce.	Businesses, Citizens	OECD (2003)
	Support the creation of new business and work opportunities.	Businesses	Noie (2003)
	Create opportunities for new revenues; Offer faster and improved collection of government revenues.	Government, Businesses	Sorin Kertesz (2003)
	Reinforce the government's drive towards efficient governance and improve the transparency to manage effectively the country's social and economic resources for development.	Businesses, Citizens	Basu (2004)
	Promote local economy vitality.	Businesses, Citizens	Ferguson (2005)
	Facilitate the partnership process between government and businesses or private sector.	Government, Businesses	Al-Sebie and Irani (2005), Bertot and Jaeger (2006)
	Support businesses' aim to increase their cost-saving activities by supporting the creation and adoption of a powerful e-government system that provides online services, which helps minimize their routine visits to	Businesses	Al Shafi and Weerakkody (2009)

Category	Benefit	Beneficiary	Authors
	government authorities required in tradition to undertake the service.		
Accessibility and Availability	Deliver electronic and integrated public services.	Government Businesses, Citizens	Reynolds & Regio (2001)
	Provide citizens an increase in government accessibility, decrease in government bureaucracy and increase in citizen participation in democracy.	Citizens	Prins (2001)
	Provide fast and easy access to government information which guarantee a high government availability, and transparency and responsiveness to citizens' needs.	Businesses, Citizens	Halchin (2004), Doty and Erdelez (2002)
	Share information and ideas between all government agencies and departments to build one mega database.	Government	OECD (2003)
	Improve public service delivery.	Businesses, Citizens	Haldenwang (2003)
	Transform services, making them more accessible, more convenient, more responsive and more cost effective.	Government Businesses, Citizens	Fergusson (2005)
	Provide an improved accessibility to public services with higher quality.	Businesses, Citizens	Carter and Belanger (2005)
	Guarantee the availability of online governmental services and an increased governmental availability and	Government Businesses, Citizens	Scholl and Klischewski (2007)

Category	Benefit	Beneficiary	Authors
	accessibility.		
	Provide an ease of accessibility of government services.	Businesses, Citizens	Kumar <i>et al.</i> (2007)
	Provide citizens and businesses a single gateway to access the government services and information that enables the integration of government to citizen and government to business transactions.	Businesses, Citizens	Al Shafi and Weerakkody (2009)
	Allow, by using the e-applications, people, businesses, and government sectors to access to available government information 24 hours a day, 7 days a week, which improves the quality of these services.	Government Businesses, Citizens	Ndou (2004)
Technology Awareness & Usage	Bridge the digital divide; Achieve lifelong learning.	Citizens	Reynolds and Regio (2001)
	Enable through ICT better management of external relations.	Businesses, Citizens	Caldow (2001)
	Increase of users' ICT skills , internet knowledge and computer usage.	Government, Businesses, Citizens	Noie (2003)
	Allow development of new services, integration, and automation; Offer high-value web content to provide additional incentives for people to use the web, leading to an increase in	Government, Businesses, Citizens	Sorin Kertesz (2003)

Category	Benefit	Beneficiary	Authors
	Internet penetration rates.		
	Use the technology to personalize a website to a point where delivery of services could be tailored to meet the specific needs of an individual, thereby increasing the satisfaction of citizens from government services.	Citizens	Gilber and Balestrini (2004)
Government Reform & Democracy	Create a more participative form of government that can lead to direct democracy.	Government, Citizens	Reynolds and Regio (2001)
	Enable levels of democratic participation that were previously unimaginable.	Citizens	Caldow (2001)
	Renew local democracy, by making councils more open, more accountable, more inclusive and better able to lead their communities.	Citizens	Ferguson (2005)

Table 2. 7: E-Government Benefits

Challenge Category	Challenge Cat. Reference	Example of Challenges	Challenge Reference
Information and data	Gil-García and Pardo (2005)	Information accessibility and data quality	Ballou and Tayi (1999), Brown (2000), Ambite <i>et al.</i> (2002), Burbridge (2002), Kushchu and Kuscu (2003), Scholl (2005), Coursey and Norris (2008)
		Dynamic information needs	Brown and Brudney (2003), Gilbert <i>et al.</i> (2004)
		Data integrity	Aichholzer and Schmutzer (2000)
		Data privacy/Confidentiality	AlShehri and Drew (2010), Government Accountability Office (2001), Kushchu and Kuscu, (2003), Reffat (2006), Aichholzer and Schmutzer, (2000), Coursey and Norris (2008), Ebrahim and Irani (2004), Gilbert and al. (2004), Safeena and Kammani (2013), Rahman <i>et al.</i> (2014), Dalal (2006), Edmiston (2003), Marquette (2001), Kubicek (2004), Wu (2014)
Information Technology	Gil-García and Pardo (2005), Al-Shehry <i>et al.</i> (2006), Al-Sebie and Irani, (2005), Gilbert <i>et al.</i> (2004), West (2004), Ndou (2004) Jaeger and Thompson,	Usability	Brown (2000), DeLone and Mclean (2003), Garson (2003), Mahler and Regan (2003), Gilbert <i>et al.</i> (2004), Safeena and Kammani (2013), Kumar <i>et al.</i> (2007)
		Payment infrastructure	Kushchu and Kuscu (2003), Safeena and Kammani (2013)

Challenge Category	Challenge Cat. Reference	Example of Challenges	Challenge Reference
	(2003), Prins (2001), Ashaye and Irani, (2014)	Maintaining electronic records/Record Management	Government Accountability Office (2001), Reffat (2006)
		Accessibility	Kushchu and Kuscu (2003), Aichholzer and Schmutzer (2000)
		Ensure better and constant service-provisioning to the public including citizens and businesses	Government Accountability Office (2001), Gortmaker <i>et al.</i> (2004), Kamal (2008), Kumar <i>et al.</i> (2007)
		Security	Irvine (2000), Milner (2000), Joshi <i>et al.</i> (2002), Moon (2002), Holden <i>et al.</i> (2003), Luna-Reyes and Gil-Garcia (2003), Roy (2003), AlShehri and Drew (2010), Government Accountability Office (2001), Kushchu and Kuscu (2003), Reffat (2006), Aichholzer and Schmutzer (2000), Coursey and Norris (2008), Ebrahim and Irani (2004), Gilbert <i>et al.</i> (2004), Safeena and Kammani (2013), Rahman <i>et al.</i> (2014), Belanger <i>et al.</i> (2006), Coursey (2005), NECCC (2000), Wu (2014)
		ICT Infrastructure	AlShehri and Drew (2010), Government Accountability Office (2001), Kushchu and Kuscu (2003), Reffat (2006), Aichholzer and Schmutzer (2000), Coursey and Norris

