

**AN OPTIMIZED ELECTRONIC GOVERNMENT
SERVICES ADOPTION MODEL USING
STRUCTURAL EQUATION AND MAXIMUM
ATTRIBUTE RELATIVE MODELS**

DEDEN WITARSYAH



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PERPUSTAKAAN TUNKU TUN AMINAH

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ABSTRACT

Electronic Government (e-gov) and its adoption plays an important role in assisting countries to provide their citizen with various services. However, the literature has shown that the adoption of current e-government services adoption model does not properly precise in fulfilling the user's desires, particularly in developing countries. This is due to the fact that the key factors of the current models are not suitable and properly determined. Specifically, current adoption models have too many factors, thus resulting to difficulties to work on important factors especially when constraints are imposed. In this research, Structural Equation Model (SEM) was used to analyze the effectiveness of recent models. SEM was selected because it allows researchers to test the relationship between complex variables are either recursive or nonrecursive to obtain a thorough overview of the whole model. From the analysis, an optimized model is proposed. Then, Maximum Attribute Relative (MAR) is implemented to determine the most important factors of e-government adoption model. MAR has been chosen because it has the capability to solve the uncertainty information of the respondents' respond. The proposed model has been tested and passed the t-test and p-value approach where the value of Behavior Intention to User Behavior are 5.584 and 0.000; value of Facilitating Condition to User Behavior are 3.535 and 0.000; value of Information Quality to Performance Expectancy are 2.714 and 0.007; value of Performance Expectancy to Behavior Intention are 6.171 and 0.000; value of System Quality to Performance Expectancy are 2.895 and 0.004; and finally, value of Trust to Behavior Intention are 5.422 and 0.000. The fit test and indices for the model proposed were proven fit enough, where Standardized Root Mean Square Residual (SRMR) was 0.063 that indicated a good fit of the model, and Normed Fit Index (NFI) was 0.778, showing the marginal fit of the model. Meanwhile, computational model analysis using MAR to support the procession of the proposed model showed that Facilitating Condition (FC) has a value of 43. This portrays that the FC variable is the highest in influencing the people to use e-government, followed by Performance Expectancy and Information Quality that resulting in the value of both 35. The

findings confirmed the significance of information quality, system quality and trust perceived by the citizens in adopting e-government services, and provide insights into whether an optimization model and computational model using MAR based on the soft set theory should be integrated to explain citizens' intention to use e-government. Additionally, the optimized model offers the stakeholders a new perspective for dealing with e-government adoption by signifying the importance of support quality perceived by citizens.



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ABSTRAK

Kerajaan Elektronik (e-kerajaan) dan penerimaannya memainkan peranan penting dalam membantu negara untuk menyediakan rakyat dengan pelbagai perkhidmatan. Walau bagaimanapun, kajian literatur terdahulu di dalam e-kerajaan menunjukkan bahawa model penerimaan perkhidmatan yang sedia ada kurang sesuai terutamanya di negara-negara membangun. Ketidaksesuaian ini disebabkan oleh model-model penerimaan yang sedia ada mempunyai banyak faktor-faktor yang menyebabkan kesukaran pada implementasi terutamanya pada kekangan tertentu. Oleh itu, dicadangkan model penerimaan perkhidmatan e-kerajaan yang optimum di dalam kajian ini. Pertama, *Structural Equation Model* (SEM) digunakan untuk menganalisis keberkesanan model terkini. Model yang optimum telah dicadangkan hasil daripada keputusan analisis berkenaan. Seterusnya, *Maximum Attribute Relative* (MAR) digunakan untuk menentukan faktor model penerimaan e-kerajaan yang paling penting. MAR telah dipilih kerana ia mempunyai keupayaan untuk menyelesaikan ketidakpastian maklumat daripada responden. Model yang dicadangkan telah diuji dengan menggunakan kaedah *t-test* dan *p-value* dan nilai-nilai yang diperolehi adalah seperti berikut: *Behavior Intention* kepada *User Behavior* adalah 5.584 dan 0.000; *Facilitating Condition* kepada *User Behavior* adalah 3.535 dan 0.000; nilai *Information Quality* kepada *Performance Expectancy* ialah 2.714 dan 0.007; *Performance Expectancy* kepada *Behavior Intention* ialah 6.171 dan 0.000; *System Quality* ke *Performance Expectancy* adalah 2.895 dan 0.004; dan, *Trust* kepada *Behavior Intention* adalah 5.422 dan 0.000. Keputusan *Fit test* dan indeks untuk model yang dicadangkan telah dibuktikan sangat sesuai. Nilai *Standardized Root Mean Square Residual* (SRMR) adalah 0.063 menunjukkan model berkenaan sesuai, dan nilai *Normed Fit Index* (NFI) adalah 0.778, menunjukkan kesesuaian marjinal model. Selain itu, analisis model komputasi yang menggunakan MAR untuk menyokong prosesi model yang dicadangkan menunjukkan bahawa *Facilitating Condition* (FC) mempunyai nilai 43. Ini menunjukkan bahawa nilai pemboleh ubah FC adalah yang paling tinggi dalam mempengaruhi pengguna untuk menerima e-kerajaan, diikuti oleh

Kemajuan Prestasi dan *Information Quality* yang mempunyai nilai 35. Hasil kajian ini mengesahkan kepentingan untuk menyokong kualiti maklumat, kualiti sistem dan kepercayaan daripada sudut pengguna, dan juga menunjukkan keperluan sama ada model pengoptimuman dan model komputasi yang menggunakan MAR berdasarkan teori soft set harus diintegrasikan untuk menjelaskan kehendak pengguna dalam penerimaan e-kerajaan. Di samping itu, model optimum ini menawarkan perspektif baru untuk menangani penerimaan e-kerajaan dengan menandakan kepentingan kualiti sokongan daripada sudut pengguna.



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PUBLICATIONS

A fair amount of the materials presented in this thesis have been published in various refereed conference proceedings and journals.

