Promoting Universal Access to E-government Services — A Comprehensive Conceptual Framework from Citizens' Perspective

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(ABSTRACT)

The world moves toward the era of a smart society that is human-centered, sustainable, and inclusive. Countries employed new information and communication technologies to deliver services and engage citizens in the decision-making process. These services are evolving and in the near future, we can expect a plethora of new services related to Smart Society 5.0 and Industry 4.0, in addition to more traditional services. The possibility of these new technologies to foster sustainable development can only be obtained when all target users have fair access to the offered services.

In the e-government context, ensuring service quality is crucial for success. While many factors contribute to service quality, user experience is becoming increasingly important. Governments need to put citizens at the center of the design process of their services and ensure that all target users have an enhanced experience with the offered e-services. Moreover, e-government constantly changes over time and continues to drive opportunities and open new possibilities for potential developments. Therefore, it is highly recommended that government agencies regularly evaluate citizens' experience with the offered services and investigate the factors that significantly influence their adoption behavior.

However, numerous research efforts investigated the user experience of e-government from the lens of specific government services in an individual or specific range of countries. There has been a lack of a global e-government adoption framework to evaluate users' adoption behaviors of e-government services. Despite successful efforts to formalize certain aspects

of user experience, there remains a need for a comprehensive and systematic framework for user experience evaluation.

Therefore, the main objective of this thesis is to conduct a comprehensive study of the state of the art in user experience evaluation and develop a unified framework that integrates existing knowledge on the topic. It provides a systematic approach for enhancing user experience by providing guidelines on how to evaluate users' adoption behaviors of e-government services efficiently as a reference for future investigations. The research approach was conducted through two main phases. The first phase aims to design the proposed conceptual framework to evaluate users' adoption behaviors of e-government services. Hence, we have conducted a systematic literature review on user experience towards e-government services and cover all different aspects to better understand target users and enhance their overall experience. This systematic review informed the design of a holistic conceptual framework by investigating factors that significantly affect users' adoption of e-government services globally. The proposed framework provides a standard overarching process for future research in the e-government domain by providing an established methodology for evaluating users' adoption behaviors of e-government services. This framework is global, it is used to evaluate users' adoption behaviors of e-government in any country to ensure that citizens have a good experience with e-government services in that country. The framework includes the most common significant factors influencing users' adoption behaviors of e-government that represent the necessary steps to enhance citizen experience and boost their adoption behavior.

The second phase implies the utilization of the proposed framework to evaluate users' adoption behaviors of e-government by developing a reference implementation of e-government adoption based on the proposed framework. The quantitative research methodology was employed using a web-based questionnaire to evaluate the e-government adoption behavior. The questionnaire contains a set of measurement items pertaining to each factor that

existed in the proposed framework to investigate their potential relationships. The questionnaire underwent an iterative process of testing and validation to ensure the reliability and credibility of the measurement items. Then, the multivariate statistics, including the structural equation modeling, have been adopted to analyze and examine the framework relationships. Preliminary results of this thesis include two user studies investigating user experience towards specific e-government services to support the development of the conceptual framework. Then, the proposed framework alongside the reference implementation were applied to evaluate the Saudi e-government adoption by evaluating the adoption behavior and developing an explanatory model for the adoption behaviors of Saudi citizens.

The contributions of this thesis can be summarized by conducting a systematic literature review on user experience towards e-government services to inform the design of the proposed framework. Then, developing a global conceptual framework for evaluating users' adoption behaviors of e-government. Overall, this thesis provides valuable insights into enhancing citizen experience and increasing their adoption of e-government services, which supports government agencies, practitioners, and policymakers.

Promoting Universal Access to E-government Services — A Comprehensive Conceptual Framework from Citizens' Perspective

Asma A. Aldrees

(GENERAL AUDIENCE ABSTRACT)

Governments employed new technologies that are dynamic and smart to deliver services to citizens and ensure they are engaged while using these services. Nowadays, the phenomenon of 'smart society' refers to systems that are human-centered, sustainable, and accessed by all target users. Universal access to government services is the pillar to achieving sustainable development goals as expressions of a smart society. In the electronic government context, ensuring service quality is crucial for success. While many factors contribute to service quality, user experience is becoming increasingly important. Governments need to put citizens at the center of the design process of their services and ensure that all target users have an enhanced experience with the offered e-services. Moreover, e-government constantly changes over time and continues to drive opportunities and open new possibilities for potential developments. Therefore, it is highly recommended that government agencies regularly evaluate citizens' experience and investigate the factors that influence their adoption behavior.

In the literature, there has been a lack of a comprehensive review of user experience towards e-government services globally. In addition, many research efforts focused on developing e-government adoption frameworks based on government services in a specific country or a limited range of countries. There has been a lack of a global e-government adoption framework to evaluate users' adoption behaviors of e-government services. Despite successful efforts to formalize certain aspects of user experience, there remains a need for a comprehensive and systematic framework for user experience evaluation.

Therefore, the main objective of this thesis is to conduct a comprehensive study of the state of the art in user experience evaluation and develop a unified framework that integrates existing knowledge on the topic. It provides a systematic approach to enhance the user experience by providing guidelines on how to evaluate users' adoption behaviors of e-government services efficiently as a reference for future investigations. This comprehensive review informed the design of a holistic conceptual framework by investigating significant factors influencing users' adoption behaviors of e-government services globally. Hence, the proposed framework includes the most common significant factors influencing users' adoption behaviors of e-government imported from the comprehensive review's results. This framework provides a standard overarching process for future research in the e-government domain by providing an established methodology for evaluating users' adoption behaviors of e-government services. It is used to evaluate the e-government adoption behaviors in any country to ensure the efficiency of e-government services and enhance the citizen experience in that country.

The quantitative research methodology was employed using a web-based questionnaire to evaluate the e-government adoption behavior based on the proposed framework. The questionnaire was tested and validated to ensure the reliability and credibility of the questionnaire items. After that, specific statistical techniques, including structural equation modeling, were used to examine and refine the framework relationships. Preliminary results of this thesis include two user studies investigating users' experience towards specific e-government services to support the development of the conceptual framework. Hence, the proposed framework alongside the developed questionnaire and implemented analysis techniques were applied to evaluate the Saudi e-government adoption by evaluating the adoption behavior and developing an explanatory model for the adoption behaviors of Saudi citizens. This thesis supports the e-government by providing valuable insights to government practitioners and policymakers on enhancing citizen experience and increasing their adoption of e-government services.

Dedication

To my great parents, and my dearest sisters (Shairy and Dora),

To my friends, and my advisor,

whom I couldn't have done this without their support.

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List of Abbreviations

AGFI	Adjusted Goodness of Fit Index
AI	Artificial Intelligence
AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CITC	Communications and Information Technology Commission
CVR	Content Validity Ratio
DF	Degrees of Freedom
DF	Design Factor
DGA	Digital Government Authority
DGRL	Digital Government Reference Library
DOI	Diffusion Of Innovations
E-Government	Electronic Government
E-Service	Electronic Service
EFA	Exploratory Factor Analysis
EGDI	E-Government Development Index

FC	Facilitating Conditions
G2B	Government to Business
G2C	Government to Citizen
G2E	Government to Employee
G2G	Government to Government
GASTAT	General Authority for Statistics
GDP	Gross Domestic Product
GFI	Goodness of Fit Index
GOF	Goodness Of Fit
HCI	Human Capital Index
HF	Human Factor
HRDF	Human Resources Development Fund
ICT	information and Communications Technology
IRB	Institutional Review Board
IS	Information Systems
IT	Information Technology
KMO	Kaiser-Meyer-Olkin
KSA	Kingdom of Saudi Arabia
MI	Modification Indices

MIS	Management Information System
MLE	Maximum Likelihood Estimation
MTurk	Amazon Mechanical Turk
NFI	Normed Fitness Index
OECD	Organization for Economic Co-operation and Development
OSI	Online Service Index
OSI	Online Services Index
PEOU	Perceived Ease Of Use
PU	Perceived Usefulness
RMSEA	Root Mean Square Error of Approximation
SDG	Sustainable Development Goal
SEM	Structural Equation Modeling
SEMOPY	Structural Equation Models Optimization in Python
SFL	Standardised Factor Loading
SI	Social Influence
SLR	Systematic Literature Review
SR	Standardised Residuals
SRMR	Standardised Root Mean Residual
TAM	Technology Acceptance Model

TII	Telecommunication Infrastructure Index
TLI	Tucker-Lewis Index
TOG	Trust of Government
TPB	Theory of Planned Behavior
UCD	User Centered-Design
UK	United Kingdom
US	United States
UTAUT	Unified Theory of Acceptance and Use of Technology
UX	User Experience
VIF	Variance Inflation Factors

Chapter 1

Introduction

The Japanese government announced 'Society 5.0', in 2016, as the implementation of the 'Super smart Society acts.' Society 5.0 promotes the concept of a people-centric society that focuses on the effect of technology on the public and the requirements to create a well-being society [7]. The scope of Society 5.0 vision is to support an inclusive society by offering the right services which focus on the diverse needs and preferences of all target users. Therefore, it allows the whole society to live a prosperous life through catering to universally accessed services [8, 9].

In the government context, the United Nations launched the Sustainable Development Goals (SDGs) plan to achieve a better and more sustainable future for all countries. One of the principles of effective governance for sustainable development is inclusiveness, which implies leaving no one behind. Hence, the main idea behind this plan is to promote the sustainability of each country by delivering universally accessed government services to everyone, anytime and everywhere [2, 10]. In alignment with Society 5.0 vision, the Japan Business Federation proposed a set of measures and targets required to develop the electronic government (e-government) based on a user-oriented design approach. They offer a better understanding of e-government among target users by facilitating fair access to government services and addressing social barriers to adopting these services. From this standpoint, governments should constantly engage users in the design of their services to ensure a highly efficient user experience towards e-government services [11].

The e-government mainly indicates the adoption of Information and Communication Technology (ICT) infrastructure to enhance the means by which government services are provided. It has become increasingly important across countries worldwide [12]. According to the United Nations report, "The level of e-government development globally has improved, with the average E-Government Development Index (EGDI) value increasing from 0.55 in 2018 to 0.60 in 2020" [2, p. 33]. The significance of e-government initiatives refers to the beneficial results that they can provide to the public sector, such as: improving the efficiency of the government sector, ensuring the quality of the offered services, facilitating the accessibility and smooth communication among public organizations and their stakeholders, increasing citizens' acceptance and satisfaction with the e-government initiatives, and encouraging citizens' participation and engagement in public administration activities and decision-making processes [13, 14, 15, 16].

The e-government also facilitates offering government services via a single access point similar to the one-stop-shopping style in the business sector [1]. Greunz et al. [17] considered e-government as the sum of all electronic connections among government employees, citizens, businesses, and industries where subordinating relationships exist. Undoubtedly, e-government initiatives make life better and more comfortable for all parties. They offer the opportunity to break down any temporal and geographical barriers between governments and their citizens [12]. Moreover, the optimal use of e-government is the ability to bridge the gap of communication and interaction between the government and their users and allow other governments worldwide to improve their management strategies. Collaboratively, e-government initiatives help leverage citizens' involvement in policy and decision-making processes. Therefore, e-government can overcome traditional government's negative experience based on complex structures which yield many barriers [18].

Recently, the demand to develop high-quality and usable e-government systems that provide

effectiveness, efficiency, and satisfaction is growing rapidly [19]. Designing a usable system is mainly focused on the experience of its target users, their perceptions of the system's design, and their actual interaction with the system. Accordingly, users' perceptions, knowledge, and needs regarding the specific system are considered significant aspects that must be integrated into the system development process to ensure its usability and efficiency [20]. Hence, there is a demand for adopting a User-Centered Design (UCD) approach to the system development process. The UCD is the philosophy that focuses on the end-users and puts them at the center of the system development life cycle [21].

Therefore, governments need to put their citizens at the center of the design of e-government services. They need to understand how citizens use the offered e-services and what issues they confront while using these services. The UCD-based approach supports e-governments to deepen citizens' adoption of their systems and offer services that are efficient and usable. It helps articulate citizens' needs, preferences, and adoption behaviors to offer the expected and accepted services. It also enables the community to get involved in the adoption strategies and specify proper delivery means of e-government service. Thus, governments can overcome potential difficulties that citizens may encounter while utilizing e-government services and improve their relationships with citizens. In this research, we consider the UCD-based approach to investigate the significant factors for adopting e-government from citizens' perspectives, which leads to enhancing their experience and promoting universal access to e-government.