Challenge Category	Challenge Cat. Reference	Example of Challenges	Challenge Reference
			(2008), Ebrahim and Irani (2004), Safeena and Kammani (2013), Rahman <i>et al.</i> (2014), Bonham <i>et al.</i> (2001), Bourn (2002), Dawes and Pardo (2002), Taifur (2006), Yong (2003), Khanh (2014)
		Technological incompatibility/ lack of interoperability	Chengalur-Smith and Duchessi (1999), Brown (2001), Landsberg and Wolken (2001), Dawes and Pardo (2002), Burbridge (2002), Holden <i>et al.</i> (2003), Kushchu and Kuscü (2003), Reffat (2006)
		Technology complexity	Chengalur-Smith and Duchessi (1999), West and Berman (2001), Garson (2003), Gilbert <i>et al.</i> (2004)
		Technical skills and experience	Brown (2001), Dawes and Pardo (2002), Ho (2002), Moon (2002), Holden <i>et al.</i> (2003), Safeena and Kammani (2013), Rahman <i>et al.</i> (2014), Khanh (2014)
		Technology newness	Ho (2002), Roy (2003)

Challenge Category	Challenge Cat. Reference	Example of Challenges	Challenge Reference
Organizational & Managerial	Gil-García and Pardo (2005), Al-Shehry <i>et al.</i> (2006), Al-Sebie and Irani (2005), Gilbert <i>et al.</i> , (2004), West (2004), Ndou (2004), Jaeger and Thompson (2003), Prins, (2001), Ashaye and Irani (2014)	Lack of Qualified Personnel and Training/ e-Literacy/ Technology Education	AlShehri and Drew (2010), Reffat (2006), Safeena and Kammani (2013), Kumar <i>et al.</i> (2007), Rahman <i>et al.</i> (2014), BEI (2004), Chen and Gant (2001), Dawes and Pardo (2002), Heeks (2001, 2005), Moon (2002), Morshed (2006), Taifur (2006), Dominguez <i>et al.</i> (2011), Khanh (2014), Rice (2003), Thomas and Streib (2003), UNDP (2001), Bwalya <i>et al.</i> (2014), Khanh (2014)
		Marketing	Reffat (2006)
		Manager's attitudes and behavior/ Top management support	Heintze and Bretschneider (2000), Gagnon (2001), AlShehri and Drew (2010), Government Accountability Office (2001), Safeena and Kammani (2013), Rahman <i>et al.</i> (2014), Coursey and Norris (2008), Kettle (2002), CEG (2001), Mahmood (2004), Koh <i>et al.</i> (2005), Singh (2003), Bonham <i>et al.</i> (2001), Dominguez <i>et al.</i> (2011), Khanh (2014)
		Users or organizational diversity	Smith <i>et al.</i> (2001), Dawes and Pardo (2002), Brown and Brudney (2003), Roy (2003), AlShehri and Drew (2010),

Challenge Category	Challenge Cat. Reference	Example of Challenges	Challenge Reference
			Kumar <i>et al.</i> (2007), Rahman <i>et al.</i> (2014), Hasan (2003), Koh <i>et.al</i> (2005), Coursey and Norris (2008), Dominguez <i>et al.</i> (2011)
		Transparency	Reffat (2006), Bwalya <i>et al.</i> (2014), Rahman <i>et al.</i> (2014)
		Lack of alignment of organizational goals and project	AlShehri and Drew (2010)
		Multiple or conflicting goals	Dawes and Pardo (2002), Brown (2003), Kim and Kim (2003), AlShehri and Drew (2010)
		Resistance to change	Burbridge (2002), Ho (2002), Edmiston (2003), AlShehri and Drew (2010), Aichholzer and Schmutzer (2000), Coursey and Norris (2008)
		Internal effectiveness and efficiency	Scholl (2005)
		Turf and conflicts	Bellamy (2000), Jiang and Kleing (2000), Barret and Green (2001), Burbridge (2002), Edmiston (2003), Rocheleau (2003), Roy (2003), AlShehri and Drew (2010)
Legal, Policy & Regulatory	Gil-García and Pardo (2005), Ashaye and Irani (2014)	Restrictive laws, regulations and public policy	Chengalur-Smith and Duchessi (1999), Harris (2000), Dawes and Pardo (2002), Mahler and Regan (2002), Kushchu and Kuscu (2003), Reffat

Challenge Category	Challenge Cat. Reference	Example of Challenges	Challenge Reference
			(2006), Aichholzer and Schmutzer (2000), Rahman <i>et al.</i> (2014), Dalal (2006), Marquette (2001), Wu (2014)
		One year budgets	Fountain (2001), Dawes and Pardo (2002)
		Intergovernmental relationships	Bellamy (2000), Harris (2000), Landsberg and Wolken (2001), Burbridge (2002), Dawes and Pardo (2002), Rocheleau (2003), Coursey and Norris (2008), Rahman <i>et al.</i> (2014)
Institutional & Environmental	Gil-García and Pardo (2005)	Privacy concerns	Milner (2000), Joshi <i>et al.</i> (2002), Moon (2002), Duncan and Roehrig (2003), Edmiston (2003), Holden <i>et al.</i> (2003), Miyazaki and Fernandez (2001), Rahman <i>et al.</i> (2014), Kubicek (2004), Dalal (2006), Edmiston (2003), Marquette (2001), Wu (2014)
		Autonomy of agencies	Fountain (2001), Landsberg and Wolken (2001), Dawes and Pardo (2002)
		Policy and political pressures and level of support	Bajjaly (1999), Heintze and Bretschneider (2000), Mahler and Regan (2002), Brown and Brudney (2003), Edmiston (2003),