Journals

1. Deden Witarsyah Jacob, Mohd Farhan Md Fudzee, Mohamad Aizi Salamat and Tutut Herawan. "A Review on Generic End-User Adoption for e-Government Services", *International Review of Administrative Sciences*. DOI: 10.1177/0020852315585062. (ISI Indexed with IF = 0.716)
2. Deden Witarsyah, Teddy Sjafrizal, Mohd Farhan Md Fudzee and Mohamad Aizi Salamat. "The Critical Factors Affecting e-Government Adoption in Indonesia: A Conceptual Framework", *International Journal on Advanced Science, Engineering and Information Technology*, vol. 7, no. 1, pp. 160-167. 2017.[Online].(Scopus Indexed).
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3. Deden Witarsyah Jacob, Mohd Farhan Md Fudzee and Mohamad Aizi Salamat. "A Conceptual Study on Generic End Users Adoption of e-Government Services", *International Journal on Advanced Science Engineering and Information Technology*, Vol 7, Issue 3, pp. 1000-1006, 2017. (Scopus Indexed).
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Book Chapters

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LIST OF SYMBOLS AND ABBREVIATIONS

AVE	- Average Variance Extracted
BI	- Behavior Intention
BISER	- Benchmarking the Information Society in European Regions
CR	- Construct Reliability
C-TAM-TPB	- Combined TAM and TPB
D and M IS	- DeLone and McLean Information System
EE	- Effort Expectancy
EGDI	- E-government Development Index
EU	- European Union
FC	- Facilitating Conditions
ICT	- Information and Communication Technology
IDT	- Innovation Diffusi on Theory
IQ	- Information Quality
MAR	- Maximum Attribute Relative
MM	- Motivation Model
MPCU	- Model of Personal Computer Utilization
NFI	- Normed Fit Index
PE	- Performance Expectancy
PLS	- Partial Least Squares
SEM	- Structural Equation Model
SCT	- Social Cognitive Theory
SD	- Standard Deviation
SI	- Social Influence
SQ	- System Quality
SPSS	- Statistical Package for the Social Sciences
SLF	- Standard Loading Factor
SRMR	- Standardized Root Mean Square Residual

TR	- Trust
TAM	- Technology Acceptance Model
TRA	- Theory of Reasoned Action
TPB	- Theory of Planned Behavior
UB	- User Behavior
UK	- United Kingdom
US	- United States of America
UTAUT	- Unified Theory of Acceptance and Use of Technology
UNGS	- The United Nations E-Government Survey



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CHAPTER 1

INTRODUCTION

In this section, the background of the research is outlined, followed by problem statements, objectives, contributions, and scope of the research. Lastly, the thesis organization is presented.

1.1 Background

The World Bank reports that e-government initiatives have the potential to transform government relations with citizens, businesses, and other arms of government (World Bank, 2016). Furthermore, these initiatives can enhance service delivery to businesses in many ways. For example, it can improve business registration and license application, inspection clearance, customs modernization, tax administration and procurement of goods and services by making the services easily accessible and convenient using Internet technologies.

Figure 1.1 illustrates the regional averages as compared to the world median of 0.4712 in 2014. Europe (0.6936) continues to lead with the highest regional E-Government Development Index (EGDI), followed by the Americas (0.5074), Asia (0.4951), Oceania (0.4086) and finally Africa (0.2661). Examining previous trends, there has been no change in regional positions since 2003.

Progress in Africa remains relatively not too fast and uneven. This continent's average regional EGDI is 0.2661 (Nations, 2014). Meanwhile, Europe continues to be

the global leader in e-government development. In the previous ranking (2012), seven out of top ten countries were European, meanwhile, in 2014 only four European countries are in the top ten. Nevertheless, 11 out of the top 20 countries and 26 out of the top 40 countries are European (Nations, 2014).

The on-going financial crisis, low growth, unemployment and aging population has led Europe to actively seek innovative solutions in order to remain competitive, restore growth and to be able to continue to offer a wide-range of public services to its citizens.

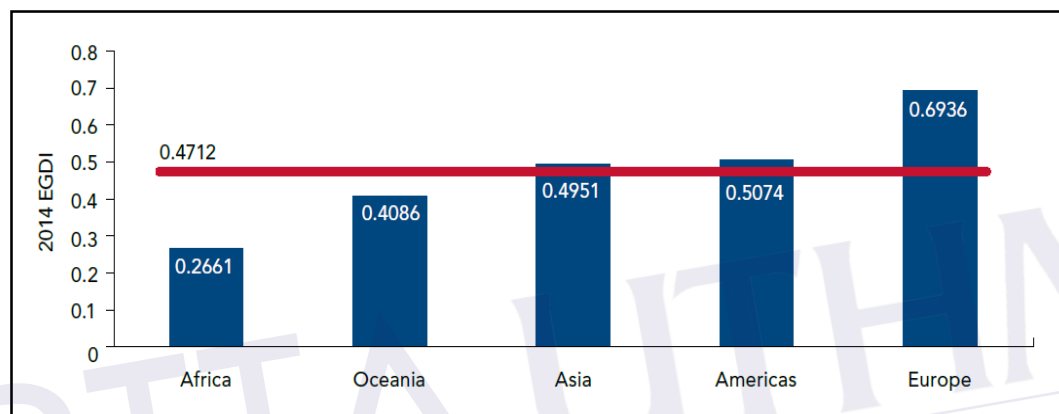


Figure 1.1: Regional Averages of E-government Development (Nations, 2014)

Tokdemir et al. founded underlying factors that play role in citizens' decision to use e-government services in Turkey (Tokdemir et al., 2017), and introduced trust of internet and trust of government based on The Unified Theory of Acceptance and Use of Technology (UTAUT) model. The result showed performance expectancy, social influence, facilitating conditions and trust of Internet was found to have a positive effect on behavioral intention to use e-government services. Additionally, both Trust factors were found to have a positive influence on performance expectancy of e-government services.

A literature review related to critical success and failure factors of e-government projects for the evaluation of open government initiatives using a case of budget transparency in Mexico (Puron-Cid, 2014). The author found that a selection of practical recommendations were identified as useful for a successful adoption of open government projects. Meanwhile, Savoldelli et al., (2014) identified a paradox

in the still low adoption of e-government initiatives after more than two decades of policy efforts and public investments for the deployment of online public services. The adoption factors for e-government services should be thoroughly known before any adoption model is constructed. Many researchers understood the initiatives that encourage the adoption of e-government services in different environments (Safeena & Kammani, 2013).

Ahmad and Markkula (2013) stated that there is urgent need for policy-makers and decision-makers to develop a better understanding of citizens' needs. The adopted model can be used as a guideline for the implementation of e-government services, especially in Pakistan. This study suggests that governments should run extensive advertising campaigns to ensure that people are aware of the services and use them. This implies that governments should place emphasis to increase awareness of the services, show their benefits to citizens, and encourage confidence in the system.

Earlier e-government research paid too much attention to e-government service adoption from the supplier side (the government) while overlooking the user side of e-government, such as citizens and businesses (Lee, Kim, and Ahn, 2011). This work attempts to fill this research gap, the author argues that the willingness of a business to adopt e-government depends on the perceived quality of government services through traditional brick and mortar service channels (offline service channels), and the level of trust businesses place in the internet technology itself.