1.1 Motivation

As government agencies have a substantial presence in citizens' daily lives, it is essential to design services that cater to citizens' needs and enhance their experience. Citizens' percep-

tions of the importance and ease of use of e-government services significantly influence their intention to use these services. Therefore, designing e-government services should deeply focus on citizens' requirements to provide usable, efficient, acceptable, and appropriate services. Moreover, the e-government is constantly changing over time and continues to drive opportunities and open new possibilities for potential developments. Therefore, there is a constant demand for further investigation to understand citizens' adoption of such new services. Government agencies need to regularly evaluate the adoption level of the offered services and investigate the critical factors that significantly affect the adoption from citizens' perspectives, which in turn enhance their experience. Hence, governments can ensure citizens' acceptance of the offered e-services and mitigate any potential adoption challenges.

However, numerous research efforts investigated the user experience of e-government from the lens of specific government services in an individual or specific range of countries. There has been a lack of a thorough investigation of user experience towards e-government services globally. In addition, many existing research studies focused on developing e-government adoption frameworks based on the UCD-based approach from the lens of specific government services in an individual country or a specific range of countries. There has been a lack of a global e-government adoption framework that could directly contribute to enhancing citizen experience by evaluating their adoption of any e-government services in any country. As a result, the main focus of this research is to improve the user experience of e-government services and promote universal access to these services by ensuring that everyone has fair access to them.

This thesis produces a systematic approach for evaluating citizens' adoption behaviors of e-government as a reference for future investigations. We have conducted a systematic literature review on user experience towards e-government services and cover all different aspects to better understand target users and enhance their overall experience. This comprehensive

review will inform the design of a proposed holistic conceptual framework by investigating significant factors that influence citizens' adoption of e-government services globally. The proposed framework will include the most common critical factors influencing citizens' adoption of e-government services imported from the systematic review results. These factors represent the necessary steps for enhancing citizen experience and increasing their adoption of such services. This framework would provide a standard overarching process for future research in the e-government domain by providing an established methodology for evaluating citizens' adoption behaviors of e-government services. It is not dependent on or associated with any particular e-government service or country. Otherwise, it could be used to evaluate citizens' adoption behaviors of e-government services in any country, ensure the usability and efficiency of e-government services, and enhance citizen experience in that country. Hence, there is no need to create a new conceptual framework to investigate the adoption of every specific e-government service, which saves lots of research efforts and time. We believe that the proposed conceptual framework will cover critical adoption behaviors, so it can be utilized for evaluating the adoption behavior of any e-government service. To the best of our knowledge, this is the first application of a comprehensive conceptual framework for evaluating citizens' adoption behaviors of e-government services and enhancing citizen experience by creating a UCD-based reference implementation, resulting in a higher level of success for e-government services.

1.2 Main Research Question

This research study looks into incorporating the UCD-based approach to improve e-government services and enhance citizen experience which leads to high adoption rates of these services. We primarily aim to support universal access to e-government services and ensure that ev-

eryone has fair access to e-government services. Therefore, we propose a comprehensive conceptual framework that provides an established methodology to assess citizens' adoption behavior of e-government services, leading to an improved overall experience. Hence, the main research question has been formulated as follows:

How to promote universal access to e-government services?

To answer this research question, two main research goals alongside their tasks and the research methodology to fulfill each task have been formulated in the following subsections.

1.2.1 Research Goal 1: Design the Comprehensive Conceptual Framework

In this goal, we intend to identify the significant factors that are more likely to affect citizens' adoption behaviors toward e-government services. Therefore, we can develop a conceptual framework based on the identified factors to evaluate citizens' adoption behaviors of e-government services. As we mentioned before, the primary aim of this research is to develop a comprehensive framework to be applied in any context and for any e-government services. Therefore, a deep investigation into the prior e-government adoption research studies has been performed to develop the new conceptual framework efficiently. To achieve this goal, two main research tasks have been identified, as explained below:

Task-1: identify the significant factors that affect citizens' adoption behaviors of e-government services:

- To fulfill this task, we have conducted a systematic literature review to develop a deeper understanding of user experience towards e-government services and then identify the most common salient factors that influence citizens' adoption behaviors of

e-government services. Appendix A provides a complete list of the primary studies adopted for this review.

Task-2: develop the conceptual framework for evaluating the e-government adoption behaviors from citizens' perspectives:

- One of the research gaps in enhancing user experience towards e-government services is the critical need for developing a comprehensive adoption framework that could be used in various contexts. Hence, we have imported the significant factors that influence citizens' adoption behaviors of e-government services from the systematic literature review's findings. Then, we analyzed the adopted factors and merged the conceptually similar factors. After that, we developed the conceptual framework to evaluate citizens' adoption of e-government services. Research hypotheses were developed related to the adopted critical factors included in the conceptual framework.

1.2.2 Research Goal 2: Deploy the Developed Conceptual Framework.

Once we have accomplished the first research goal of identifying the crucial factors that influence the adoption behavior of e-government and developing the conceptual framework, our next research goal is to utilize this framework in a specific context to evaluate the adoption behavior of e-government services among citizens in an effective manner. To fulfill this goal, the following two tasks along with the research methodology for each task have been identified:

Task-3: implement the conceptual framework to evaluate citizens' adoption behaviors of any e-government service:

We aim to implement the proposed framework and provide a UCD-based reference implementation for evaluating e-government adoption behavior to minimize the evaluation efforts for every e-government service. Citizens' behaviors are likely to change over time; hence, government agencies are required to conduct regular evaluations of e-government services and be updated with citizens' needs and preferences. Therefore, the proposed reference implementation system enables government agencies to save the time and cost of evaluating the adoption behaviors of such services and increases the quality of the offered services by constantly considering citizens' needs. To fulfill this task, we have provided a systematic procedure on how we should analyze citizens' adoption behavior using the proposed framework, as follows:

- **Identify the research methodology:**

  This research mainly aims to examine the key factors influencing citizens' adoption of e-government services from their perspective, with the goal of meeting their needs for such services. Our evaluation of the adoption behavior of e-government is confirmatory in nature and involves testing several research hypotheses developed for this purpose. In this step, we have conducted an in-depth investigation of the available research methodologies to adopt the appropriate research method that fits the goals of this research. As the research aims to investigate the causal relationships between specific factors for e-government adoption behaviors and derives findings that can be generalized to a larger population, a quantitative research method is being used [22, 23].

- **Develop the research instrument:**

  In this step, we develop the survey instrument used to collect data from citizens regarding their adoption behaviors of e-government services. A web-based questionnaire is adopted as the survey instrument in this research. We have developed the research instrument questions based on an extensive screening of the prior research studies on

the e-government adoption field. After that, we propose two criteria to ensure the readiness of the questionnaire by evaluating the content validity and reliability of the questionnaire items. The validity testing concerns the data representation by inviting experts in the field to evaluate the appropriateness of the questionnaire items to their corresponding identified factors. In the next step, we conduct a pilot study to confirm the reliability of the questionnaire items and apply the required changes.

- **Identify data analysis procedures:**
  In this step, we need to identify data analysis metrics to evaluate the collected data from citizens. Therefore, we adopt the Structural Equation Modeling (SEM) techniques to analyze and measure the citizens' adoption behaviors of e-government services. We develop statistical procedures and steps to apply SEM techniques and analyze the data.

- **Build a UCD-based reference implementation to evaluate citizens' adoption behaviors of the e-government services:**
  By following the quantitative research methodology and SEM techniques for investigating the proposed framework and evaluating the research hypotheses, we can develop a UCD-based reference implementation system for e-government adoption. This system can be used as a reference for further investigations of e-government adoption from citizens' perspectives. Therefore, the system can contribute to improving the e-government adoption levels and reducing the efforts asserted to evaluate citizens' adoption of e-government services.

Task-4: use the framework in a specific context to evaluate the e-government adoption behavior from citizens' perspectives:

In this task, we intend to focus on specific e-government services to investigate the current

state of e-government adoption from citizens' perspectives. The e-government employment services are adopted to be investigated in this research study. We then narrow down the research efforts by investigating the adoption of e-government employment services in Saudi Arabia as a case study. We aim to apply the developed conceptual framework and evaluate the research hypotheses to explore the adoption behaviors of Saudi citizens toward employment services. Empirical user studies should be conducted to investigate the e-government domain and contribute to fulfilling this task, as follows:

- **A comparative analysis of the usability of e-government employment services [24]:**
  We started the investigation by selecting the e-government employment services and evaluating their usability from citizens' perceptions. The US and Saudi Arabia were selected to compare the usability of their job seeking web portals from the Saudi and US citizens' perspectives. The findings showed that the Saudi job seeking web portal lacks the usability requirements that would ensure a constant adoption of these services by citizens.

- **Gender disparity in the usability of the Saudi job seeking web portal [25]:**
  An extended investigation has been conducted on the Saudi job seeking web portal to evaluate its usability from Saudi citizens' perspectives based on their gender. the study revealed that there is a significant gender disparity between Saudi citizens' perceptions regarding the usability of the job seeking web portal. Therefore, further research is highly demanded to understand citizens' needs and preferences to adopt such e-government services.

- **An empirical evaluation of citizens' adoption of the Saudi e-government employment services using the proposed conceptual framework:**

After developing the UCD-based reference implementation, we will conduct a user study using the proposed conceptual framework for the Saudi e-government employment services to evaluate the adoption behavior from citizens' perspectives by recruiting over 1000 participants. The results of this empirical study contribute to improving e-government employment services in Saudi Arabia by understanding citizens' adoption behaviors of these services and identifying the critical adoption factors from citizens' perspectives. The results would enhance the citizen experience by ensuring high adoption behaviors of the offered e-government services.

1.3 Research Contributions

This research study contributes to the knowledge and practice for enhancing citizen adoption behaviors in the e-government arena by developing a UCD-based reference implementation that brings e-government services to a more successful level. This reference implementation informs web designers of the established methodology and guidelines required to efficiently evaluate users' adoption of e-government services and provide accurate and reliable results. The overall research approach is summarized in Figure 1.1. The research contributions for each research goal can be summarized as follows:

Research Goal 1: Design the comprehensive conceptual framework:

- **Task-1: identify the significant factors that affect citizens' adoption behaviors of e-government services:**

- A revised systematic review of the e-government domain for identifying the significant adoption factors in different contexts. The adopted factors are crucial to guarantee citizens' initial acceptance and willingness to adopt such e-government services.

Therefore, they can be applied globally to any e-government service.

- **Task-2: develop the conceptual framework for evaluating the e-government adoption behaviors from citizens' perspectives:**

- An updated holistic conceptual framework of the e-government adoption to enhance citizen adoption alongside the research hypotheses to explore and validate any e-government service adoption level from citizens' perspectives based on the selected factors. It incorporates the most common salient factors in e-government adoption across countries. To the best of our knowledge, there has not been much work on developing such a comprehensive framework for e-government adoption that can be applied in various contexts, with previous efforts being focused mostly on developing e-government adoption frameworks for a specific context.

Research Goal 2: Deploy the developed conceptual framework:

- **Task-3: implement the conceptual framework to evaluate citizens' adoption behaviors of any e-government service:**

- A reliable and valid web-based questionnaire to collect citizens' responses regarding their adoption behaviors of e-government services. The questionnaire goes through two criteria to ensure its readiness by evaluating the content validity and reliability of the questionnaire items. The validity testing concerns the data representation by inviting experts in the field to evaluate the fit of the questionnaire items to their corresponding factors. In the next step, content reliability, a pilot study is conducted to confirm the reliability of the questionnaire items. Then, the questionnaire is updated regarding the results of both tests prior to using it for the given case study.

- A standard UCD-based reference implementation for e-government adoption to support governments in evaluating citizens' adoption of their services accurately and efficiently. Such research provides one of the pioneered contributions to the e-government domain.

- **Task-4: use the framework in a specific context to evaluate the e-government adoption behavior from citizens' perspectives:**

- A comparative analysis of the usability between two e-government job seeking web portals from two different countries, the US as a leading country of e-government development and Saudi Arabia as a developing country that ranked in the very high level of e-government development for the first time in 2020. To the best of our knowledge, the usability of e-government job seeking web portals has not been investigated and compared between the US and Saudi Arabia which in turn would contribute to comprehending the current state of the e-government domain in both countries and improving the e-government adoption level by following the UCD-based approach.

- Gender disparity analysis in the usability of Saudi employment services from citizens' perspectives. This research study provides significant findings to the Saudi e-government. It distinctly contributes to exploring and evaluating the citizen experience of Saudi e-government adoption behavior from the lens of gender.