Challenge Category	Challenge Cat. Reference	Example of Challenges	Challenge Reference
			Rocheleau (2003), Roy (2003), Coursey and Norris (2008), Safeena & Kammani (2013), CEG (2001), OECD (2003), Kettle (2002), Koh <i>et al.</i> (2005), Bonham <i>et al.</i> (2001), Mahmood (2004), Ndou (2004), Dominguez <i>et al.</i> (2011), Rahman <i>et al.</i> (2014)
		Environmental context (social, economic, demographic)	Heintze and Bretschneider (2000), Ho (2002), La Porte <i>et al.</i> (2002), Brown and Brudney (2003), Edmiston (2003), Holden <i>et al.</i> (2003), Al-Shehry <i>et al.</i> (2006), Al-Sebie and Irani (2005), Gilbert <i>et al.</i> (2004), West (2004), Ndou (2004), Jaeger and Thompson (2003), Prins, (2001)
Social	Al-Shehry <i>et al.</i> (2006), Al-Sebie and Irani, (2005), Gilbert <i>et al.</i> (2004), West (2004), Ndou (2004), Jaeger and Thompson (2003) Prins (2001), AlShehri and Drew (2010)	Digital divide	AlShehri and Drew (2010), Reffat (2006), Haldenwang (2003), Kertesz (2003), Rahman <i>et al.</i> (2014), Thomas and Streib (2003), Rice (2003)
		Lack of trust in government	Sang <i>et al.</i> 2009, Ashaye and Irani 2014, Al-Rashidi 2009, AlShehri and Drew (2010), Alateyah <i>et al.</i> (2013), Ozkan and Kanat (2011), Rahman <i>et al.</i> (2014), Kubicek

Challenge Category	Challenge Cat. Reference	Example of Challenges	Challenge Reference
			(2004)
		Addressing IT human capital concerns/ Technology education/ e-literacy	Government Accountability Office (2001), Reffat (2006), Safeena and Kammani (2013), Alateyah <i>et al.</i> (2013), Kertesz (2003), Kumar <i>et al.</i> (2007), Miyazaki and Fernandez (2001), Cho (2004), Rahman <i>et al.</i> (2014), Fors and Moreno (2002), Rice (2003), Thomas and Streib (2003), Khanh (2014)
		Culture (resistance to change, willingness/ ability to use e-project)	AlShehri and Drew (2010), Coursey and Norris (2008), Ashaye (2014), Goings <i>et al.</i> (2003), Alateyah (2013), Gilbert and Balestrini (2004), Carter and Bélanger (2005)
Operational	Al-Shehry <i>et al.</i> (2006), Al-Sebie and Irani (2005), Gilbert <i>et al.</i> (2004), West (2004), Ndou (2004), Jaeger and Thompson (2003), Prins (2001).	Core business processes improvement and reengineering	Scholl (2005)
		Internal changes in the administration and organization of the external relations with service customers	Aichholzer and Schmutzer, (2000)
		Building efficient e-government business cases	Government Accountability Office, (2001)
Financial	Al-Shehry <i>et al.</i> (2006), Gilbert <i>et al.</i> (2004), Al-Sebie and Irani (2005),	Organizations to reduce their high charges to expand their financial capabilities	AlShehri and Drew (2010), Kamal (2008)
		Difficulty justifying return on investment	Coursey and Norris (2008)

Challenge Category	Challenge Cat. Reference	Example of Challenges	Challenge Reference
	West (2004), Ndou (2004) Jaeger and Thompson (2003), Prins, (2001), AlShehri and Drew (2010)	Lack of financial resources	Coursey and Norris (2008), Ebrahim & Irani (2004), Safeena and Kammani, (2013), Rahman <i>et al.</i> (2014), Dawes and Pardo (2002), Edmiston (2003), Norris <i>et al.</i> (2001), Khanh (2014)
Strategic	Al-Shehry <i>et al.</i> (2006), Al-Sebie and Irani (2005), Gilbert <i>et al.</i> (2004), West (2004), Ndou (2004), Jaeger and Thompson (2003), Prins (2001), Ashaye and Irani (2014)	Maintaining a citizen focus	Government Accountability Office (2001)

Table 2. 8: E-Government Challenges/Barriers

Approach	Definition	Authors
Process/Function oriented	Visualize, question, analyse, and interpret data to understand relationships, patterns, and trends.	Environmental Systems Research Institute (2015)
Process/Function oriented	Integrates hardware, software, and data for capturing, managing, analysing, and displaying all forms of geographically referenced information.	Bhargava et al. (2012)
Process/Function oriented	System that integrates hardware, software, and data for capturing, managing, analysing, and displaying all forms of geographically referenced information.	Environmental Systems Research Institute (2012)
Toolbox	Provide the geographic information with the infrastructure, tools and methods for tackling real world problems within acceptable timeframes.	Maguire (2010)
Process/Function oriented – Elements	<p>GIS consists of:</p> <ul style="list-style-type: none"> - Digital Data – the geographical information that you will view and analyse using computer hardware and software. - Computer Hardware – computers used for storing data, displaying graphics and processing data. - Computer Software – computer programs that run on the computer hardware and allow you to work with digital data. 	Sutton et al. (2009)
Social Construction – Process/Function oriented	<p>An organized activity by which people:</p> <ul style="list-style-type: none"> • Measure aspects of geographic phenomena and processes; • Represent these measurements, usually in the form of a computer database, to emphasize spatial themes, entities, and relationships; • Operate upon these representations to produce more measurements and to discover new relationships by integrating disparate sources • Transform these representations to conform to other frameworks of entities and relationships 	Longley et al. (2005), Chrisman (1999)
Process/Function oriented	Capture, store, and manage spatially referenced data such as points, lines, and polygons.	Miles and Ho's (1999)
Process/Function oriented	An organized collection of computer hardware and software designed to efficiently create, manipulate, analyse, and display all types of geographically or spatially referenced data.	Pine (1998)