Soft set is a parameterized general mathematical tool which deals with a collection of approximate descriptions of objects. Each approximate description has two parts, a predicate and an approximate value set. In classical mathematics, a mathematical model of an object is constructed and defines the notion of the exact solution of this model. Usually, the mathematical model is too complicated and the exact solution is not easily obtained (Mamat, 2013). So, the notion of approximate solution is introduced and the solution is calculated. In soft set theory, opposite approach can be used to solve this problem. The initial description of the object has an approximate nature, and do not need to introduce the notion of the exact solution. The absence of restriction on the approximate description in soft set theory makes this theory very convenient and easily applicable. Any parameterization can be used with the help of words and sentences, real numbers, functions, mappings and so on.

1.2 Problem Statement

Obviously, e-government occurred due to the technological revolution following the diffusion of the Information and Communication Technology (ICT). This trend increases government's awareness on public services. Based on the Table 1.1, there are three dimension of e-government adoption barriers frequency such as technological and economical, managerial and organizational and institutional and political.

Table 1.1: Frequency Barriers to E-government Adoption
(Savoldelli, Codagnone, and Misuraca, 2014)

Dimension	Barriers Factor	Period 1 th Reinventing governance (1994-2004)	Period 2 nd Strategy implementation in Europe (2005-2009)	Period 3 rd Digital agenda (2010-2013)
Technological and economical	Lack of bandwidth capacity	24 %	11.9 %	0%
	Lack of interoperability	0%	14.3 %	9.5 %
	High investment and maintenance	24 %	7.1 %	4.8 %
	Lack of privacy and security	24 %	31 %	9.5 %
	Lack of open source software	0%	0%	4.8 %
Managerial and organizational	Lack of project management capability	24 %	11.9 %	0%
	Resistance to change	24 %	11.9 %	9.5%
	Lack of skills	24 %	26.2 %	33.3 %
Institutional and Political	Digital divide		1.5 %	6.2 %
	Lack of legal basis	0%	1.5 %	7.2 %
	Lack of political commitment	1.5 %	1.5 %	0%
	Lack of political coordination	1.5 %	4.6 %	0%
	Lack of policy cycle management	4.6 %	3.1 %	12.3 %
	Lack of measurement and evaluation	1.5 %	7.7 %	9.2 %
	Lack of citizen participation	0%	3.2 %	13.8 %
	Lack of trust and transparency	1.5 %	6.2 %	10.8 %

E-government is based upon the nature of relationships among governments, citizens and technology (Heinze and Hu, 2005). On the side, Information and Communication Technology (ICT) has dramatically revolutionized the processes, operations and structure of public sectors, which are almost universally adopted or on the verge of being adopted by both developed and developing countries. However, the primary problem with technology-enabled modernization is that decision makers do not consider user expectations and preferences. Rather, to some extent and focus on cost considerations and system design (Verdegem and Verleye, 2009). Furthermore, the challenge facing e-government is not solely due to technological issues (Kamel, Sandhu, and Woods, 2014; Laura Alcaide-Munoz Manuel Pedro Rodriguez Bolivar, 2015; Sorn-in, 2015; Voutinioti, 2013a) but rather on how to use those technologies to improve the abilities of government institutions while improving the quality of citizens' lives by re-defining the relationship between them and their governments (Sorn-in, 2015).

Thus, e-government still faces major challenges as it continues to expand from North American to Asian countries. Nevertheless, benefiting from both developed and developing countries' experiences, understanding their successes and failures and adapting the knowledge and characteristics of other environments are fundamental to the future of e-government in many parts of the world (Gao and Lee, 2017; Moreno et al., 2018; Nam, 2018; Rey-moreno et al., 2017; Sangki, 2017; Verkijika and Wet, 2018; Nations, 2014). Governments must realize that the success of e-government does not depend only on the supplier side, but also on the demand side to adopt online service.

The current study aims to bridge the existing gap in the literature by investigating the roles of perceived information quality, system quality and trust towards e-government systems. This is a necessary step to understand what makes effective in the use and, thereby, the continuous use of e-government systems.

The reviewed literature in the current chapter provides the basis for identifying the gap to extend the knowledge of e-government adoption and usage in developing countries. Therefore, moving from a general context of e-government studies to a more specific context, that is, successful e-government systems' adoption, this research attempts to reveal the roles of perceived support quality of the system, trust, reliable

and robust model on behavior intention to use government's on-line services. Figure 1.2 illustrates the procedures undertaken to identify the gap using scenario leading to the problem for the present study.