- The Saudi citizens' adoption behaviors towards Saudi e-government employment services. This research study contributes to the knowledge by investigating the significant factors that influence the adoption behavior of Saudi employment services from citizens' perspectives. A user study was conducted to evaluate Saudi citizens' adoption behavior by using the proposed conceptual framework and recruiting over 1110 participants. The findings of this study would support government decision-makers with a better understanding of Saudi citizens' adoption behaviors to improve these services.

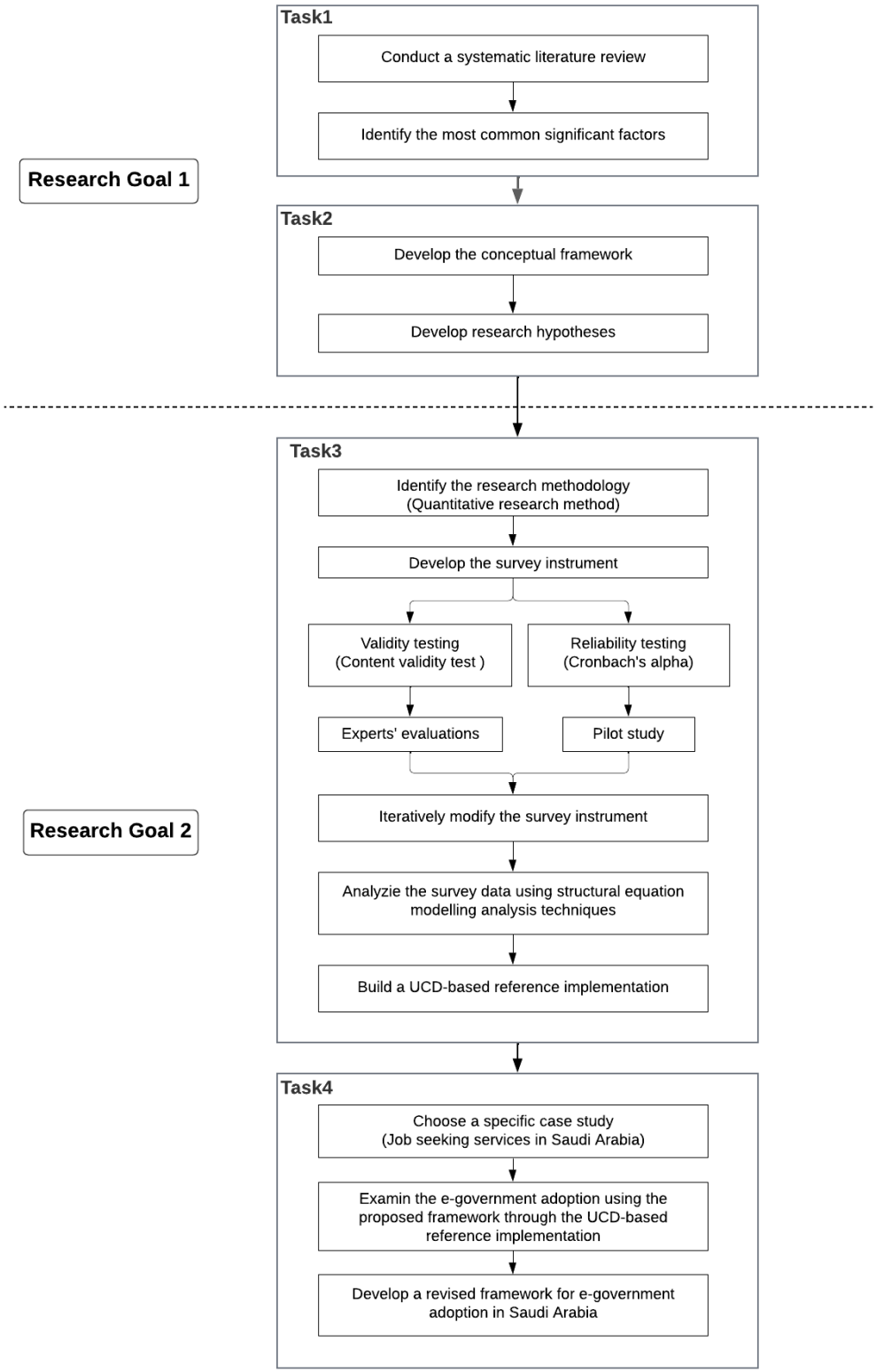


Figure 1.1: The overall research approach.

1.4 Dissertation Structure

The main chapters of this dissertation are organized as follows:

- **Chapter 2: Literature Review.** presents a narrative literature review on the e-government sector by providing a comprehensive perspective on the topic. It summarizes different studies published in this domain from which conclusions lead to the necessity to conduct a systematic literature review study, which will enhance the user experience of e-government services. In section 2.1, we start by investigating this phenomenon in-depth and exploring different aspects, such as definitions, classifications, development stages, benefits, and challenges. In the following section, we will conduct a literature review of e-government implementation and adoption in both developed and developing countries. Subsequently, a broad summary of the e-government level over the world is presented by explaining the e-government strategies and plans in some selected countries worldwide in section 2.2. Finally, we explore the technology acceptance models and theories that have been frequently utilized in the e-government adoption domain in section 2.3.

- **Chapter 3: Problem Definition.** discusses the problem scope and identifies the research gap associated with implementing the conceptual framework for e-government adoption. This chapter also discusses the shortcomings of the existing frameworks for evaluating e-government adoption and the potential of a holistic conceptual framework in e-government adoption.

- **Chapter 4: The Conceptual Framework.** aims to propose a holistic conceptual framework for evaluating the adoption of e-government. First, we conduct a comprehensive systematic literature review in the e-government context for the past two

decades to explore the factors that significantly affect e-government adoption in different countries in section 4.2. After that, we analyze the findings of the systematic review study to explore the most frequent significant factors that globally affect e-government adoption behavior. In section 4.4, we discuss in depth the critical factors that are adopted in the proposed conceptual framework alongside the research hypotheses developed to examine the correlation between the adopted factors and the behavior of e-government adoption.

- **Chapter 5: The Research Methodology.** reviews the research paradigms and determines the adopted methodology to fulfill the corresponding research goal. The quantitative data method is adopted as the research methodology in this research. In section 5.2, we discuss the development of the questionnaire, the data collection, and the equation to find the suitable sample size. After that, the data analysis process is explained in-depth in section 5.3. The statistical assessments are identified to examine the reliability and validity of the proposed framework. The structural equation modeling techniques are selected to evaluate the developed hypotheses.

- **Chapter 6: Case Study.** provides an overview of the preliminary results of the research by discussing the case study used to evaluate and examine the proposed conceptual framework. The e-government employment services are adopted as a case study to apply the proposed conceptual framework. In section 6.1, we provide a general overview of the unemployment rates in the world, followed by a comparative analysis of the job seeking web portals' usability between the US and Saudi Arabia section 6.2. After that, we explore the Saudi e-government and the adoption behavior from citizens' perspectives in section 6.3. We also discuss the significant motivation for adopting Saudi Arabia due to the dramatic change in Saudi society, which results in a gender disparity in the usability of Saudi job seeking web portal in subsection 6.3.4. Finally,

in section 6.4, we develop the sample size and questionnaire wordings regarding the Saudi context.

- **Chapter 7: Results.** provides the final results of e-government adoption behavior in Saudi Arabia, especially job seeking services. In section 7.1, we explain the validity and reliability testing steps to evaluate the survey instrument prior to using it in the given user study. We discuss the results of both tests and change the questionnaire accordingly. After that, in section 7.2, we provide a complete analysis of demographic data across the participants' gender, age group, and education level. It provides an overview of the Saudi participants' profiles. In section 7.3, we explain the final results regarding the adoption behavior of e-government services in Saudi Arabia. We provide the final structural model results which show the factors that significantly influence the adoption of the Taqat web portal in Saudi Arabia.

- **Chapter 8: Conclusion.** provides a summary conclusion of this thesis. It also introduces an overall discussion about the research contributions.

1.5 Conclusion

This chapter aimed to identify the research goals and motivation alongside the proposed research question. It started by briefly explaining the background of the research study and discussing the motivation of this research in section 1.1. Then, the main research question has been formulated in section 1.2 along with the research goals and the tasks associated with each goal as well as the research methodology to achieve these tasks. After that, we provided the significant contributions of this dissertation to the e-government in section 1.3. Finally, the dissertation structure is provided alongside a brief explanation of each chapter in section 1.4. Next, chapter 2 presents a narrative literature review of e-government.

Chapter 2

Literature Review

This chapter provides a narrative literature review related to the e-government concept. In section 2.1, we start by investigating this phenomenon in-depth and exploring its different aspects, such as its definitions, classifications, development stages, benefits, and challenges. After that, we review the e-government implementation and adoption in developed and developing countries, as we synthesize the critical factor for adopting e-government services in these countries from the perspectives of the supply side and the demand side.

Then, section 2.2 reviews the current state of the e-government implementation in different countries across the world and highlights their strategies and plans for developing e-government systems. Finally, we explore and investigate the technology acceptance models and theories that researchers have widely adopted in the context of e-government adoption. Section 2.3 presents the widely used technology acceptance models and theories in the e-government adoption context.

2.1 An Overview of E-government

The following subsections define the e-government concept, its classification, development stages, benefits, and challenges in more detail, as well as the comparative analysis of the e-government adoption studies worldwide between developed and developing countries.

2.1.1 E-government

Globally, governments have adopted the e-government term as a permanent commitment towards their stakeholders to enhance their services [6, 26], and increase citizens' confidence and intentions to adopt the e-government initiatives [27, 28, 29]. Since then, e-government initiatives have grown dramatically and provided great opportunities for research and development [30]. This initiative has multiple terms, such as online government, digital government, and electronic government. In this research study, we will adopt the e-government term for reference. Regardless of the variety of terms used to describe this concept, they all refer to the use of electronic medium and Internet channels to deliver government services to the public.

Prior research studies in the e-government domain revealed that there is no globally agreed definition pertaining to the e-government; otherwise, various definitions of the e-government are found [31, 32]. The majority of these definitions focus on two significant aspects of e-government: first, e-government is a new approach to using ICT to deliver and provide new services. Second, the way governments provide e-services and information to their stakeholders [33].

For instance, it is simply defined as using ICT services by public organizations via improved electronic medium channels between government agencies and citizens for the seamless and fast delivery of government services and transactions [34, 35]. It can also be defined as implementing cost-effective ICT forms for enhancing the work processes with citizens, industries, government entities, and all other government employees by emphasizing the role of business facilities in e-government systems [18, 36]. Teo et al. [37] described it as a tool that constantly utilizes ICT to deliver and enhance government services for the target users.

However, e-government is a more comprehensive, and broader concept beyond the delivery

of e-services. It can be addressed from diverse perspectives, such as technical, social, legal, and organizational perspectives [38, 39]. Alghamdi and Beloff [40, p. 1217] provided a comprehensive definition of e-government from a general view as "the utilization of various ICTs for facilitating communication between the government and the stakeholders, providing effective, efficient and integrated e-Services that enhance the relationship between the government and the stakeholders through multiple and flexible channels, leading to a more democratic system and increased engagement."

Based on the previous definitions of e-government, we can consider it a strategic plan that adopts new and promising technologies to enhance stakeholders' adoption, interactions, participation, engagements, and trust with the government sector through the available government services and information.

2.1.2 E-government Classification

According to [39, 41], there are different models of e-government based on the type of their stakeholders. The stakeholder can be defined as any organization, group, or individual that is involved and affected by the government's achievements [42]. These models can be categorized as follows:

- **Government-to-Government (G2G)**: refers to service delivery programs across government entities, agencies, and employees. It offers a large database for efficient communication and effective information sharing among different levels of government.

- **Government-to-Business (G2B)**: refers to the electronic transaction initiatives between governments and businesses. It provides electronic purchases for the government marketplace.

- **Government-to-Citizen (G2C)**: refers to the provision of electronic communication and services by the government to its citizens.
- **Government-to-Employees (G2E)**: refers to the use of electronic communication and service delivery between a government and its employees. This type of e-government aims to provide government employees with the necessary resources, data access, and training to support their tasks effectively.

Government-to-Government (G2G)

It focuses on enhancing the collaboration of internal processes within government organizations. This category is deemed the basis of the e-government systems [43]. Communication in the context of e-services can take place either internally within the same organization or externally with other agencies or organizations. This type of interconnection has the potential to enhance the efficiency and effectiveness of e-services by enabling the seamless sharing of public information, resources, and databases among public agencies [43, 44]. Due to this efficient collaboration among public agencies, G2G can ensure greater consistency, accuracy, reliability, and transparency of the shared resources and information [27].