Approach	Definition	Authors
Toolbox	Powerful set of computer-based tools used to collect, store, manipulate, analyse and display spatially referenced information.	Burrough and McDonnell (1998)
Application Elements –	Describe the hardware, software, data, procedures and people needed to develop Land Inventory.	Tomlinson (1998)
Toolbox	System designed to observe and analyse the full range of human-environment activity with reference to the right data.	Wright et al. (1997)
Social Construction – Process/Function oriented	GIS is a socially constructed technology.	Warren (1995)
Toolbox	Information system designed specifically to handle geographically referenced information tied to specific locations on the surface of the earth.	Goodchild (1995)
Process/Function oriented	Computerized system for capturing, storing, updating and displaying geographic data.	Clarke (1995), Laurini and Thompson (1992), Maguire et al. (1991)
Elements	Four basic elements which operate in an institutional context: computer hardware, computer software, data and liveware.	Maguire et al. (1991)
Process/Function oriented	A system with advanced geo-modelling capabilities.	Koshkarirov et al. (1989)
Process/Function oriented	Any manual or computer based set of procedures used to store and manipulate geographically referenced data.	Aronoff (1989)
Elements	An institutional entity, reflecting an organizational structure that integrates technology with a database, expertise and continuing financial support over time.	Carter (1989)
Process/Function oriented	An information technology which stores, analyses and displays both spatial and non-spatial data.	Parker (1988)
Decision support System	A decision support system involving the integration of spatially referenced data in a problem-solving environment.	Cowen (1988)
Elements	GIS is a set of three components: GIS technology (software & hardware), GIS database (geographical and related data) and GIS infrastructure (staff, facilities and supporting elements).	Dickinson and Calkins (1988)
Database	A database system in which most of the data are	Smith et al. (1987)

Approach	Definition	Authors
	spatially indexed and upon with a set of procedures operated in order to answer queries about spatial entities in the database.	
Process/Function oriented	A system for capturing, storing, checking, manipulating, analysing and displaying data which are spatially referenced to the earth.	US Department of the Environment (1987)
Toolbox	Powerful set of tools for storing and retrieving, transforming and displaying spatial data collected from the real world for different purposes.	Burrough (1986)
Management Information System	A form of MIS that allows map display of the general information.	Devine and Field (1986)
Process/Function oriented	An automated set of functions that provides professionals with advanced capabilities for the storage, retrieval, manipulation, and display of geographically located data.	Ozemoy et al. (1981)
Database	A special case of information systems where the database consists of observations on spatially distributed features, activities, or events which are definable in space as points, lines and areas to retrieve data for ad hoc queries and analyses.	Dueker (1979)
Application	GIS as a computer application designed to perform certain specific functions.	Tomlinson (1960)

Table 2. 9: GIS definitions

Benefit	Category				Beneficiary			Author
	EFF	OPR	STR	EXT	GOV	BUS	CIT	
Helps managers and citizens to better recognize the changes and updates occurring in the real world			X	X	X	X	X	Sattler (2014)
Offers a unique set of spatial and analytical tools, used by researchers and policymakers who revealed its usefulness as a problem-solving technology, and the capability to convey essential information to peers	X	X	X	X	X	X	X	England (2014)
Establishes the connections between governmental departments and increases the flow of information locally	X	X			X			Skelton (2014)
Increases the community involvement and the resource management efficiency by expanding the community of people interaction with GIS and provides the linking between spatial and non-spatial data by placing spatial data in the format that users understand	X	X		X	X	X	X	Colburn (2013)
Provides the mobile user with the capability to search for the nearest business or service in their location proximity, receive alerts, find a friend, locate taxis, service personnel, doctors, and rental equipment, schedule fleets, track objects, find information such as navigation, weather, traffic, and room schedules, automate airport check-ins	X	X		X			X	Rainer and Cegielski, (2012)
Is useful as a unique and global feature supporting the modern world's needs	X	X			X	X	X	Longley et al. (2011)
Relates sites to infrastructure, to area markets, and to land use and zoning patterns	X	X		X	X	X	X	Schafer (2011)
Supports the representation of a community's points of interest on popular location based services to create public value and thus people are to find goods and services			X	X		X	X	Ahmed (2011)
Offers through web GIS a versatility and approachability		X		X		X	X	Li et al. (2011)
Provides data spatially referenced that represent the majority of data processing in local government authorities, offers the government a trusted source of information and improves the government performance as well as its efficiency	X	X		X	X			Breetzke et al. (2011)

Allows users to receive up-to-date information about their surroundings, save time and money, and make better, informed real-time choices and enables businesses to build and maintain customer relationships, increasing their profit gain potential		X		X		X	X	Kaplan (2011)
Enhances the overall body of environmental knowledge through the availability of huge amounts of place-based data, images, and other geographically relevant information online (web and mobile)	X	X		X			X	Ahmed (2011)
Is used for the enhancement of public participation and enablement in spatial planning and environmental management situations	X		X	X	X	X	X	Bunch and MacLennan (2010), Miller et al. (2004), Voinov and Costanza (1999)
Assists in distributing information to law enforcement agencies, residents and potential residents	X	X		X	X	X	X	Wilson (2009)
Allows law enforcement agencies to collect data on crimes and to collaborate more easily and effectively with other agencies	X	X		X	X			Boba et al. (2009)
Improves the analytical capabilities of the law enforcement agencies and supports the managerial and operational decision making activities and accordingly having a significant positive impact on policing outcomes, such as crime rates	X	X	X		X			Demir (2009), Gul (2009), La Vigne et al. (2008), Smith (2007), Pain et al. (2006), Gilfoyle and Thorpe (2004), Leipnik and Albert (2003), Hirschfield (2001), Bowers and Hirschfield (2001), Jankowski and Timothy (2001) LaVigne and Groff (2001), Chainey (2001), Greenwald (2000)
Relates different incompatible data, when analysed separately, to extract valuable information from these new relationships	X	X			X	X	X	Carocci et al. (2009), Galati (2006), Longley et al. (2005)
Adds the concept of location to the analysis executed over the issues related to crime and human behaviour, public health and environmental studies		X	X	X	X		X	Donovan et al. (2009), Lee et al. (2008), Zahran et al. (2006), Duncan and Mummery (2005), Matei et al. (2001)
Offers the pupils an active learning method engaging them in critical thinking and providing them the capability to think and work like scientists by investigating complex relationships		X	X	X			X	Kerski (2008), Holzberg (2006), Lucking and Christmann (2003)