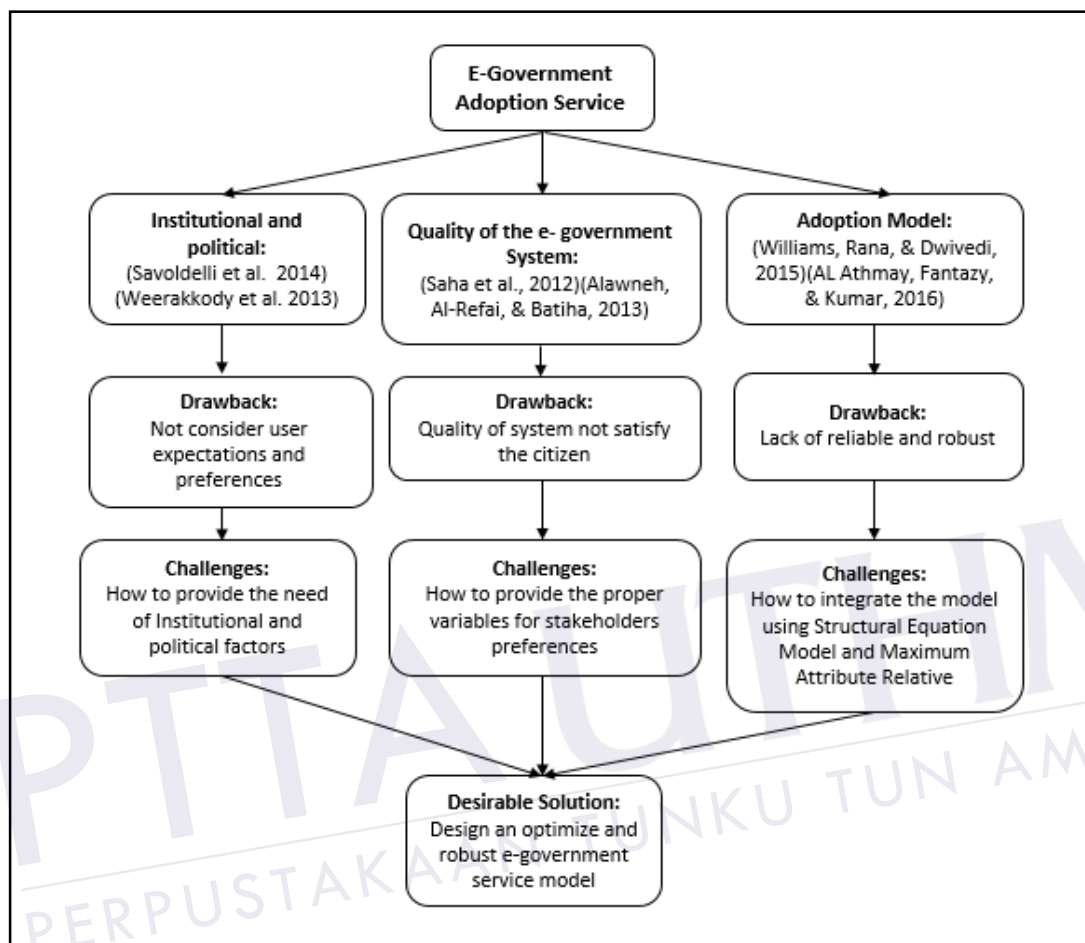


Figure 1.2: Scenario Leading to the Problem

Therefore, based on these drawbacks, there is a need to improve the existing adoption models to find new solutions for adopting e-government. Computational model such as soft set theory can be used as a technique to analyses e-government adoption models. this work presents applicable and efficient soft set approach using maximum attribute relative.

The proposed technique is based on the selection of the best clustering attribute. The datasets are taken from a survey aimed to understand the e-government service adoption issue in Indonesia. At this stage of the research points how a soft set approach for data clustering can be used to select the best clustering attribute. The result of this study will present useful information for decision makers to come out

with relevant policy and may potentially provide recommendations on how to design and develop e-government system to improve public service. Figure 1.2 represents scenario leading to the problem above.

1.3 Research Aim

The aim of the research is to propose a generic end-user adoption model for e-government services.

1.4 Research Objective

In order to achieve the research aim, a few objectives have been set as the following:

1. To propose an optimized e-government services adoption model using Structural Equation Model (SEM) analysis.
2. To assess the proposed adoption model using FIT analysis.
3. To determine the dominant variables of the proposed model based on maximum attribute relative analysis.

1.5 Research Scope

The research will:

1. Only focus on optimizing e-government service adoption model in 2017.
2. Only focus on exploring the citizens' perspective in several cities in Indonesia in adopting the e-government service.
3. Employ Maximum Attribute Relative (MAR) based on the soft set theory as the technique for determining the best clustering attribute.

1.6 Research Significance

This research will propose an optimized e-government service adoption model using structural equation model and maximum attribute relative by performing statistic and computational model analysis. The proposed model could support by providing an alternative approach for adopting e-government service. The result from this work can

be used to develop a robust and reliable model that can offer alternative to conventional techniques.

1.7 Thesis Organization

The rest of this thesis is organized as follows: Chapter 2 examines current work on e-government system, the unified theory of acceptance and use of technology model, and the fundamental concept of soft set theory. Aside from that, the notion of an information system and its relation to a relational database, concept of an indiscernibility relation induced by a subset of the whole set of attributes, concept of a Pawlak approximation space, and notion of set approximations and its quality of approximations are also described.

Chapter 3 describes the research framework. This chapter guides in a procedure and logic for generating the new knowledge of the current study. Meanwhile, Chapter 4 describes conceptualisation, research model and proposed hypotheses for this research.

Chapter 5 describes the experimental results of the proposed techniques. Further, an application of the proposed technique for clustering is presented. Discussion and analysis of the results of the proposed technique will be given in detail here. Finally, the conclusion and future works will be described in Chapter 6.



PTTAAUTIM
PERTUAKAAN TINKU TUN AMINAH

CHAPTER 2

LITERATURE REVIEW

This chapter will describe and explain some preliminary knowledge which is required in understanding the topic under discussion. First, the concept of e-government, structural equation model, and soft set theory will be explained followed by the concept of data clustering. A brief description of the soft set theory will be given, including its definition and relationship to information system.

2.1 Electronic Government Definition

The expansion of the internet and the advancement of ICT offered new channels for governments to reach and serve their citizens. According to Rana, Dwivedi, and Williams (2015), e-government has broad perception and contains different principles.

Basically, e-government is concerned on interaction between government and citizens through digital media or the internet. Moreover, Chen et al. (2015) stated that generally, e-government has some potential to elicit favourable perceptions on usefulness, satisfaction, and subsequent net benefit for the government. E-government was a marvel that connections to the service and information to people in general.

2.2 Level of E-Government Evolution

According to the results of a survey conducted by the Department of Economic and Social Affairs Division for Public Administration and Development Management,

United Nation New York in 2008, e-government evolution consists of five levels, namely:

1. Emerging

At this stage, the online government presence consists primarily of a web page and/or an official website, links to ministries or departments of education, health, social welfare, labor, and finance may not exist. Most information is static and little interaction with the community.

2. Enhance

At this stage, the government provides more information on public policy and governance. The government has created links to collect information that is easily accessible to the public.

3. Interactive

At this stage, the government provides online services such as forums that can be downloaded for tax payments and applications for license renewals. In addition, the onset of an interactive website or portal with services to enhance community feelings is clearly required.

4. Transactional

At this stage, the government begins to transform itself by introducing a two-way interaction between government and society. For example, for tax payments, apps for ID cards, birth certificates, passports, and license renewals. This is similar to G2C interactions and citizens are able to access this service 24 hours/day. All transactions are conducted online.

5. Connected

At this stage, governments transform themselves into a connected entity that responds to the needs of its citizens by developing an integrated back office infrastructure. This is the most sophisticated level of online e-government initiatives and is characterized by:

1. Horizontal connections (among government agencies).
2. Vertical connections (central and local government agencies).
3. Infrastructure connections (interoperability issues).
4. Connections between governments and citizens.
5. Connections among stakeholders (government, private sector, academic

institutions, NGOs and civil society).

In addition, e-participation and citizen engagement are supported and encouraged by governments in the decision-making process.

2.3 Acceptance of Information Technology

Nair et al. (2015) mentioned that technological advances have an integral role in changing and facilitating people's lives in various areas including communication, health and economy. With the increasing use of technology, the past two decades have seen a substantial increase in the development of new and different approaches to government that have created a global impact. Therefore, practitioners and researchers need a better understanding through practical methods of evaluating technology. (Chauhan, 2015; Fagan, Kilmon, and Pandey, 2012; Gangwar et al., 2014; Rauniar et al., 2014). Table 2.1 summarizes the main information technology acceptance factors in the literature.