In addition, the use of service delivery in the G2G domain contributes to communication speed up among public agencies, eliminating redundancy, cost reduction, and improving strategic decisions [45]. Therefore, service delivery requires an advanced level of collaboration because public organizations have become more dependent on each other.

Government-to-Business (G2B)

It refers to using ICT services to enhance and facilitate different interactions and transactions electronically between public agencies and private organizations. It aims to enhance these

relationships by improving the efficiency of the connection between the two sides [34, 46]. In the G2B domain, many activities can be carried out smoothly, such as business licensing, tax returns, exchanging notes, distributing policies and regulations, and other business services [45]. Due to the private sector's enthusiasm to improve its processes and reduce costs and efforts, significant attention has been paid to the G2B domain.

The implementation of G2B has many benefits for the public as well as private sectors. It helps develop business enterprises and improve business quality [43]. Moreover, it supports business organizations by simplifying procedures, saving time, reducing efforts, and enhancing interactions between governments and businesses. G2B allows private sector businesses to obtain accurate and updated information and services from the government sector, which in turn enhances the decision-making process [45].

Government-to-Citizen (G2C)

It indicates the relationship between the government and citizens over electronic channels. This domain aims to facilitate all interactions and relationships between the government sector and citizens through using the e-government system. G2C is the main purpose of implementing e-government initiatives since it includes a huge number of users (citizens) [43, 44] Therefore, the successful implementation of the G2C domain has a crucial role in enhancing this interaction through facilitating citizens' requirements, saving time, and reducing costs and efforts [27, 47].

In this domain, the public sector constantly attempts to provide citizens with required information and services conveniently and instantly [45, 46]. It tends to offer all required information in a single place and guarantees full access to government e-services all the time 24/7. Also, it promotes citizens' awareness of the e-government and enhances their

engagement in decision-making, such as their participation in e-voting processes [38].

Government-to-Employee (G2E)

It refers to the interaction between government agencies and their employees [42]. It aims to improve and sharpen the ICT skills of government employees to guarantee the effective and efficient delivery of government services. It facilitates the way government agencies offer or share training, learning, knowledge, and information with their employees to complete internal processes and reduce administration costs. Moreover, It also enables them to access important information, such as regulations and policies, civil rights laws, and training opportunities [48].

G2E plays a fundamental role in facilitating the required skills for employees to enhance their job and make them faster and more productive through implementing an efficient e-government system. According to Seifert [43], G2E is considered a subset of the G2G domain as it helps to enhance the government's daily operations and facilitate transactions with other stakeholders.

Siau and Long [1] developed an e-government framework that divides these categories into internal and external domains based on their stakeholders' positions and relations to the government sector. The G2G and G2E represent internal activities because their interactions are limited within the government sector, either with other governments or government employees. Whereas G2B and G2C are external activities as government sectors interact with different external stakeholders of business organizations and citizens who do not belong to the government sector. Figure 2.1 shows the overall e-government framework.

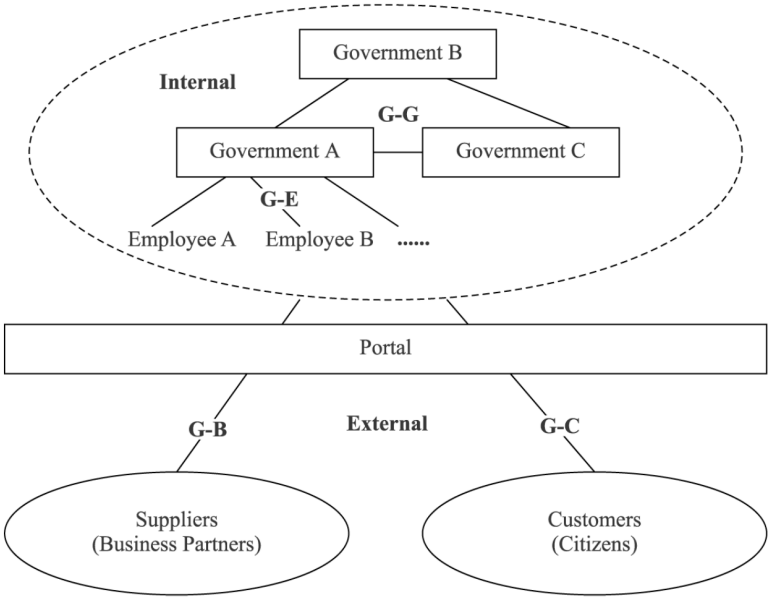


Figure 2.1: The e-government framework [1, p. 445]

2.1.3 E-government Development Stages

E-Government stages (also called levels or phases) indicate the e-government implementation phases. Various stage models have been discussed and proposed in the prior research studies in the e-government domain for identifying the required e-government levels. E-government stage models aim to evaluate the implementation of the current e-government programs and set up a plan to fulfill the requirements and meet the desired goals. E-government stages represent a reference to determine where the new proposed initiatives fit into the entire e-government system. These stages or phases are not dependent on each other; they do not process in order, which means no need to complete one phase to begin another one. They provide specific methods to assess the e-government processes [49, 50]. Overall, the e-government implementation consists of four main stages, including publishing, interaction, transaction, and integration [50, 51, 52]:

1. **Publishing stage:** focuses on providing the public with the required information

and delivering e-services through governments' web portals. It represents the earliest stage of e-government implementation, where static and straightforward information is available online. Such information usually includes lists of available e-services offered by the public sector, working hours, contact information, and offices' physical locations [47, 50].

2. **Interaction stage:** focuses on further implementation of e-government by improving its functionality. It develops two-way communications between the government sector and its stakeholders in which both sides can exchange public information and also public e-services can be requested electronically [52] This stage often includes providing government stakeholders with necessary steps and guidelines for requesting e-services, making appointments, filling in interactive forms, and responding to simple inquiries from stakeholders regarding particular service [49, 50]. This stage lacks the two-way interactions between government agencies and citizens [52].

3. **Transaction stage:** concentrates on providing full-featured e-services, where e-government stakeholders can ultimately carry out multiple transactions through e-government systems [35]. It focuses on developing unlimited two-way interactions between government agencies and their stakeholders. In this stage, stakeholders start to take an active role while utilizing e-government systems to fully engage with the offered e-services. It usually includes payment actions, such as renewing visas, obtaining passports, bill payments, and paying taxes [1]. Hence, the e-government assures improving the effectiveness and efficiency of government agencies in delivering public e-services. It facilitates citizens to request the offered e-services effectively and conveniently [47, 50].

4. **Integration stage:** refers to the long-term goal of e-government systems by providing government stakeholders with integrated public e-services through e-government systems. It involves how the integration of government functions can be organized and

perceived. It usually refers to adopting an integrated, single access point where the government sector offers all public e-services to its stakeholders [50, 51]. This stage facilitates a seamless flow of public information among various government agencies. It also improves the public value of the government sector by enhancing the transparency of decision-making processes [49].

2.1.4 E-government Benefits

There is an increment in recognition of the e-government benefits and features. E-government implies an exponential development of government processes that dramatically improve the delivery channels of e-services rather than a simple electronic automation of such services. Such a system can reduce the government procedure's complexity, fulfill the users' needs, and increase interaction and participation levels [31, 52]. E-government increases productivity by reducing time, cost, and effort by offering more efficient and effective procedures. It also ensures high levels of engagement with stakeholders and high-quality services.

Moreover, providing e-government services through a unified, integrated single access point contributes to enhancing accessibility and facilitating the workflow effectively alongside reducing the need to visit government offices physically. E-government also contributes to promoting democracy by emphasizing transparency, accountability, participation in decision-making, and supporting economies [47, 53]. A summary of some considerable advantages of e-government adoption is illustrated in Table 2.1:

Table 2.1: Related benefits of adopting e-government.

Benefit	Explanation	Reference
Accessibility	E-government uses ICTs that allow stakeholders to fully access e-government systems and obtain services in a seamless manner.	[27] [43] [28] [54]

Table 2.1: Related benefits of adopting e-government (continued).

Benefit	Explanation	Reference
Availability	E-government services and public information are available all over the year which allows government stakeholders to have 24/7 access to e-government systems.	[38] [28] [47]
Saving time and cost	E-government is cheaper and more effective, as it eliminates the use of traditional means of communication and decreases the need for physical attendance to government offices or agencies. The adoption of e-government services results in simplifying the processes, saving time, and reducing costs.	[55] [31] [56] [54]
Facilitating interactions	The e-government implementation facilitates the interactions and communications between the public sector and its target users and also improves the coordination among government agencies themselves. It improves the relationships in the government sector and increases users' satisfaction.	[53] [28] [35]
Improving efficiency and effectiveness	E-government provides several ways to obtain the offered e-services, which in turn increases the efficiency and effectiveness of the system. For instance, different payment methods are introduced to give users a facilitated option in conducting e-government transactions. Also, e-government enhances economics and offers private sectors opportunities to expand and improve. Moreover, e-government development leads to delivering the offered services efficiently.	[44] [52] [43] [57]
Improving integration	The E-government system offers a one-stop shopping style where the interactions with government agencies are conducted via a single access point provided by the government sector. Government stakeholders can easily communicate with government agencies and utilize any offered e-service from a single place without the necessity to ask where to go or how to adopt such a service.	[50] [51] [43]

Table 2.1: Related benefits of adopting e-government (continued).

Benefit	Explanation	Reference
personalization	E-government transforms and rebuilds the relationship between government agencies and their stakeholders by offering personalized services. Instead of providing all available services to government stakeholders, the e-government initiatives tend to deliver services that are more personalized, which would enhance users' experience and increase their satisfaction levels.	[48] [54] [56]
Accountability	E-government system strengthens the accountability and transparency of its processes and offered services. Stakeholders have the ability to track and control their transactions with the government. It helps promote the responsiveness of the government agency and improve stakeholders' trust.	[53] [12] [58] [57]
Combating digital divide	E-government helps narrow down the digital divide among different government stakeholders, as it offers the same quality of services and public information to all stakeholders equally.	[59] [56] [58]
Improving participation and engagement levels	E-government initiatives create different forms of e-participation that improve the relationships between stakeholders and the government, such as e-voting, online debates, and exchanging information. It helps improve the democracy level within the government. Moreover, by facilitating stakeholders' access to government policies and regulations, e-government promotes stakeholders' inclusion in public decision-making processes.	[35] [60] [61] [54]
Reducing corruption	The transformation to an e-government system has significant benefits in improving its processes and reducing potential systematic corruption. It helps systematically organize the complexity in the e-government processes which results in increasing transparency, eliminating corruption, and providing services equitably for all stakeholders	[48] [62] [63]

As illustrated above, e-government has a significant impact on the relationship between

government agencies and their stakeholders, and the quality of their lives. Successful implementation of e-government services would enhance citizens' adoption behaviors, which in turn would improve society. During the e-government implementation, some of the e-government benefits can be achieved in a short-term manner, such as saving costs, time, and effort. Whereas other benefits, such as increasing democracy and reducing corruption, require a long period of time to be accomplished. Subsequently, investigating the factors that significantly affect e-government adoption is crucial to achieving the potential benefits.

2.1.5 E-government Challenges

The implementation of e-government is challenging due to the limitations from various perspectives, including the organizational perspective, the financial perspective, the technological perspective, and the social perspective [54, 64, 65, 66, 67]. Such complexities and challenges have a significant impact on e-government development. Therefore, it has become crucial for the efficient development of e-government to understand how such complexity and challenges can be addressed in different countries [6, 52]. Table 2.2 provides an overview of the obstacles that impede the progress of e-government initiatives.

Table 2.2: Complex perspectives hindering the e-government development.

Challenge perspective	Main challenges	Reference
Organizational challenges	• Lack of organizational management support. • Lack of public e-services quality. • The lack of qualified government employees.	[6] [15] [33] [68] [69]
Technological challenges	• Inadequate ICT infrastructure. • The lack of accessibility. • Security and privacy concerns.	[70] [71] [72] [73] [74]
Financial challenges	• Insufficient financial resources. • High cost of ICT infrastructure.	[54] [63] [67] [75] [76]

Table 2.2: Complex perspectives hindering the e-government development (continued).