Offers the interactions between governments and citizens in political decision-making processes	X		X	X	X		X	Goodchild (2007), Elwood (2002), Ghose (2001)
Offers the users the technological capabilities to participate and share data		X	X	X	X	X	X	Goodchild (2007), Seiber (2007)
Allows citizens to become more involved in the process of creating geographic information and thus ensuring the collective impact of the public on the GIS			X	X			X	Goodchild (2007)
Increases tremendously the public participation in a project especially when using Web GIS			X	X			X	Jankowski et al. (2007)
Provides access to the data to all parties involved, greatly improves the communication and increases the efficiency when helped rescue operators need to get to the disaster sites quickly by allocating the required resources to the affected areas	X	X		X	X	X	X	Fike (2007)
Offers the public the information accessibility and encourages public participation in the GIS projects		X		X			X	Kingston (2007)
Enables the researchers to develop more accessible and comprehensible information for the citizens		X		X			X	Aronson et al. (2007)
Supports in measuring the local service demand, services' delivery and their performance, assists the process of foreseeing, properly adjusting, and prioritizing the required public service delivery and offers a clear visualization and spatial analysis of data		X	X	X	X	X	X	Ashby et al. (2007)
Provides competitive advantages in security and planning activities, offers strategy selection and decision-making capabilities for both business and governmental authorities and increases operational efficiency if digital data processing features are available	X	X	X	X	X	X		Smith (2007)
Improves the pupil's attitude towards geography since they gain the know-how of problem-based learning instruction and enjoys the introduction of a new technology			X	X			X	Tulloch and Graff (2007), Drennon (2005), Baker and White (2003), Keiper (1999)
Emphasizes the online collaboration and sharing technologies through the Web 2.0 as "crowd-sourcing"			X	X		X	X	Howe (2006)

Offers the community information accessibility and easier interpretation to the community stakeholders		X		X			X	Choi et al. (2006)
Facilitates the database management by enabling visual displays and map production and allows the synchronization of data updates visually	X	X			X	X		Demirci and Suen (2006)
Improves the critical thinking and mainly the geographic thinking skills by integrating it into the problem-based learning instruction			X	X			X	Shin (2006), Bednarz (2004)
Offers the law enforcement agencies a tool to increase its traditional functions, information sharing in addition to the enhancement of problem solving		X	X		X			Boba (2005), Tennant (2001)
Impacts the work procedures, flow of information, management, and team and organizational culture		X	X		X			Gilfoyle and Thorpe (2004)
Creates through web GIS a richer user experience that is interactive, easy to understand, and even fun to learn and use		X	X	X		X	X	Kraak (2004)
Provides the local organizations the decision-making capability through the cost of testing probable models, invested time and effort			X	X	X			O'Looney (2003)
Enables easier and faster information management and data queries with less resources, improves the agencies' effectiveness in its core mission, extends to the public the data availability thus crossing the agencies' walls of the agency and allowing easier access to wide audience and improves the data management in the organizations by enhancing its efficiency and effectiveness	X	X	X	X	X		X	Tulloch and Epstein (2002)
Provides pupils the capability and chance to apply knowledge in person using higher-order skills such as problem-solving and synthesis		X	X	X			X	Sanders et al. (2002)
Creates an education environment where pupils can visually discover, investigate, and make decisions about issues in an interactive and challenging manner		X	X	X			X	Audet and Ludwig (2000)
Provides a new and great model for leading ourselves			X	X			X	Greene (2000)

Improve existing operations, additional capabilities not available in a non-GIS environment, response to unexpected, non-planned, or emergency situations, intangible improvements and revenues generated through sale of data and products.	X	X	X		X			Montgomery County Council's Management and Fiscal Policy Committee (1999)
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Table 2. 10: Geographic Information benefits



#	Research Questions	Research Objectives	Research Hypothesis	Research Methodology/ Method
1	RQ1: What are the factors influencing the e-government citizens' adoption?	RO1: To identify the factors influencing the e-government citizens' adoption.		Secondary Data Research – Systematic Literature Review
		RO2: To address the potential role of GI, as an influential factor, in the adoption of e-government services and validate the identified gap.		Secondary Data Research – Systematic Literature Review
		RO3: To explore all the GI related components that reflect the GI influence on the e-government services adoption.		Secondary Data Research – Systematic Literature Review
2	RQ2: What is the impact of the geographic information (GI) and the other identified	RO4: To develop, test, validate and finalize the GI-based e-government (GE-government) citizens'	H1: High level of Perceived Ease of Use has positive influence on the E-government citizens' adoption H2: High level of Perceived Usefulness has	Quantitative Primary Data Research – Structured Questionnaire Survey

#	Research Questions	Research Objectives	Research Hypothesis	Research Methodology/ Method
	influential factors on the adoption of the e-government services?	<p>adoption framework.</p> <hr/> <p>RO5: To study the GI direct impact on the e-government citizens' adoption.</p>	<p>positive influence on the E-government citizens' adoption</p> <p>H3: High level of positive Word of Mouth has positive influence on the E-government citizens' adoption</p> <p>H4: Low level of Favouritism has positive influence on the E-government citizens' adoption</p> <p>H5: Digital Divide has influence on the E-government citizens' adoption</p> <p>H6: High level of Website Design has positive influence on the E-government citizens' adoption</p> <p>H7: High level of Internet & Computer Skills Confidence has positive influence on the E-government citizens' adoption</p> <p>H8: Low level of Fear of Job Loss Belief has positive influence on the E-government citizens' adoption</p>	<p>Data Analysis method – Descriptive Statistics, Exploratory Factor Analysis, Binary Logistic Regression Modelling and Pearson Chi-square.</p>