Table 2.1: The Main Information Technology Acceptance Factors

Author	Purpose	Method	Finding
(Vassilakaki et al., 2016)	Identified the use of mobile technology by the library science and information systems undergraduate students in Greece.	A questionnaire developed from relevant literature.	Students employed laptops and desktop computers to perform education-related tasks.
(Barhouni, 2016)	Designed an extended Technology Acceptance Model (TAM) to be used in the evaluation and assessment of e-information services.	An experimental approach-based comparison between an experimental group and a control group.	Principal results show that the behavior intention was influenced significantly by user satisfaction.
(Rondan, et al., 2015)	Provided a complete and chronological view of the evolution of the main acceptance and use of technology models.	A comparison of partial least squares (linear model) and Warp Partial Least Squares (PLS) (non-linear model).	Unified Theory of Acceptance and Use of Technology (UTAUT) ver.2 model obtains a better explanation power than other Technology Acceptance Model (TAM).
(Ratten, 2015)	Crossed-culturally compare how consumers in China and Australia adopt cloud computing services.	The TAM and social cognitive theory are identified as the theoretical frameworks.	Outlined the different areas of technological innovation research that are needed to advance the information technology industry in the future.

2.3.1 User Acceptance

User acceptance can be defined as the desire of a group of users in utilizing information technology designed to assist their work (Dillon, 2001). To predict user acceptance in the field of IT, the researchers created a model that can describe user acceptance. There are eight models related to user acceptance namely Theory of Reason Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behavior (TPB), Combined TAM and TPB (C-TAM – TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), and Social Cognitive Theory (SCT). These eight models were integrated by Venkatesh et al. (2003) into a new model of The Unified Theory of Acceptance and Use of Technology (UTAUT).

2.3.1.1 Theory of Reason Action (TRA)

Theory of Reason Action (TRA), a model introduced by Fishbein and Ajzen (1975), is a widely used model and has been proven to predict and explain the behavior of various domains.

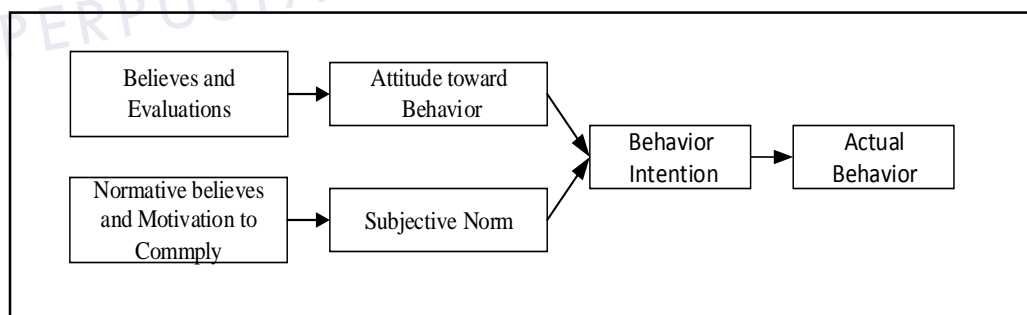


Figure 2.1: Theory of Reason Action (Fishbein and Ajzen, 1975)

TRA is one of the most fundamental and influential theories of human behavior. This model has been used to predict behavior (Sheppard et al., 1988). Davis et al. (1989) applied TRA to individual's acceptance of technologies and found that the variance explained was largely consistent with the research used by TRA in other

behavioral contexts. As depicted in Figure 2.1, there are two important constructs in this model according to Fishbein and Ajzen (1975):

1. Attitude toward behavior
Individual positive or negative feelings (evaluative affects) on how to execute target behavior.
2. Subjective norm
The perception of people that people who are important to him think he should or should not do the behavior in question.

2.3.1.2 Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) is an adaptation of the previous TRA model. Davis et al. (1989) developed this model to understand user acceptance on information systems. TAM is tailored to the IT context, and is designed to predict the acceptance of information technology and usage on the job. Unlike TRA, TAM's final conceptualization does not include attitude constructs in order to better explain the intention. TAM has been widely applied to a diverse set of technologies and users. According to Davis et al. (1989), important constructs in this model are as follows:

1. Perceived usefulness
The extent to which a person believes that using a particular system will improve his work.
2. Perceived ease of use
The extent to which a person believes that using a particular system will be free from effort.
3. Subjective norm
The perception of people that most people are important to him thinks he should or should not do the behavior in question (Fishbein and Ajzen, 1975).

2.3.1.3 Motivational Model (MM)

Davis et al. (1989) examined what motivations drive a person to use a computer at work. Davis's research was conducted on 200 respondents to study the use of word-

based word processing program written on Personal Computer. This study was concluded that one's interest in using computers in the workplace is influenced by two factors. The first is their perception of the extent to which computer can improve the performance of their work, and the second factor is the extent to which it can give a pleasant feeling when using your own computer. The important constructs in this model are:

1. Extrinsic motivation

Perception where users want to perform an activity because it is perceived as a tool in achieving the results, but different from the activity itself, for example in terms of performance improvement, income and promotion positions.

2. Intrinsic motivation

Perceptions where users want to perform an activity because there is no obvious strong reason other than the process of doing the activity itself.

2.3.1.4 Theory of Planned Behavior (TPB)

This theory is the development and refinement of the limitations in the TRA discussed above. Ajzen (1991) presented reviews from several successful studies using TPB to predict intent and behavior in a variety of settings. TPB has been successfully applied to understand individuals' acceptance and use of different technologies. The fundamental difference between this theory and the previous one is the addition of one element that is the perception of a person's behavioral control. Perceived Behavioral Control (PBC) is defined as a person's perception of the extent to which the ease or difficulty in performing a behavior (Ajzen, 1991). Figure 2.2 shows a TPB model that often used in various researches on behavior. Usually TPB is used as an intervening variable to explain a person's intention which then explains the person's behavior.

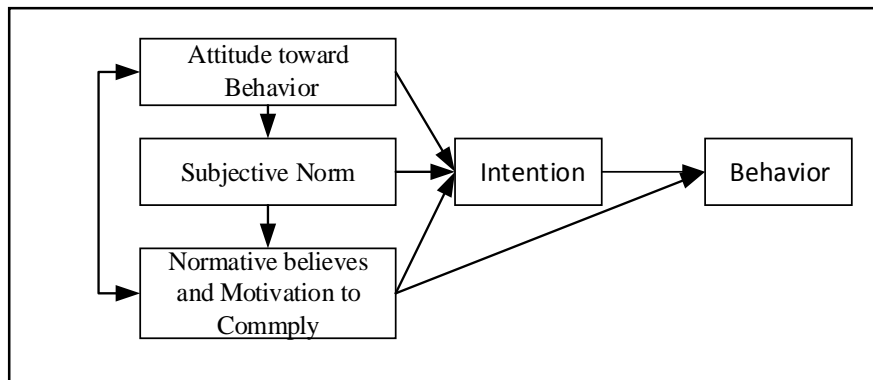


Figure 2.2: Theory of Planned Behavior (TPB) Model (Ajzen, 1991)

2.3.1.5 Combined TAM and TPB (C-TAM-TPB)

This combined TAM / TPB theory is often referred to as the decomposed theory of planned behavior. It explains the behavior of a person with the construction of a multi-dimensional model. This model combines TAM and TPB models, with important constructs of this model are attitude toward behavior, subjective norms, perceived usefulness, and perceived behavioral control (Taylor and Todd, 1995).