Challenge perspective	Main challenges	Reference
Social challenges	• Distinctive cultural aspects. • Resistance to change. • Perception of trust.	[6] [67] [71] [77] [78]

Organizational and Governmental Challenges

These obstacles are associated with particular internal factors within the government sector that hinder the implementation of e-government programs in various contexts [6]. The development process requires the reorganization of business processes in the public sector to develop public services. The reorganized process delivers the flexibility that involves re-engineering the organizational structure for the internal processes to eliminate redundancy in the delivery process. Therefore, the potential of e-government development can be completely utilized [60].

Many research studies in the literature have explored the organizational and governmental challenges in implementing e-government under several circumstances. For instance, the lack of appropriate and customized strategic plans and policies to fit the specific context [54]. The lack of knowledgeable and qualified personnel is another challenge when government employees are not qualified and lack many skills to implement e-government systems. The qualified employees include technical, political, administration, and social specialists [15].

Moreover, the unsatisfied quality of the delivered e-services due to the speed and quality of performing e-services is another organizational challenge mentioned by many research studies [33, 61]. Althonayan and Althonayan [69] reported that the lack of administrative support in the public sector is a critical issue of e-government development. Organizational management is crucial in e-government implementation to deal with potential resistance and

assure the entire interactions in the organization [68].

Technological Challenges

They pertain to the accessibility and functionality of technologies that affect the implementation of e-government initiatives in specific situations [56]. Technologies are the cornerstone of e-government development, taking into account the skills, demands, and expectations of government stakeholders. The evaluation of the technological challenges for implementing e-government systems fully depends on the characteristic of a specific country and on how compatible they are with the existing specific system. Therefore, many crucial factors from a technological viewpoint must be tackled in the e-government development process [66].

Several research studies highlighted the technological challenges to e-government development. The ICT infrastructure must be improved to implement the e-government systems [6, 56]. The ICT technical challenges form the most critical issues against e-government systems as the ICT infrastructure represents the backbone of e-government systems. Such barriers include a shortage of secure networks, issues with system access, the complexity of the existing system, and difficulties in integrating several databases [15]. The inadequate ICT infrastructure hinders obtaining a successful e-government implementation [72]. Therefore, Siddiquee [74] indicated that the ICT infrastructure should comply with the e-government development requirements to reduce its technological challenges.

Moreover, privacy and security issues are constant critical risks in IT systems. In the e-government concept, these issues are increasing rapidly due to the highly confidential information that the e-government deals with. Hence, the government should obtain the most advanced security and privacy precautions and approaches to protect this information. This challenge is considered a very sensitive and critical challenge that must be addressed to ensure

the success of e-government implementation [15, 72]. Al-Shboul et al. [71] asserted that government stakeholders need to guarantee the incorporation of security and privacy approaches into the e-government development process to further enhance e-government adoption and trust. Also, the accessibility challenges due to the e-government system technical difficulties is another significant technological barrier that deters stakeholders from adopting the offered e-government services in an effective and efficient manner [70, 73].

Financial Challenges

They refer to the financial resources required for e-government development under a specific context. Implementing e-government systems globally poses a significant challenge due to the lack of adequate financial resources [50, 63]. Overall, when it comes to deciding on how to provide the required financial resources for e-government development, the political situation may conflict with the senior officials' decisions, indicating critical financial challenges.

The impact of financial challenges has been widely addressed in the literature regarding the development of e-government. They all assert the importance of financial support for the e-government success [54, 75]. The limited availability of public e-services in different countries is due to the lack of financial resources [63]. Acquiring adequate ICT infrastructure equipment slow down the progress of e-government development due to its high cost, which would take many years in some countries to achieve the desired progress for the e-government development [67, 76].

Social Challenges

They are related to particular social challenges that impact the e-government development process. Inadequate attention to social challenges that arise from specific contexts has been

identified as a key reason for the failure of many e-government initiatives in various countries. Such social challenges indicate a negative perception of the offered government e-services by different stakeholders because of the lack of e-government awareness, which hinders the e-government development in a particular country [64, 67]. Stakeholders' attitudes and organizational culture are critical challenges in adopting new technologies. In the e-government context, there is a need for solid interactions between government agencies and their stakeholders to confirm the successful development of the e-government initiatives and ensure e-government adoption by the stakeholders [54]

Several research studies in the literature have investigated social challenges to the e-government development process. They argue that the cultural aspects of specific societies, such as religion and traditions, should be addressed for successful e-government development. Another critical social challenge that should be addressed when developing an e-government program is resistance to change. Some government stakeholders desire to maintain traditional ways of requesting public services, as they feel more comfortable with traditional processes than the electronic means [71, 78].

Moreover, due to the lack of technical backgrounds of government stakeholders and their unwillingness to learn new technical skills, many stakeholders are unwilling to adopt and trust e-government. Hence, perceived risk and perceived trust in the e-government have a substantial impact on the e-government adoption behavior [6, 77].

2.1.6 E-government Adoption Studies

Due to the vast growth of e-government services, it has become necessary to examine the key adoption factors worldwide by studying e-government adoption [16, 42, 79]. Numerous research studies have been conducted to investigate the significant factors for e-government

Table 2.3: Leading countries in e-government development in 2020 [2, p. 12].

Country	Rating class	Region	OSI value	HCI value	TII value	EGDI value (2020)	EGDI value (2018)
Denmark	VH	Europe	0.9706	0.9588	0.9979	0.9758	0.9150
Republic of Korea	VH	Asia	1.0000	0.8997	0.9684	0.9560	0.9010
Estonia	VH	Europe	0.9941	0.9266	0.9212	0.9473	0.8486
Finland	VH	Europe	0.9706	0.9549	0.9101	0.9452	0.8815
Australia	VH	Oceania	0.9471	1.0000	0.8825	0.9432	0.9053
Sweden	VH	Europe	0.9000	0.9471	0.9625	0.9365	0.8882
United Kingdom of Great Britain and Northern Ireland	VH	Europe	0.9588	0.9292	0.9195	0.9358	0.8999
New Zealand	VH	Oceania	0.9294	0.9516	0.9207	0.9339	0.8806
United States of America	VH	Americas	0.9471	0.9239	0.9182	0.9297	0.8769
Netherlands	VH	Europe	0.9059	0.9349	0.9276	0.9228	0.8757
Singapore	VH	Asia	0.9647	0.8904	0.8899	0.9150	0.8812
Iceland	VH	Europe	0.7941	0.9525	0.9838	0.9101	0.8316
Norway	VH	Europe	0.8765	0.9392	0.9034	0.9064	0.8557
Japan	VH	Asia	0.9059	0.8684	0.9223	0.8989	0.8783

Source: 2020 United Nations E-Government Survey.

adoption in various countries. Such studies divided the e-government adoption approach into two different contexts based on the country's current state, including developed and developing countries [13].

According to the United Nations annual report, countries are classified based on their GDP per capita, ICT infrastructure, human assets, and the level of financial activities [2]. There is a significant difference between developed and developing countries with regard to IT infrastructure, practices, and uses [6]. Developed countries provide successful e-government development practices, and they are considered world leaders in developing e-government initiatives. In 2020, around fourteen developed countries represented the world leaders for e-government development, as shown in Table 2.3 [2]. On the other hand, developing countries lack sufficient skills, knowledge, and practices to develop acceptable strategies to implement and develop e-government systems. Chen et al. [6] provided a brief comparison between developed and developing countries, as illustrated in Table 2.4.

Table 2.4: Differences between developed and developing countries [6, p. 27].

	Developed countries	**Developing countries**
History and Culture	• Government and economy developed early, immediately after independence. • Economy growing at a constant rate, productivity increasing, high standard of living. • Relatively long history of democracy and more transparent government policy and rule.	• Government is usually not specifically defined; the economy not increasing in productivity. • Economy not growing or increasing productivity; low standard of living. • Relatively short history of democracy and less transparent government policy and rule.
Technical staff	• Has a current staff, needs to increase technical abilities, and hire younger professionals. • Has outsourcing abilities and financial resources to outsource; current staff would be able to define requirements for development.	• Does not have a staff, or has very limited in-house staff. • Does not have local outsourcing abilities and rarely has the financial ability to outsource; current staff may be unable to define specific requirements.
Infrastructure	• Good current infrastructure. • High Internet access for employees and citizens.	• Bad current infrastructure. • Low Internet access for employees and citizens.
Citizens	• High Internet access and computer literacy; still has digital divide and privacy issues. • Relatively more experienced in the democratic system and more actively participate in the governmental policy-making process.	• Low Internet access and citizens are reluctant to trust online services; few citizens still do not know how to operate computers. • Relatively less experienced in the democratic system and less active participation in the governmental policy-making process.

Table 2.4: Differences between developed and developing countries (continued) [6, p. 27].

	Developed countries	**Developing countries**
Government officers	Decent computer literacy and dedication to resources; many do not place e-government as a high priority.	Low computer literacy and dedication to resources; many do not place e-government as a high priority due to a lack of knowledge on the issue.

The government represents the supplier of public services to serve citizens' demands. Therefore, Reddick [47] categorized the e-government research into two main perspectives: the supply side (the government) and the demand side (citizens). The supply side explores the significant factors related to the organizational and management aspects of the public service supplier that influence the government system's adoption and implementation [38, 50, 80]. Examples of these factors include government policies and strategies, organizational resources, required regulations, and IT infrastructure. Whereas, the demand side perspective focuses on the actual users who benefit from the offered public services and the critical factors that would increase e-government adoption behaviors [47]. The demand side focuses on examining different requirements, expectations, perceptions, and demands of individual citizens for adopting e-government services [13]. Examples of these factors include perceived usefulness, perceived ease of use, experience, trust, and social influence.

Many research studies in the literature have been conducted to examine e-government adoption from these two side perspectives in different contexts. The following subsections provide a detailed discussion of critical determinants of e-government adoption from these two perspectives in developed and developing countries.

E-government Adoption in Developed Countries

As mentioned above in Table 2.4, developed countries show significant development in e-government development research due to their well-established IT infrastructure, living standards, economies, and personnel skills. Therefore, various research studies have been conducted to investigate e-government adoption in developed countries.

From the supply side perspective: Tung and Rieck [81] explored the critical factors that significantly affect e-government adoption among private organizations in Singapore. The authors developed a theoretical model for understanding e-government adoption in private organizations. A survey instrument was adopted for the collection of around 128 responses, and the Structural Equation Modelling (SEM) techniques. The study inferred that management readiness, external pressures, and sensitivity to cost are the critical factors that affect e-government adoption in private organizations.

Moon and Norris [80] explored the effects of managerial innovations in municipal e-government adoption by analyzing two large American survey datasets. The two datasets were merged by integrating the information of each city. The new dataset includes 739 US municipal governments, which participated in both surveys. This study revealed that managerial innovativeness orientation and city size are the most significant factors of municipal e-government adoption in the US.

Hossain and Chan [82] investigated the significant factors for adopting open government data in Australia. They conducted a semi-structured interview with eleven government employees from six government agencies to understand the utilization of open government data. To analyze the collected data, the content analysis technique was adopted. The study concluded that political leadership, institutional pressure, digital technologies, perceived interoperabil-

ity, management commitment, and organizational readiness are the crucial organizational factors that affect open government data adoption in Australia. The findings of this study support government policymakers to develop future strategies on open data adoption.

In another e-government adoption study, Jans et al. [83] conducted a study that analyzed the e-government adoption level in 429 Dutch municipalities in the Netherlands. The authors used a questionnaire to collect data from the municipalities about their e-government services and analyzed the data using statistical methods. The study's results showed that political alignment, policy network resources, and past performance are the factors that significantly influence e-government development and adoption from the government agencies' perspective.

Moreover, a mixed-research method approach (quantitative and qualitative) was performed by Husin et al. [84] to understand the e-government adoption in Australia. The data was collected from 166 employees from two large government organizations using a combination of survey instruments. Also, semi-structured interviews with 19 participants have taken place in the study. Both research methods investigated employees' expectations and awareness of organization policies while adopting web 2.0 tools and social media platforms in the work. A theoretical model was proposed to help government agencies develop effective e-government adoption through employees' motivations to use web 2.0 technologies. The study revealed that top management support for these technologies, perceived usefulness, transparent culture work among employees, and standardizing technology implementations in public organizations are critical for e-government adoption. The proposed model can be considered as an adoption guide from government organizations' perspectives.

From the demand side perspective: In the United Kingdom, a study was conducted to evaluate the impact of e-government website quality on e-government adoption, specifically

regarding the online payment of self-assessed taxes [85]. The researchers utilized a mixed-methods approach, collecting data from 420 participants quantitatively and 273 participants qualitatively. The study found that usability, service interaction, and information quality are significant factors in e-government adoption from citizens' perspectives. To analyze the data, the researchers used the data triangulation approach.