#	Research Questions	Research Objectives	Research Hypothesis	Research Methodology/ Method
			<p>H9: Low level of Religious Belief has positive influence on the E-government citizens' adoption</p> <p>H10: High Level of positive Attitude has positive influence on the E-government citizens' adoption</p> <p>H11: High Level of Trust in Internet has positive influence on the E-government citizens' adoption</p> <p>H12: High Level of Trust in Government has positive influence on the E-government citizens' adoption</p> <p>H13: Low level of Resistance to change has positive influence on the E-government citizens' adoption</p> <p>H14: Male is more E-government adopter than Female gender</p> <p>H15: Younger and middle Age are more E-government adopters than older age groups</p>	

#	Research Questions	Research Objectives	Research Hypothesis	Research Methodology/ Method
			<p>H16: Higher Level of Income are more E-government adopters than lower Level of Income groups</p> <p>H17: Higher Level of Education are more E-government adopters than lower Level of Education groups</p> <p>H21: Geographic Information has positive influence on the E-government citizens' adoption</p> <p>H22: The Geographic Information increase the level of positive influence of the Website Design on the E-government Citizens' Adoption</p> <p>H23: The Geographic Information increase the level of positive influence of the Perceived Usefulness on the E-government Citizens' Adoption</p> <p>H24: The Geographic Information increase the level of positive influence of the Perceived Ease</p>	

#	Research Questions	Research Objectives	Research Hypothesis	Research Methodology/ Method
			of Use on the E-government Citizens' Adoption	
3	RQ3: What influential role has the geographic information (GI) in the e-government citizens' adoption (EGCA) influential factors?	RO6: To study the GI direct impact on some of the identified e-government citizens' adoption influential factors.	<p>H18: The Geographic Information has influence over the Website Design of the E-government applications</p> <p>H19: The Geographic Information has influence over the Perceived Usefulness of the E-government applications</p> <p>H20: The Geographic Information has influence over the Perceived Ease of Use of the E-government applications</p>	<p>Quantitative Primary Data Research – Structured Questionnaire Survey</p> <p>Data Analysis method – Descriptive Statistics and Pearson Chi-square</p>

Table 4. 2: Mapping Research Questions, Objectives, Hypotheses to Methodologies/Methods

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
H1	High level of Perceived Ease of Use has positive influence on the E-government citizens' adoption	Perceived Ease of Use (PEOU)	E-government Citizens' Adoption	Davis (1989), Alghamdi and Beloff (2016), Alomari (2014), Alateyah et al. (2013), AlHujran et al (2013), Abu Shanab (2012), Abu Nadi et al. (2008), Hung et al. (2006), Persaud and Sehgal	Alomari (2014-2010)	I would like to use E-government portals since it simplifies the access to the government services.
H2	High level of Perceived Usefulness has positive influence on the E-government citizens' adoption	Perceived Usefulness (PU)	E-government Citizens' Adoption	(2005), Chang et al. (2005), Carter and Belanger (2005), Phang et al. (2005) and Carter and Belanger (2004)	Alomari (2014-2010)	I would find useful E-government portals more valuable to be used.
H3	High level of positive Word of Mouth has positive influence on the E-government citizens' adoption	Word of Mouth (WOM)	E-government Citizens' Adoption	Granovetter (1973), Kim and Prabhakar (2004) and Alomari (2014 – 2010)	Alomari (2014-2010)	I would highly recommend the E-government services (ex. Online Tax/Bills/Violations Payments, Municipal services, Postal

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
	adoption					services,...).
H4	Low level of Favouritism has positive influence on the E-government citizens' adoption	Favouritism (FA)	E-government Citizens' Adoption	Feghali (1997), Makhoul and Harrison (2004), Whiteoak et al. (2006), Cunningham and Sarayrah (1993), Alghamdi and Beloff (2016), Alomari (2014 – 2010) and Al Awadhi and Morris (2009)	Alomari (2014-2010)	I prefer to use E-government services (ex. Online Tax/Bills/Violations Payments, Tourism services, Municipal services,...) instead of the traditional services that relies on interpersonal relationship.
					Alomari (2014-2010)	I would rely on my interpersonal relationships with powerful people in conducting the different transaction in any government agency.
H5	Digital Divide has influence on	Digital Divide (DD)	E-government	Alomari (2014, 2006), Alateyah (2013), Al	Alomari (2014-2010)	B, C, D, G

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
	the E-government citizens' adoption		Citizens' Adoption	Hujran et al. (2013), Belanger & Carter (2009), Abu-Samaha and Abdel Samad (2007), Reddick (2005), Thomas and Streib (2003) and Tarawneh (2003)		
H6	High level of Website Design has positive influence on the E-government citizens' adoption	Website Design (WD)	E-government Citizens' Adoption	Alghamdi and Beloff (2016), Alomari (2014), Alateyah (2013), Akkaya (2013), Kumar et al. (2007), Abanumi et al. (2005), Gilbert and Balestrini (2004) and Moon (2004)	Alomari (2014-2010)	I would be definitely confident in using E-government portals if it is designed in a user friendly way.
H7	High level of Internet & Computer Skills Confidence has positive influence on the E-government citizens' adoption	Internet & Computer Skills Confidence (ICSC)	E-government Citizens' Adoption	Alomari (2014), Al Hujran et al. (2013), Alateyah (2013), Wangpipatwong et al. (2008), Carter and Weerakkody (2008), Belanger and Carter (2006), Vassilakis et al. (2005), Pons (2004),	Alomari (2014-2010)	If I have the internet and computer skills, I will definitely feel capable in using the E-government portals.