2.3.1.6 Model of Personal Computer Utilization (MPCU)

This theory was developed using the behavioral factors approach (Triandis, 1980) in the context of information technology to predict the use of PCs. This theory that is used in sociological and psychological research explains constructing factors that influence one's behavior. Its constructs are:

- Job-fit
The extent to which an individual believes that the use of technology can improve the performance of his work.
- Complexity
The extent to which an innovation deems to be as lightly as possible is difficult to understand and use.
- Long-term consequences
- Affect towards use

Based on Triandis (1980), support for use is the feeling of joy or pleasure, or depression, annoyance, displeasure, or subconsciousness by a particular individual.

- Social factors

Social factors are the internalization of individuals from subjective cultural reference groups, and inter-personal agreements that have been made with others, in certain social situations (Triandis, 1980).

- Facilitating conditions

Objective factors in the environment where observers agree to make an action. For example, returning goods that have been purchased online, if no charge is charged to return the goods. This model can be seen in Figure 2.3 below.

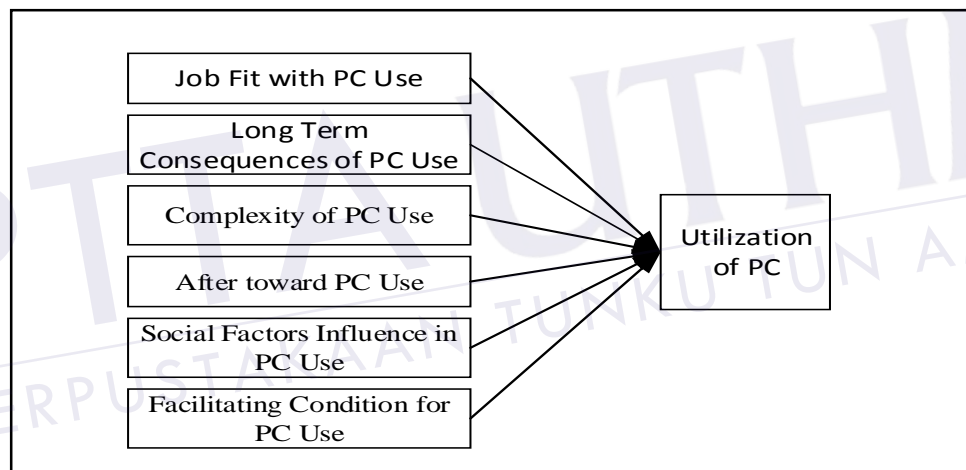


Figure 2.3: PC Utilization (MPCU) Model (Triandis, 1980)

2.3.1.7 Innovation Diffusion Theory (IDT)

This theory was developed based on the theory of diffusion of innovations that was popularly developed by Rogers (1995) began to be introduced since the 1960s by studying various kinds of organizational innovation. The important constructs in this model are:

- Relative advantage

The extent to which an innovation is regarded as better than a precursor.

- **Ease of use**
The extent to which an innovation is perceived as a difficulty to use it.
- **Image**
The degree to which the use of an innovation is considered to enhance one's image or status in one's social system.
- **Visibility**
The degree to which people can see other people using the system within the organization.
- **Compatibility**
The extent to which an innovation is considered in line and consistent with the values that exist.
- **Result demonstrability**
The credibility of the results using innovation, including their observability and delivery.
- **Voluntariness of use**
The extent to which the use of innovation is regarded as voluntary, or free will.

This model is given in Figure 2.4.

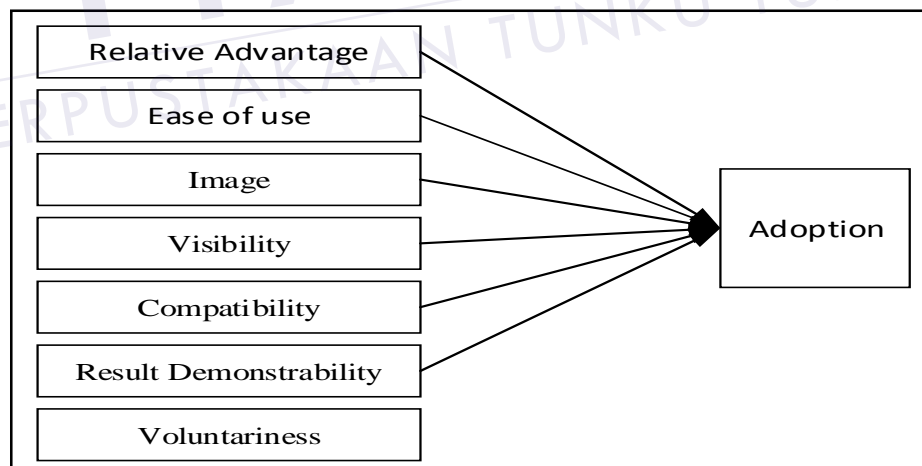


Figure 2.4: Innovation Diffusion Theory (IDT) Model (Rogers, 1995)

2.3.1.8 Social Cognitive Theory (SCT)

This theory is widely used to explain human behavior (Bandura, 1986). Compeau and Higgins (1995) applied and developed this theory for computer usage. In their

research, Compeau and Higgins developed a model to explain the role of self-efficacy, i.e. an assessment of a person's ability to use a technology to accomplish a particular job or task. This assessment does not consider what people have done in the past, but rather consider what can be done in the future.

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

Several researchers introduced the Unified Theory of Acceptance and Use of Technology (UTAUT) that aims to explain user intentions to use an IS and subsequent usage behavior as shown in Figure 2.5 (Venkatesh, Morris, Davis, and Davis, 2003).