Horst et al. [86] investigated the factors that significantly influence e-government adoption in the Netherlands. The technology acceptance model developed by Davis [87] was used to evaluate e-government adoption by citizens. The study utilized a survey instrument to collect data from 238 respondents and analyzed it using SEM techniques. The findings showed that perceived trust, risk perception, personal experience, subjective norm, and perceived behavioral control are critical factors for predicting the perceived usefulness of e-services. Furthermore, trust of the e-government was found to be the main factor in predicting the perceived usefulness of e-government adoption.

Yao and Murphy [88] investigated the critical factors for adopting e-voting systems in the US government. The authors collected 453 responses from citizens using a survey instrument. The study used the technology acceptance model to develop a theoretical model and SEM techniques to analyze the collected data. The results indicated that system privacy, system mobility, and system accuracy are crucial determinants that influence the adoption of e-voting systems. In addition, Schaupp et al. [89] developed a theoretical model to examine the significant factors in adopting e-filing services in the US. A survey instrument was adopted and returned 260 responses from citizens with the SEM approach for data analysis. The results showed that performance expectancy, social influence, trust of the e-government, perceived risk, and optimism bias significantly affect citizens' adoption of the e-filing system.

Moreover, Carter et al. [90] proposed a combined model to explore and analyze the critical factors for e-government adoption in the US and the UK. A total of 245 responses were

collected, 105 surveys were returned from US citizens, and 140 surveys were returned from UK citizens along with the SEM approach for data analysis. The results indicated that disposition to trust, trust of the internet, perceived usefulness, and perceived ease of use are the key factors for e-government adoption in the US and UK.

To summarize, many prior research studies have investigated and examined the significant factors for adopting e-government systems in developed countries. We briefly discussed some of these studies. Table 2.5 provides an overview of some of the prior research studies conducted on e-government adoption in developed countries. It is not an exhaustive list, but it highlights some of the key studies and their findings in this domain.

Table 2.5: A summary of e-government adoption in developed countries.

Perspective	Critical factors		Reference
Supply side	• Policy authority • City size • Management capacity • Institutional power • Management commitment • Organizational readiness • Staff constraints • Work routineness • Political alignment • Past performance • Policy network resources • Political leadership • Financial resources • External pressures • Sensitivity to cost	• Leadership support • Skilled human resources • Transparent culture work • Standardizing technology • Organizational centralization • Top management understanding • Participation in professional networks • Digital technologies • Perceived interoperability • Public organizations collaboration • Managerial innovation orientation	[80] [81] [82] [83] [84] [91] [92] [93] [94] [95] [96].

Table 2.5: A summary of e-government adoption in developed countries (continued).

Perspective	Critical factors		Reference
Demand side	• Perceived ease of use • Perceived usefulness • Information quality • Perceived trust • Perceived risk • Subjective norms • Personal experience • Perceived behavioral control • Trust of the e-government • System privacy • System mobility	• System accuracy • Performance expectancy • Effort expectancy • Social influence • Optimism bias • Disposition to trust • Trust of the internet • Facilitating conditions • Computer self-efficacy • Internet safety perception	[85] [86] [88] [89] [90] [97] [98] [99] [100] [101] [102] [103].

E-government Adoption in Developing Countries

Developing countries have different properties, as we mentioned in Table 2.4. They lack adequate IT infrastructure facilities, proper practices, skills, and knowledge to develop e-government systems. Considering these characteristics is crucial for gaining a better understanding of e-government adoption in developing countries.

From the supply side perspective: Many research studies have been conducted to investigate the supply side perspective of e-government adoption in developing countries.

The study conducted by Weerakkody et al. [56] explored the challenges and complexities of e-government development in Qatar. The researchers used semi-structured interviews with eight government officials and analyzed the data using content analysis techniques. The study found that e-government adoption was significantly influenced by organizational structure, government support, funding, leadership, and regulations. Other critical factors for e-government adoption in Qatar included power distribution, strategy alignment, future demands, education, training, culture, prioritization of deliverables, and a citizen-centric focus.

Al-Zoubi et al. [104] investigated the key factors for the e-government adoption among private organizations in Jordan. A survey instrument was used to collect 113 responses, and the binary logistic regression techniques were used for data analysis. The study indicated that private organizations require organizational factors to adopt e-government systems and offer new e-services to their customers. From the organizational theme, top management support, financial resources, and organizational culture significantly affect e-government adoption. Additionally, IT infrastructure, competition pressure, and government pressure are also critical external factors influencing e-government adoption by Jordanian organizations. In their study, Liang et al. [105] explored the factors that affect e-government cloud adoption in China. The study used a mixed-methods approach that involved collecting data from 21 officials, as well as using secondary data sources and observations. The findings revealed that top management support, organization inertia, public policies and standards, financial commitment support, and following successful cases were considered significant factors for e-government cloud adoption.

Van et al. [106] investigated the importance of Vietnam's e-government role in terms of trade and economy. The study aimed to find out the critical factors that impact the Vietnam economy through adopting e-government services. A survey instrument was used to collect

266 useful questionnaires and examine the developed hypothesis. Three main themes, such as e-services, economics, and politics, were identified to investigate the critical factors of e-government adoption. The study revealed that the top management support and government policy from political themes are considered significant factors in adopting e-government services for trade and economics. This research can help future e-government development through government policymakers.

In another e-government adoption study, Thanh et al. [79] provided a deep investigation and analysis of the critical role of the information systems interoperability dimensions for e-government development. The focus of the research was to identify significant factors that affect the interoperability adoption for e-government in Vietnam. A survey instrument was used to collect data from IT employees in Vietnam public organizations; 205 responses were received. The survey data was analyzed using SEM techniques. The study revealed that collaboration and coordination, technical expertise, and risk management have significantly affected the interoperability adoption of e-government information systems in Vietnam.

From the demand side perspective: Wang [107] investigated the adoption of e-filing services in Taiwan. TAM was adopted to develop a proposed model to understand the adoption behavior of e-filing services from citizens' perspectives [87]. The data collected from a survey instrument, consisting of 260 responses, was analyzed using SEM techniques. The findings showed that perceived ease of use, perceived usefulness, computer self-efficacy, and perceived credibility were significant factors that influenced the adoption of e-filing services. Similarly, Phang et al. [102] adopted the same methodology as Wang [107] to investigate the senior citizens' perceptions towards the adoption of the e-withdrawal system in China using TAM as the theoretical framework. Also, a survey instrument tool was used to collect the perceptions of 99 citizens, along with the SEM techniques to perform the

analysis. The study found that perceived usefulness, perceived ease of use, users' resource-saving, perceived internet safety, self-actualization, and computer anxiety critically affect the adoption of e-withdrawal systems in China from senior citizens' perspective.

In another e-government adoption study, Wangpipatwong et al. [108] investigated the factors that significantly affect the continuance intention to use e-government systems in Thailand from citizens' perspectives. The acceptance of the technology model and the concept of computer self-efficacy were integrated to examine the citizens' perceptions of using e-government websites. A survey instrument was adopted and collected 416 responses from citizens in Thailand. The linear regression technique was utilized for data analysis. The results showed that perceived usefulness and perceived ease of use directly influence citizens' intentions to use e-government websites. Moreover, the results revealed that computer self-efficacy directly impacts citizens' continuance intention to use e-government websites.

In Kuwait, AlAwadhi and Morris [109] investigated the adoption of e-government services from citizens' perspectives. The unified acceptance and usage model was adopted to explore the critical factors in this context. A survey instrument was distributed among students taking science and humanities courses, and then 880 responses were returned. The study concluded that performance expectancy, effort expectancy, facilitating conditions, and peer influence significantly influence citizens' adoption of e-government services in Kuwait. In addition, trust and cultural factors were suggested by the authors for future investigations of e-government adoption.

Rana et al. [16] investigated the success of an e-government system in India by exploring the factors that significantly affect the citizens' adoption of that system. The IS success model and the technology acceptance model were developed to examine this system by proposing twelve hypotheses. The model was examined and validated through citizens' responses collected by a survey instrument; 419 valid responses were collected. The collected data

were analyzed using the linear regression model techniques. The study revealed that all the proposed hypotheses were accepted and confirmed that the twelve examined factors in this study significantly affect e-government adoption in India. These factors are perceived usefulness, perceived ease of use, information quality, system quality, service quality, perceived satisfaction, perceived risk, and behavioral intention.

Overall, many prior research studies have been conducted to explore the significant determinants of e-government adoption in developing countries. We briefly discussed some of these studies. Table 2.6 provides an overview of some of the prior research studies conducted on e-government adoption in developing countries. It is not an exhaustive list, but it highlights some of the key studies and their findings in this domain.

Table 2.6: A summary of e-government adoption in developing countries.

Perspective	Critical factors		Reference
Supply side	• Organizational structure • Government support • Leadership and regulations • Training and education • Organizational culture • Citizen-centric focus • Prioritization of deliverables • Organizational future needs • Power distribution • Top management support • Organization inertia	• Financial commitment support • Public policies and standards • Following successful cases • Top management support • Government policy • Risk management • Collaboration and coordination • Technical expertise • ICT infrastructure • Competition pressure • Government pressure	[15] [48] [56] [79] [104] [105] [106].

Table 2.6: A summary of e-government adoption in developing countries (continued).

Perspective	Critical factors		Reference
Demand side	• Perceived ease of use • Perceived usefulness • Computer self-efficacy • Perceived credibility • Perceived internet safety • Users' resource-saving • Self-actualization • Computer anxiety • Information quality • System quality • Service quality • Perceived satisfaction	• Perceived risk • Behavioral intention • Performance expectancy • Effort expectancy • Peer influence • Facilitating conditions • Trust of the e-government • Compatibility • Subjective norms • Perceived public value • Attitude	[16] [36] [102] [107] [108] [109] [110] [111] [112].

In conclusion, many prior research studies have been carried out to investigate the e-government concept in developed and developing countries. On the supply side, there was a consensus on the critical importance of proper ICT infrastructure, top management support, and financial resources among majorities of research studies in spite of the country's type. However, e-government systems cannot improve the delivery of public e-service if they are not adopted by the public (citizens). Therefore, on the demand side, citizens' acceptance of the offered e-services has shown its dominance on the critical factors of e-government adoption from citizens' perspectives in different developed and developing countries [87].

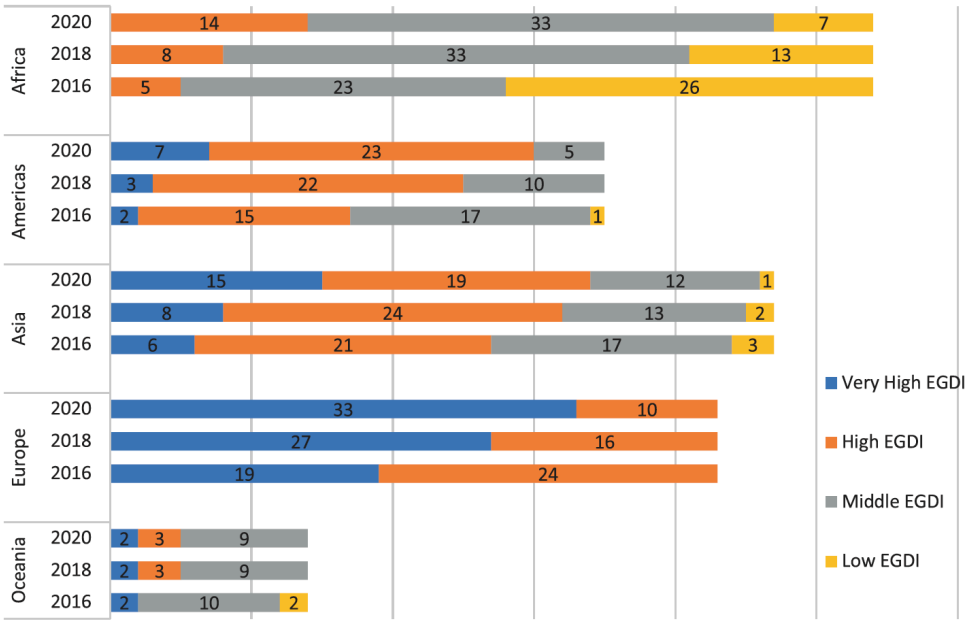
2.2 E-government over the World

According to the United Nations e-government survey in 2020, there is a significant difference among world countries regarding their e-government development status. The survey revealed that although income could significantly improve the ICT infrastructure and overall government development, it does not guarantee e-government development. Although their low income, many countries have established advanced e-government systems. Likewise, other countries have low e-government development levels in spite of their high income. [2].