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
	adoption			Moon (2004), Jaeger and Thompson (2003), Welch & Hinnant (2003) and Aladwani (2003)		
H8	Low level of Fear of Job Loss Belief has positive influence on the E-government citizens' adoption	Fear of Job Loss Belief (FJLB)	E-government Citizens' Adoption	Alomari (2014) and Vassilakis et al. (2005)	Alomari (2014-2010)	I would have negative attitudes toward E-government services because I might lose my job.
H9	Low level of Religious Belief has positive influence on the E-government citizens' adoption	Religious Belief (RB)	E-government Citizens' Adoption	Alomari (2014), Hofheinz (2005), Evans and Yen (2005), Dimitrova and Beilock (2005), Leonard et al. (2004), Norton (2002) and Hill et al. (1998)	Alomari (2014-2010)	The existence of immoral issues and views on the internet, inconsistent with my religious belief, would prevent me from using the E-government portals.
H10	High Level of positive Attitude has positive	Attitude (AT)	E-government Citizens'	Alomari (2014), Al Hujran et al. (2013), Susanto (2013), Harfouche (2010),	Alomari (2014-2010)	Using E-government portals to interact with government is

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
	influence on the E-government citizens' adoption		Adoption	AlAwadhi and Morris (2008), Hung et al. (2006), Persaud and Sehgal (2005), Chu and Wu (2005), Pons (2004) and Charbaji and Mikdashi (2003)		an appealing idea that I like it and I would easily adapt to any changes that E-government may cause.
H11	High Level of Trust in Internet has positive influence on the E-government citizens' adoption	Trust in Internet (TI)	E-government Citizens' Adoption	Alghamdi and Beloff (2016), Alomari (2014), Alateyah (2013), Susanto (2010), Al Hujran et al. (2013), Akkaya (2013), Harfouche (2010), Abu Nadi (2008), AlAwadhi and Morris (2008), Al-Shafi and Weerakkody (2009), Kumar et al. (2007), Chang et al. (2005), Phang et al. (2005), Carter and Belanger (2005), Chang et al. (2005), Gilbert and Balestrini (2004), Pons	Alomari (2014-2010) and Al-Shafi and Weerakkody (2009)	Faster and safer internet will make me feel more comfortable and confident in using E-government portals.

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
				(2004), Rao (2002) and Warkentin et al. (2002)		
H12	High Level of Trust in Government has positive influence on the E-government citizens' adoption	Trust in Government (TG)	E-government Citizens' Adoption	Alghamdi and Beloff (2016), Alomari (2014), Alateyah (2013), Susanto (2010), Al Hujran et al. (2013), Akkaya (2013), Harfouche (2010), Abu Nadi (2008), AlAwadhi and Morris (2008), Belanger and Carter (2008), Welch et al. (2005), Van Slyke et al. (2004) and Pavlou (2003)	Alomari (2014-2010)	With high government's technological capabilities, I would like to use E-government portals.
H13	Low level of Resistance to change has positive influence on the E-government citizens'	Resistance to Change (RTC)	E-government Citizens' Adoption	Alomari (2014), Abu-Shanab (2012), Schwester (2009), Kamal and Themistocleous (2006), Ndou (2004), Edmiston (2003) and Sathye (1999)	Alomari (2014-2010)	I would easily adapt to change from using traditional government services to electronic services (ex. Online Tax/Bills/Violations

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
	adoption					Payments, Tourism services, Postal services,...).
H14	Male is more E-government adopter than Female gender	Gender (GE)	E-government Citizens' Adoption	Alghamdi and Beloff (2016), Alomari (2014), Al Hujran et al. (2013), Akkaya et al. (2013), Susanto (2013), Abu Shanab (2012), Rokhman (2010), Harfouche (2010), Belanger and Carter (2009), Al-Shafi and Weerakkody (2009), Abu Nadi (2008), Al Awadhi and Morris (2008), Carter & Weerakkody (2008), Patel & Jacobson (2008), Dwivedi & Lal (2007), Choudrie and Papazafeiropoulou (2006), Dimitrova and Chen (2006), Choudrie and Dwivedi (2005), Choudrie	Alomari (2014-2010) and Al-Shafi and Weerakkody (2009)	A

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
				& Lee (2004), Venkatesh et al. (2003), Thomas and Streib (2003), Hart and Teeter (2003), Jackson and Scott (2001), Morris and Venkatesh (2000), Venkatesh et al. (2000) and Anderson and Young (1999)		
H15	Younger and middle Age are more E-government adopters than older age groups	Age (AG)	E-government Citizens' Adoption	Alghamdi and Beloff (2016), Alomari (2014), Susanto (2013), Akkaya et al. (2013), Al Hujran et al. (2013), Harfouche (2010), Rokhman (2010), Al-Shafi and Weerakkody (2009), Patel and Jacobson (2008), Abu Nadi (2008), Al Awadhi and Morris (2008), Dwivedi and Lal (2007), Dimitrova and Chen (2006), Choudrie and Papazafeiropoulou	Alomari (2014-2010) and Al-Shafi and Weerakkody (2009)	B

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
				(2006), Choudri and Lee (2006), Choudrie and Dwivedi (2005), Thomas and Streib (2003), Hart and Teeter (2003), Venkatesh et al. (2003) and Morris and Venkatesh (2000)		
H16	Higher Level of Income are more E-government adopters than lower Level of Income groups	Level of Income (LI)	E-government Citizens' Adoption	Alghamdi and Beloff (2016), Alomari (2014), Susanto (2013), Al Hujran et al. (2013), Harfouche (2010), Shafi and Weerakkody (2009), Abu Nadi (2008), Patel and Jacobson (2008), Dimitrova and Chen (2006), Choudrie and Dwivedi (2005), Thomas and Streib (2003) and Hart and Teeter (2003)	Alomari (2014-2010) and Al-Shafi and Weerakkody (2009)	C