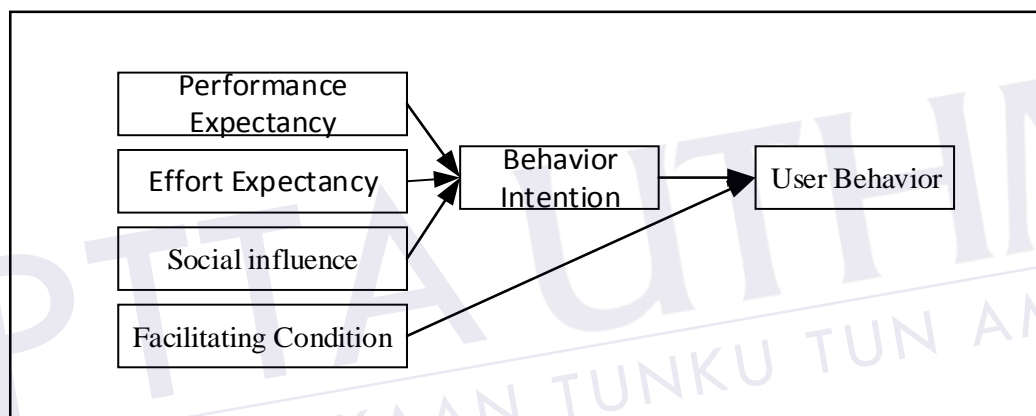


Figure 2.5: UTAUT Model (Venkatesh et al., 2003).

UTAUT is a proposed technology adoption model by Viswanath Venkatesh, et al. in 2003. In this model, there are four variables that have a role important as a factor that has a significant effect on the user acceptance and usage behavior, namely: performance expectancy, effort expectancy, social influence, and facilitating conditions. These four variables initiated from the eight models mentioned earlier. Furthermore, Venkatesh et al. (2003) empirically measured the eight models mentioned earlier in four different organizational settings for a period of six months. The result showed that the eight models could describe 17 percents and 53 percents of the variance in user intentions to use information technology. Next, empirically validate the UTAUT model. It's found that UTAUT model outperformed the eight individual

models and explained 70 percent of the variance. Table 2.2 describes construct theories underlying the UTAUT model.

Table 2.2: Construct Theories Underlying the UTAUT Model

No	Name of Theory	Author and Year	Definition
1	Theory of Reasoned Action (TRA)	Fishbein and Ajzen (1975)	The theory for predicting human behavior is by analyzing the relationship between various performance criteria and one's attitude, intentions, and subjective norms.
2	Theory of Planned Behavior (TPB)	Ajzen (1988)	The theory is used to satisfy circumstances when a person's behavior is not voluntary by including predictors of intent and behavior that refers to beliefs about the existence of factors that can facilitate or hinder the performance of a particular behavior.
3	Technology Acceptance Model (TAM)	Davis (1989)	Identify a person's reaction and perception that determines the person's attitude and behavior by modeling one's behavior as a function of the purpose of behavior in which the goal of behavior is determined by the attitude of the behavior.
4	Motivational Model (MM)	Davis et al. (1992)	Motivation theory developed to predict the acceptance and use of technology.
5	Combined TAM and TPB (C-TAM-TPB)	Taylor and Todd (1995)	The hybrid model of TPB with TAM provides an accurate explanation of the determinants of acceptance and behavior of the use of a particular technology.
6	Model of PC Utilization (MPCU)	Thompson et al. (1991)	Assess the influence of conditions that affect and facilitate social factors, complexity, task conformance and long-term consequences on PC utilization.
7	Innovation Diffusion Theory (IDT)	Rogers (1995)	Adopted from the application of IDT technology that can measure the perception of society by using seven key attributes.
8	Social Cognitive Theory (SCT)	Compeau and Higgins (1995)	Identify human behavior as an interaction of personal, behavioral, and environmental factors that aim to provide a framework for understanding, predicting, and changing human behavior.

Michael et al (2015) founded general purpose systems and specialized business systems were examined in most of the articles using the UTAUT. The analysis also indicated that cross-sectional approach, survey methods, and structural equation modeling analysis techniques were the most popular research methodologies whereas SPSS was found to be the largely used analysis tool. Other researchers describe a hypothetical framework that integrates the unique features of e-government to improve our understanding of the acceptance and usage of e-government in Saudi

Arabia (Alzahrani and Goodwin, 2012). Furthermore, a model proposed based on UTAUT, includes the characteristics of e-government, consideration, and the inclusion of trust, privacy, and Saudi culture and context.

Another study examined the role of intermediaries in facilitating e-government adoption and diffusion using a survey-based empirical study (Weerakkody, El-Haddadeh, Al-Sobhi, Shareef, and Dwivedi, 2013). In this study, an extended UTAUT model is used as the theoretical basis utilizing trust in the Internet and intermediaries. The results show that there are significant relationships among the factors that influence intention to use e-government services namely performance expectancy, effort expectancy, and trust of intermediary.

Yfantis et al., (2013) explored factors that influenced e-government adoption by improving the UTAUT model. The improved UTAUT model derives from the additional elements of trust, the context of use and human development index. The improved UTAUT also contributes in the current research such as virtual learning environment, electronic banking, and electronic library (Athmay, Fantasy, and Kumar, 2016; Awwad and Al-Majali, 2015; Celik, 2016; Mikalef, Pappas, and Giannakos, 2016; Teck Soon and Syed A. Kadir, 2017; Wang, Cho, and Denton, 2017; Xu, 2015, 2015; Yuvaraj, 2016). Aside from that, a limited number of authors proposed other conceptual models to better understand the factors that influence citizen adoption of e-government (Krishnaraju and Mathew, 2015; Lagzian and Pourbagheri, 2014; Verdegem and Verleye, 2009; Yahya, Nadzar, and Abdul, 2012). These models hypothesized a number of factors influencing citizens' adoption of e-government such as perceived security, perceived privacy, trust, website design, and service quality.

Table 2.3: The Studies That Utilized UTAUT Model

Author	Objective	Method	Significant Finding
(Mosweu, Bwalya, and Mutshewa, 2016)	Understand action officers' perceptions of, adoption and/or usage of the Document Workflow Management System (DWMS) at the Ministry of Trade and Industry in Botswana.	The study used a modified form of UTAUT as a theoretical lens to explore users' perception on the adoption and use of DWMS.	Negative attitudes to computers, computer anxiety, and complexity of DWMS.