Below we briefly provide an overview of the e-government development strategies, plans, and initiatives adopted by different countries worldwide. We divide the world's countries according to their regions: the Americas, Europe, Asia, Africa, and Oceania. All five regions made considerable e-government development progress in 2020. Europe region remains the world's leader in e-government development, followed by Asia, the Americas, Oceania, and finally Africa [2]. A comparative analysis of the world's regions based on their EGDI level in 2016, 2018, and 2020 is shown in Figure 2.2.

2.2.1 E-government in Europe

Europe is the global leader in e-government services provision, with an overall EGDI value of 0.817 for 43 European countries out of the 193 United Nations member states. It has the most consistent e-government development and also holds the world's highest proportion of very high EGDI group with 33 countries, which represents 58% [2].



Source: 2016, 2018 and 2020 United Nations E-Government Surveys.

Figure 2.2: Regional distribution of countries by EGDI level, 2016, 2018 and 2020 [2, p. 40]

E-government in Denmark

Denmark is the world's first leader in e-government development, with the highest EGDI value of 0.9758 for the United Nations' second consecutive Survey report. It has pursued a highly proactive digitization agenda since the early 1990s. Back then, the Danish Ministry of Research was responsible for creating national policy visions and emphasizing democracy, participation, and inclusion as crucial factors in formulating a proper information society. Since 2005, the Danish government has taken stock of e-government development progress to prepare for future e-government strategies [2].

In 2011, policymakers came to the idea of pushing digitization to change the relationship between government agencies and citizens. Therefore, they established the digitization agency under the ministry of finance. By 2105, the concept of 'mandatory digital self-service' has been introduced, stating that all citizens must adopt digital means to communicate with the

public sector. This transition has been carried out gradually, and the government provided many user-friendly e-government solutions and tips until all citizens are self-ministering the digital systems quickly and efficiently. Hence, digital self-service technologies have been developed across a wide range of welfare areas, making citizens in charge of provisioning services.

The current digitization strategy 2016-2020 focuses on establishing a central ICT infrastructure that connects the three levels of government (municipalities, national government, and regional government organization) to standard public services and projects, such as data security, data reuse, digital infrastructure, and digital business initiatives. Every four years, since 2001, the three government actors agree on the shared government strategy, including several proposed government digital initiatives [113].

Recently, the Denmark government has established more specialized and developed digital strategic plans, such as the national strategy for Artificial Intelligence (AI). It has proposed a funding plan for accelerating the promotion of digital strategies through AI. The Denmark government also aims to start several remarkable projects in the labor and social sectors as well as the health sector. Moreover, the Denmark government ensures safe spaces for innovation and experimentation by supporting a GovTech program, which helps tech startup companies offer new digital initiatives to increase public value [2].

E-government in the United Kingdom (UK)

The UK is the 7th world leader in e-government development and the 5th European leading country with a very high EGDI value of 0.9358. The e-government trends in the UK started in the nineties. In 1994, the early government web portal was established based on the 'build once and re-use' principle to show government information services. Then it was developed

in 2000 as a beta site to improve the web portal and gather users' feedback. The developed web portal was launched in 2001 and redesigned in 2004. The UK's e-government portals and services have continued developing until they reached the current system, which was officially launched in 2012 with complete services [114].

The e-government has been through a lot of development processes until it has become one of the global e-government leaders. A new government citizen-centric transformation strategy over 2017-2020 has been launched and accomplished by a solid framework. It assures equal access of all target users to the e-government services and portals by using their unique digital identities. Moreover, the data protection act in 2018 was integrated into e-government systems to protect citizens' data privacy. Recently, in 2019, the UK government developed a technology innovation strategy as a starting point for government innovations. Hence, rising technologies could be improved and rebuilt constantly alongside the rapid development of the technology landscape. Additionally, the UK government has published a new guidance strategy on using AI technologies in the public sector [2].

2.2.2 E-government in Asia

Asia has distinguished itself as the world's second most advanced e-government development region, with an overall EGDI value of 0.6373 for 47 Asian countries out of the 193 United Nations member states. It holds the second rank of the very high EGDI group with 15 positions, which represents 26% of the whole world's very high EGDI group, as seven Asian leading countries entered the world's very high EGDI group for the first time in 2020, which are: China, Kuwait, Malaysia, Oman, Saudi Arabia, Thailand, and Turkey. The United Nations survey's findings indicated that nevertheless the global progress in Asia, and digital government gaps are more expansive among Asian countries. It has the widest variance in

EGDI value, as shown Figure 2.2. Although it is the origin of the world's leading countries, including the Republic of Korea (2nd) and Singapore (11th), it also comprises countries with significantly low ranks, such as Afghanistan (169th) and Yemen (173rd) [2].

E-government in the Republic of Korea

The Republic of Korea is the second-world's leader in e-government development in 2020 and the top EGDI performer in Asia with a 0.9560 EGDI value, alongside the world's highest Online Services Index (OSI) with 1.000. It has an advanced ICT infrastructure, and an educational policy that improves technical skills per person. Since its independence in 1945, the Republic of Korea had carried out the industrial society over the 1970–1980s and then joined the information society, which in turn indicates an extraordinary growth in a short period of time [2].

The Korean government established its first e-government initiative in 2002 by proposing eleven major e-government initiatives. Between 2003-2007, it carried out 31 leading e-government projects that established the basis for connecting different government agencies. Since 2008, the Korean government has developed a comprehensive plan for national informatization and enhanced the e-government systems regarding openness, cooperation, and sharing principles. Whereas in 2011-2015, the Korean government initiated smart government systems using AI technologies and big data [2].

In every five-year interval, Korean e-government strategies are developed by national development plans. The 2020 smart e-government master plan assures that the government policy is evidence-based on science. This plan aims to obtain an open, integrated, and innovative national government for stakeholders. Additionally, it creates an advanced framework for developing and adopting AI technologies for innovation in the public and proactive provision

of e-government services required by citizens. The AI's economy facilitation plan reflects the intelligent government implementation strategy and focuses on reinforcing AI techniques to build a solid basis to develop sustainable digital e-government initiatives [2, 115]. Moreover, the Korean e-government provides various platforms for electronic participation and open data. At the municipal level, the participatory budget has been initiated for a long time, more than thirty years. However, the new participatory budget system widens participation, as citizens can participate in reviewing and prioritizing government processes.

With the informatization and democratic development progress, government web portals have transformed from simple informational web portals to service portals to provide seamless communication between the government and citizens. Citizens are not only informed of government policies and regulations; otherwise, they provide action and feedback. They can submit their perceptions, proposals, and ideas through the various government web portals and address issues and claim complaints. Hence, electronic channels have provided considerable contributions toward democracy in Korean e-government systems by facilitating the participation of citizens in government affairs and public matters [115].

E-government in Singapore

Singapore is the 11th world leader in e-government development and the 2nd Asian country with a very high EGDI value of 0.9150. The government foundations began with a civil service computerization program using ICT infrastructure to improve public administration. This program facilitated the launching of the Singapore e-government's first action plan between 2000-2003, then the second action plan between 2003-2006. The first plan is focused on offering e-services as much as possible, while the second plan is mainly focused on enhancing the user experience. In Singapore, the government technology agency is in charge of e-government development strategies and services. In 2006-2010, the Singapore govern-

ment introduced the iGov2010 master plan to establish integrated e-government systems performed effectively and seamlessly [2].

In 2014, the Singapore government established the smart nation initiative, of which digital government is an integral part. After that, the eGov2015 master plan was introduced between 2010-2015, building on the success of the first master plan. The second plan focused on facilitating more interaction and co-creation between government agencies, the private sector, and people. It also focused on the approach of 'government with you' instead of 'government to you.' The digital government plan was then improved in 2018 to leverage data, drive more efforts, and harness new technologies to build a proper digital society with smart nation strategy support. Also, the government announced that part of the IT infrastructure and resources transformed into a commercial cloud, and within five-year intervals, most of the system would be transformed. The new trends of cloud services have many benefits but also have high risks of cybersecurity threats. Sensitive data, such as financial, health data, and political data, can be compromised by hacking. Therefore, Blockchain technology has been adopted as a security feature to protect such information and provide specific protective measures [116].

Regarding the government web portal, Singapore has a one-stop-shop government web portal that offers access to various government portals supporting e-participation, e-services, public procurement, and open data. In addition, the Singapore government has launched digital platforms that help citizens to plan and secure their information and report issues with the e-government services or portals [2].

2.2.3 E-government in the Americas

The Americas is the world's third significant e-government development region, with an overall EGDI value of 0.6341 for 35 countries out of the 193 United Nations member states. It holds the third rank of the very high EGDI group with seven countries, which represents 12% of the world's very high EGDI group. Similar to the Asia region, there are significant government digital divides among America's countries. As it includes the world's leading country, the United States (9th), it also has countries with significantly low ranks, such as Jamaica (114th) and Cuba (140th). However, the Americas has shown an accelerated improvement in the e-government sector; 86% of the 35 Americas countries have high or very high EGDI values [2].

E-government in Canada

According to the United Nations survey in 2020, Canada is located in the 28th rank of the world's countries in e-government development and the 3rd Americas country with a very high EGDI value of 0.842. In 1999, the Canadian government announced that ICT infrastructure was a priority. The government aimed to support the exchange of ideas and businesses over computer networks, connect all Canadian citizens to public information, and promote the adoption of electronic commerce. In the preliminary stages of the e-government initiatives, the government web portals mainly focused on disseminating public information over the Internet as static information [2].

In the 21st century, the Canadian government has improved alongside technological advances and allowed for more interactions between citizens and government and vice versa. By 2001, a new government web portal was launched to establish a 'one-stop-shop approach to offer government services. This web portal was the access point for 450 government web portals.

In 2004, the Canadian government aimed to be distinguished by robust communication with its people. Therefore, it facilitated citizens' access to all government information and services electronically, from everywhere and anytime [117].

The Canadian e-government concentrated on improving the delivery of government services by using the take-up of citizens' services to evaluate their accomplishments and provide different delivery mediums. It also delivered more integrated services that link together different government agencies. Canada continued to develop its e-government initiatives with customer service sustainable standards. In 2005, the Canadian government established an integrated single access point for 595 government services using either call centers or online access points. Although Canada is not considered one of the 14 world's leading countries of e-government development, it remains one of the significantly developed countries in the e-government sector [2].

E-government in Brazil

Brazil is the 54th world country of e-government development and the 6th Americas country with a very high EGDI value of 0.7677. The e-government policies and initiatives in Brazil were initiated in 1999s with the emergence and use of ICT infrastructures. Brazil has intended to develop integrated e-government capabilities alongside creating a state regulatory bill that addresses web technology. This regulatory strategy was approved in 1999, acting as a referenced strategy for establishing websites for all government agencies. Generally speaking, this legislation leveraged the e-government initiatives by providing necessary information on the offered public e-services, developed more traditional services, and made them available online [2].

Brazil has concentrated on the digital transformation of the economy and the government.

The digital governance strategy supports the digital transformation of the public sector, while the digital transformation strategy (E-digital) deals with economic transformation. The government has developed strategic frameworks for digital participation and inclusion of public individuals, and it has also facilitated access to public data. In addition, Brazil's government has been an effective member of the international digital cooperation project with the E-governance Academy in Estonia, which intends to improve an international digital field based on security and rights [2, 118].

Brazil's e-government infrastructure has some limitations, such as the lack of meeting citizens' needs, decreased bureaucratic efficiency, and high distrust between the government and its citizenry. However, Brazil's government progress is slightly positive and paves the way for the digital federal government's evolution. Although the adoption of digital government in Brazil has been smoothly acceptable, a considerable amount of development is still required to provide integrated e-government capabilities [2].

2.2.4 E-government in Oceania

Oceania is the world's fourth significant e-government development region, with an overall EGDI value of 0.5106 for 14 Oceania countries out of the 193 United Nations member states. It holds the fourth rank of the very high EGDI group with two countries, which represents 4% of the world's very high EGDI group. Although it includes two world's leading countries: Australia (5th) and New Zealand (8th), other countries in the region have an average EGDI value of 0.44, which is significantly lower than the global average of EGDI with 0.60 [2].

E-government in Australia

Australia is ranked the world's fifth leading e-government development and the first Oceania country with a very high EGDI value of 0.9432. In 2018, the Australian government released 'Vision 2025' as a digital transformation strategy agenda for modernizing Australian public services. The strategy concentrates on creating citizen-centric public agencies and ensuring the accessibility of digital services by all users. Then, the Australian digital council has been established to integrate this national strategy into local structures. Through these new legislations, the government has forced all public agencies to utilize interoperable open standards [2].