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
H17	Higher Level of Education are more E-government adopters than lower Level of Education groups	Level of Education (LE)	E-government Citizens' Adoption	Alghamdi and Beloff (2016), Alomari (2014), Akkaya et al. (2013), Al Hujran et al. (2013), Susanto (2013), Harfouche (2010), Rokhman (2010), Al-Shafi and Weerakkody (2009), Al Awadhi and Morris (2008), Abu Nadi (2008), Patel and Jacobson (2008), Dwivedi et al. (2007), Dwivedi and Lal (2007), Dimitrova and Chen (2006), Choudrie and Papazafeiropoulou (2006), Choudrie and Dwivedi (2005), Choudrie & Lal (2004), Thomas and Streib (2003), Hart and Teeter (2003) and Venkatesh et al. (2000)	Alomari (2014-2010) and Al-Shafi and Weerakkody (2009)	D
H18	The Geographic Information has	Geographic Information	Website Design	Marson et al. (2015), Shah and Wani (2015), Ijeh	Wray (2011)	Web-portal with location based

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
	influence over the Website Design of the E-government applications	(GI)	(WD)	(2014), Pandagale et al. (2014), Yan and Wang (2012), Wray (2011), Singh et al.(2011), Wei (2011), Nair and Katiyar		services' capabilities (ex. Google digital map) will be more attractive and appealing to users.
H22	The Geographic Information increase the level of positive influence of the Website Design on the E-government Citizens' Adoption	Geographic Information (GI)/Website Design (WD)	E-government Citizens' Adoption	(2011), Balogun et al. (2010), Baz et al. (2010)		The E-government portal with location based services' capabilities (ex. Google digital map) will be more attractive and appealing to users.
H19	The Geographic Information has influence over the Perceived Usefulness of the E-government applications	Geographic Information (GI)	Perceived Usefulness (PU)	Aphane (2015), Bediroğlu (2015), Marson et al. (2015), Shah and Wani (2015), Ijeh (2014), Gupta et al. (2014), Pandagale et al. (2014), Everton et al. (2013), International IDEA (2013), Protic and	Wray (2011)	Web-portal with location based services' capabilities (ex. Google digital map) will increase the usefulness.

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
H23	The Geographic Information increase the level of positive influence of the Perceived Usefulness on the E-government Citizens' Adoption	Geographic Information (GI)/ Perceived Usefulness (PU)	E-government Citizens' Adoption	Nestorov (2013), Wray (2011)		The E-government portal with location based services' capabilities (ex. Google digital map) will increase the usefulness.
H20	The Geographic Information has influence over the Perceived Ease of Use of the E-government applications	Geographic Information (GI)	Perceived Ease of Use (PEOU)	Aphane (2015), Bediroğlu (2015), Marson et al. (2015), Shah and Wani (2015), Ijeh (2014), Gupta et al. (2014), Pandagale et al. (2014), Everton et al. (2013), International IDEA (2013), Protic and	Wray (2011)	Web-portal with location based services' capabilities (ex. Google digital map) will increase the ease of use.
H24	The Geographic Information increase the level of positive	Geographic Information (GI)/ Perceived	E-government Citizens' Adoption	Nestorov (2013), Wray (2011)		The E-government portal with location based services' capabilities (ex.

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
	influence of the Perceived Ease of Use on the E-government Citizens' Adoption	Ease of Use (PEOU)				Google digital map) will increase the ease of use.
H21	Geographic Information has positive influence on the E-government citizens' adoption	Geographic Information (GI)	E-government Citizens' Adoption			<p>Using location based services (ex. Google digital map) in the E-government portal will increase the E-government Citizens' adoption.</p> <p>As a user, I would prefer to use E-government portal with location based services (ex. Google digital map) when interacting with the government.</p>
			E-government		Alomari (2014-2010) and Al-	I believe that I will not hesitate in using

HN	Research Hypothesis	Independent Factor	Dependent Factor	Factor LR references	Initial Question Sources	Questions
			Citizens' Adoption		Shafi and Weerakkody (2009)	the E-government portal to interact with the government.

QA	Gender	Male	Female
		1	2

QB	Age	Less than 20	20 - 29	30 - 39	40 - 49	More than 50
		1	2	3	4	5

QC	Level of Income	Less than 500	500 - 1500	1500 - 2500	2500 - 3500	More than 3500
		1	2	3	4	5

QD	Level of Education	Secondary School	College	Bachelor	Higher Education	Other
		1	2	3	4	5

QE	Religion	Muslim	Christian	Other
		1	2	3

QF	Occupation	Employee in Public Sector	Employee in Private Sector	Business Owner	Other
		1	2	3	4

QG	Region of Residence	Urban Areas	Rural Areas
		1	2

QH	Internet Availability in the Region of Residence	No	Yes
		1	2

QI	I mostly use the internet at (please select one)	Home	Work	Other
		1	2	3

QJ	I prefer to execute my Online Government Transactions at (please select one)	Home	Work	Other
		1	2	3

QK	I prefer to execute my Online Government Transactions through (please select one)	Desktop	Mobile	Tablet	Laptop	Other
		1	2	3	4	5

Table 4. 3: Mapping Research Hypotheses to Questions

Appendix C: List of Abbreviations



Abbreviation	Name
E-government	Electronic Government
EGov	Electronic Government
GE-government	GI based E-government
DOI	Diffusion of Innovation
IIT	Information Integration Theory
TRA	Theory of Reasoned Action
TPB	Theory of Planned Behaviour
TAM	Technology Acceptance Model
TOE	Technology, Organization & Environment
PCI	Perceived Characteristics Innovation
SCT	Social Cognitive Theory
UTAUT	Unified Theory of Acceptance and Use of Technology
MATH	Extended Model of Acceptance Technology in Households
IS	Information System
GI	Geographic Information
GIS	Geographic Information System
GIScience	Geographic Information Science
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
WOM	Word of Mouth
FA	Favouritism
DD	Digital Divide
WD	Website Design
ICSC	Internet & Computer Skills Confidence
FJLB	Fear of Job Loss Belief
RB	Religious Belief
AT	Attitude
TI	Trust in Internet
TG	Trust in Government
RTC	Resistance to Change
GE	Gender
AG	Age
LI	Level of Income
LE	level of Education
EFA	Exploratory Factor Analysis
PCA	Principal Component Analysis
BLRMA	Binary Logistic Regression Modelling Analysis