(Silic and Back, 2016)	Revealed factors that drive the adoption and use of Unified Communications and Collaboration (UCandC) technology in organizations.	Used quantitative method to survey 296 employees from 50 different countries	Found that performance expectancy and social influence are the most influential drivers in employee acceptance and use of UCandC in organizations.
(Williams, Rana, & Dwivedi, 2015)	Performed a systematic review of articles that used UTAUT.	Literature analysis of 174 existing articles on the UTAUT model.	Found that structural equation modelling analysis technique is the most explored research methodology.
(Isaias, Reis, Coutinho, and Lencastre, 2017)	Examined the acceptance of a group of 79 students, of an educational forum, used for mobile and distance learning.	UTAUT was used as a framework for the research model.	The results confirmed three of the nine hypotheses: performance expectancy and effort expectancy had a positive influence on students' attitudes towards empathic forums.
(Tarhini, El-Masri, Ali, and Serrano, 2016)	Investigated the factors that may hinder or facilitate the acceptance and usage of Internet Banking (IB) in Lebanon	A conceptual framework was developed through extending the UTAUT.	Revealed that Performance Expectancy (PE), social influence, Perceived Credibility (PC) and Task-Technology Fit (TTF) to be significant predictors in influencing customers' Behavior Intention (BI) to use IB.

This study will propose a model that is based on UTAUT acceptance model which aims to build theory, explore theoretical models and provide a basis for checking acceptance of e-government models, as well as performing some preliminary testing of this model. This study initially uses the variables that exist in the UTAUT model such as performance expectancy, effort expectancy, social influence, and facilitating condition (see Table 2.3).

2.4 E-Government Adoption and Barrier

Brian et al. (2013) stated that Oman is motivated by driving forces similar to other developing countries, and its government employed e-government services to enhance the effectiveness and efficiency of government operations by improving public service quality and quality of information shared between different agencies.

Voutinioti (2013) stated the most important factors in influencing citizens behavior intention to adopt e-government services is effort expectancy and trust. Lack of trust and confidentiality is a major barrier to e-government adoption successes. Meanwhile, Chen et al. (2015) informed a suggested statement related to trust categorized in various trust aspects include IS Success Model.

Next, Rana, Dwivedi, and Williams (2013) study about analyzing challenges, barriers, and Critical Success Factor (CSF) of e-government adoption. The authors indicated that technological barriers, lack of security and privacy, lack of trust, lack of resources, digital divide, poor management and infrastructure, lack of awareness, legal barriers, and resilience were among the most commonly experienced challenges and barriers in e-government studies.

A small number of studies have looked at the demand side of e-government services. Botterman et al. (2003) investigated the demand side of e-government in a number of European Union (EU) countries, Switzerland and the United States (US). Their research found that attitudes toward e-government vary from one country to another. The authors also called for a more in-depth investigation to understand the regional variations in the acceptance of e-government.

Similar results have been shown in Lassnig and Markus' (2003) study which investigated the usage of e-government in Europe. Their study revealed that there are significant differences between the usage of e-government services between different European regions. Tung and Rieck (2005), J. Lee et al. (2011), and Weerakkody, El-Haddadeh, Al-Sobhi, Shareef, and Dwivedi (2013) also investigated the demand side of e-government. The aim of their studies were to better understand the adoption of e-government services by organizations. The study results showed that perceived benefits, external pressure and social influence positively impact the organization's decision to adopt e-government services in a country.

Van Dijk, Peters, and Ebbers (2008) stated that majority of the academic literature on e-government focuses on the supply side of e-government services. This includes studies on the models of e-government evaluation and practices effectiveness of implementation and challenges of e-government services; success factors and implementation of e-government initiatives.

2.5 E-Government Adoption: Critical Success Factors (CSF)

Several scholars (Rana et al., 2013a; Savoldelli et al., 2014a; Tokdemir et al., 2017; Voutinioti, 2013) examined about the parts of CSF components in e-government appropriation research. Furthermore, Rana, Dwivedi, and Williams (2013b) evaluated the various IS/IT adoption research models used in e-government adoption only on the basis of their performances across the existing research. Meanwhile, Saha, Nath, and Salehi-Sangari (2012) indicated that accessibility and navigation facility are important in determining a citizen's perceived system quality. Information preciseness, timeliness, and sufficiency were found to be key measures of information quality in government e-services.

Alghamdi, Saleh and Beloff (2016) indicated that all the proposed factors have some degree of influence on the adoption and utilization level. Perceived benefits, awareness, previous experience and regulations and policies were found to be the significant factors that are most likely to influence the adoption and usage level of users from the business sector.

Zhang and Hsieh (2010) examined the public opinion on CSF of e-government in China and found that accuracy and pervasiveness of site data were the two most vital discriminating achievement components according to Chinese nationals. Weerakkody (2013) dissected the CSF of e-government execution in Oman and on the premise of representatives' acknowledgment of three open division associations of the nation, the elements, for example, openness, security, protection, effectiveness, certainty, trust, accessibility, IT specialist abilities, and data trade ended up being the vital variables for e-government reception and dissemination.

The preparatory results from the investigation of Aladwani (2011) demonstrated that native's mindfulness, subject's web experience, resident's state of mind toward e-government, the convenience of the e-government site, persistent budgetary backing, and adequate e-government enactment are a percentage of the huge variables for Kuwaiti e-government achievement.

The general examination of the studies undertaking the exploration demonstrated that the CSF was not the select point of any research rather it was broke down alongside alternate parts of e-government. Despite the fact that it was a decent endeavor by a study to discover these components in the setting of e-government selection with national's point of view (Weerakkody, 2013). There is a very clear crevice for the future analyst to take a burrow on investigating this element of e-government selection research and create some helpful results.

2.5.1 Factors Influencing e-Government Adoption

All countries in the world today are actively promoting the use of e-government to improve service to society and reduce bureaucracy. The potential of e-government services makes scientists interested in exploring the factors that influence e-government adoption intensively. However, many opinions suggest that e-government adoption among the community is still not satisfactory (Al-Hujran et al., 2015), because of many differences in trust to government, culture, infrastructure and technology. Table 2.4 summarizes the main factors influencing e-government acceptance in the literature.

Table 2.4: Factors Influencing e-Government Adoption

Author	Objective	Method	Significant Finding
(Alghamdi, Saleh, Beloff, 2016)	Found key factors that influence the adoption and utilization level of users from the business sector.	Empirical approach.	Perceived Benefits, Awareness, Previous Experience, and Regulations and Policies were found to be the significant factors.
(Yfantis, Vassilopoulou, Pateli, and Usoro, 2013)	Explored the influential factors of the m-government adoption.	Improving the UTAUT model.	The improved UTAUT contributes in the current m-government.
(Brian, Victor, Gekara, Al-mamari, and Corbitt, 2013)	Motivated factors from a government perspective.	This study used a qualitative case study approach with semi-structured interviews.	Coercive, mimetic, and normative dynamics of conformance to international standards of e-government.
(Lu, Lu, Wang, Pan, & Qin, 2014)	Examined the influences of government social power on farmers' intention.	Technology acceptance model approach.	The role of government social power is a substantial improvement in the variance explained in intention to use.

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