Moreover, the Australian government has initiated the 2030 digital transformation plan to implement sustainable development goals and integrate them into government policies, programs, and strategies, including updating key milestones of government projects. This agenda reflects the government's commitment to adopt new technologies, such as big data, blockchain, and secure cloud techniques, to efficiently deliver public services. Therefore, the Australian government has developed various investment strategies for these new technologies supported by the digital economy strategy and the national innovation and science plan [2, 119].

The Australian government includes a central e-government web portal that is the single access of more than 900 government agencies. This web portal offers a secure and straightforward opportunity for all citizens to access government services. To confirm the security of the e-government services, the Australian government has initiated the Australian legal framework to ensure that users' sensitive data and information are protected [2].

E-government in New Zealand

New Zealand is another world's leading in e-government development (8th rank) and the 2nd country in Oceania that demonstrates an outstanding very high EGDI performance of 0.9339 in 2020. It has an international and domestic solid foundation for sustainable e-government development. The government also is committed to establishing a more inclusive, sustainable, and productive, ready economy to ensure the well-being of government initiatives in the country. In New Zealand, the current state of public sector governance is referred to as new public management introduced into currency by the legislation of the state sector act in 1988. This model is a form of public strategies and policies distinguished by its practices in the market sector and is widely considered a management model [2].

New Zealand has an effective leadership system for e-government development, such as the minister for government digital services, the digital government partnership, the government chief information security officer, and the government chief data. In 2007, the state commission held the e-government initiatives that include the work contributing to developing and delivering robust public e-services, management knowledge, and technical capability and implementing a solid ICT infrastructure to enhance the interface between government agencies and their stakeholders [2, 120].

In 2019, the government promoted a new governance plan for a digital public service that explores the critical areas where public e-services must be enhanced and modernized to meet stakeholders' demands and satisfaction. The New Zealand government is integrating the leading government web portals to facilitate access to all government services. Moreover, the government shed light on the great importance of involving non-government stakeholders to improve digital inclusion and the digital economy. Therefore, the New Zealand government enrolled in many partnerships to improve the e-government state, such as the expert advisory

panel, the digital inclusion advisory group, and the digital economy for the open government partnership [2].

2.2.5 E-government in Africa

Africa lags behind other world regions in e-government development, with an overall EGDI value of 0.3914 for 54 African countries out of the 193 United Nations member states. None of the African countries is categorized with a very high EGDI group. However, there are positive signs of significant development in e-government systems as Africa has the most considerable portion of countries that have moved from medium to high EGDI group, 14 countries with 28%. However, constant gaps in the ICT infrastructure and development of human capital have hindered many African countries from proceeding to the higher EGDI groups. Therefore, extensive development efforts are highly required in Africa to improve and enhance the current e-government state [2].

E-government in Egypt

Egypt is one of the United Nations member countries, with a rank of 111th among other global countries regarding its e-government development. In Africa, it holds the 9th rank among other African countries, with a high EGDI value of 0.5527. The e-government program was established in 2001 by the ministry of state for administrative development and the ministry of communications and information technology. The Egyptian e-government vision contains three main points: promoting community participation, enhancing public-centric service delivery, and optimizing the use of government resources. The e-government implementation was mainly divided into two phases. The first phase was from 2001-2007; it established e-government strategic plans and developed pilot projects. While the second

phase was from 2007-2012, it aimed to disseminate successful pilot projects and enhance government managerial bodies. The Egyptian government established a web portal to provide and deliver government e-services that were identified in these stages [2].

The Egyptian e-government divides e-services into four categories; the first category is the no-presence, which means no available e-services due to either broken or under-construction links. The second category refers to the informative category, which indicates a one-way flow of information provided by government agencies through web portals. The third strategy is the transactional category, which refers to the two-way communications between government agencies and their stakeholders. The last category promotes participation; it is a citizens-focus category that emphasizes citizens' satisfaction. It contains feedback forms and blogs that suggest potential improvements by citizens to increase the quality of delivered government e-services [2, 121].

The Government of Egypt is actively involved in a smart, digital government evolution program. This program aims to implement a digital platform of government services to deliver effective and efficient access to various public e-services and be a critical key for digital government transformation. The government has launched several projects to implement digital Egypt to make digital services accessible to citizens and businesses. The pilot version of the digital Egypt platform was launched in 2020, with 34 digital public services available. According to the Egyptian digital strategic plan, other government e-services will be available successively in 2023 [121].

E-government in Rwanda

Rwanda is the least developing country that holds the 130th global rank and the 16th rank among African countries in e-government development, with a medium-high EGDI value of

0.4789. Although Rwanda is the least developing country with poor ICT infrastructure, its public e-services provision is properly developed compared to other African countries. The Rwanda government has thorough digital government strategies boosted by digital government plans alongside national systems and sustainable development plans [2]. Rwanda's government has the vision to transform from a low-income country to a middle-income country by implementing economic development programs and strategic planning to reduce poverty over 2008-2012 and 2013-2018, respectively, alongside processing effective e-government initiatives. The Rwandan e-government was initiated in the early 2000s. Since then, it has set a strategic plan for 20 years up to 2020.

The strategic e-government plan was divided into four main phases. The first phase was from 2000-2005; it focused on government projects, including policy and legal framework development and human resources development. The second phase was from 2006-2010; it concentrated on the ICT infrastructure development and implementation of government projects. While the third phase was from 2011-2015, and it focused on implementing and developing government e-services. The fourth and current phase is held from 2016-2020, and it developed the smart Rwanda master plan. This plan concerns the digital transformation of the government agenda, including 24/7 available government self-services and a paperless economy with around 95% of government services transformed online by 2018 [122].

The smart master plan alongside the Vision 2050 strategy holds a robust emphasis on developing a knowledgeable society through smart ICT policies. The information society authority in Rwanda promotes the utilization of innovative technologies in the public sector. The Rwandan government has made successful moves in delivering public e-services in spite of the limited resources. The e-government platform allows two-way communication where they provide e-services updates and also allow citizens to interact with the system, request services, and directly express their concerns [2, 122].

2.3 Technology Acceptance Theories and Models

Rogers [123] identified five main phases for adopting technology, including knowledge, persuasion, decision, implementation, and confirmation. At the knowledge phase, individuals obtain the required information to understand the technology and know how it works. It provides them with an initial perception of the technology in a particular context. The persuasion phase focuses on how individuals seek information about the technology to reduce uncertainty about it. The decision phase leads to the decision-making process where individuals decide whether to adopt the technology or reject it. The implementation phase focuses on the individuals' ability to use the technology in real contexts. While the last phase, the confirmation phase, concentrates on the evaluations made by individuals regarding the advantages or disadvantages of adopting a particular technology. These assessments help individuals reinforce their decisions towards adopting the technology, resulting in efficient adoption of such technologies.

The adoption of e-government plays a vital role in the successful implementation of e-government initiatives. If target users do not use them as supposed, many e-government resources and efforts will be wasted. Therefore, research is required to examine the adoption levels and behavioral use of e-government [124]. Hence, there are various theories and models regarding technology acceptance that have been widely used to investigate the adoption of technologies, such as the Technology of Acceptance Model (TAM) [87], the Diffusion of Innovation Theory (DOI) [123], the Theory of Planned Behavior (TPB) [125], and the Unified Theory of Acceptance and Use of Technology (UTAUT) [126], IS Success Model [127], and Trust Model [97]. The following sections provide a detailed discussion of these theories.

2.3.1 Technology Acceptance Model (TAM)

TAM is considered a powerful theoretical model for understanding technology acceptance in the information systems IS) field [87]. Remarkably, the TAM has been developed to determine the factors influencing the behavioral use of technology and the extent to which users accept or reject that technology. It also helps to elucidate the reasons behind technology's rejection by users. The TAM model has two primary constructs: perceived usefulness and perceived ease of use, which are proposed as the core determinants that influence the users' intention to use and accept technology. According to Davis [87, p. 320], perceived usefulness refers to "the degree to which a person believes that using a particular system would enhance his or her job performance." While the perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of effort." The higher levels of perceived usefulness and perceived ease of use factors, the more intention to use technology [87]. The TAM boosts the ability of practitioners and researchers to determine the influence of both constructs on the users' attitudes and beliefs that eventually lead to identifying the intention to use the technology.

2.3.2 Diffusion Of Innovations (DOI)

DOI theory was established by Rogers in 1962 [123]. It went through many development stages until it reached its best shape in 1995 [128]. This theory has been widely applied to identify the adoption rate of specific technology by an organization. It considered the innovation of technology and behaviors fundamental to change instead of convincing individuals to change. Therefore, it is crucial to understand the spread of innovations and how they fit the needs of users [128]. Diffusion is defined by Rogers as "the process by which an innovation is communicated through certain channels over time among the members of

social systems," proposing that innovations are any new ideas that spread widely [128, p. 34]. DOI presumes that there are five innovation adoption categories either based on individuals' innovativeness or when novel ideas have been started. These categories are innovators, early adopters, early majority, late majority, and laggards. Rogers identified five innovation factors that determine innovation adoption success: relative advantage, compatibility, complexity, observability, and trialability [128]. The relative advantage is defined as "the degree to which an innovation is perceived as being better than the idea it supersedes" [128, p. 212]. The compatibility is about "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" [128, p. 224]. The complexity is related to "the degree to which an innovation is perceived as relatively difficult to understand and use" [128, p. 242]. Trialability is "the degree to which an innovation may be experimented with on a limited basis" Rogers [128, p. 243]. While observability is "the degree to which the results of an innovation are visible to others" [128, p. 244]. Additionally, there is a kind of similarity that has been perceived between DOI's factors and TAM's factors. In the DOI theory, the complexity and relative advantage factors are similar to perceived ease of use and perceived usefulness factors in TAM. Hence, these models can be merged, which allows for building a more inclusive model.

2.3.3 Theory of Planned Behavior (TPB)

The TPB is one of the powerful social psychological theories that adopt the cognitive approach to support human behaviors towards offered technology [125]. The TPB assumes that individuals can easily make decisions by estimating the costs and benefits of different behavioral actions and adopting the option that maximizes their expected benefits. It postulates that human behavior is the central function of their attitudes and beliefs relevant to that behavior. These beliefs are considered the predominant determinants to understand the

individual's intention to use technology where the intention to use was posited as a suited predictor for the actual behavior.

The TPB developed a combination of three vital factors: behavioral attitude, subjective norms, and perceived behavioral control as predictors of intention to use, which in turn predicts the actual behavior [125, p. 188]. Behavioral attitudes measure the individual's positive and negative attitudes and feelings toward performing the expected behavior. Subjective norms are also known as normative beliefs. They reflect the social pressures on the individual's perception of what other people, who are important to him/her, think either he should or should not perform the actual behavior. The perceived behavioral control provides a better understanding of the individual's behavior towards technology adoption by focusing on the individual's perception of the easiness and difficulty of performing the target behavior. This factor estimates the required skills to perform the specific behavior and previews all possibilities to cope with any challenges or barriers. It addresses the behavior issues that occur due to the lack of individual control.

The role of perceived behavioral control is represented by beliefs of the ability to access resources and skills needed to perform the behavior. This notion comprises two main factors. The first factor is perceived self-efficacy [129]. According to Ajzen [125], perceived behavioral control is compatible with perceived self-efficacy, which is "concerned with judgments of how well one can execute courses of action required to deal with prospective situations." [130, p. 122]. Self-efficacy beliefs can influence the choice and preparation for activities, effort expended during the performance, and emotional patterns and reactions. While the second factor is facilitating conditions, which reflect the ability of required resources to be involved in a behavior, such as electronic systems, money, time, or other specialized facilities [131]. Hence, perceived behavioral control is considered a combination of beliefs weighted by the perceived self-efficacy and perceived facilitating conditions [129]. Additionally, the perceived

ease of use and perceived usefulness factors in TAM are the fundamental determinants of behavioral attitude factors in the TPB. Therefore, TAM factors can form and represent the perceived attitude towards behavior in the TPB [129].

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

The UTAUT was constructed to predict individuals' acceptance of newly offered technology [126]. It has incorporated many models and theories to reach a unified and comprehensive view of technology acceptance. The UTAUT model was developed by incorporating factors from other existing theories and models that were considered to have a considerable impact. Venkatesh et al. [126] identified four core determinants that significantly impact users' acceptance and their behavioral intention to use new technology. These determinants are performance expectancy, effort expectancy, social influence, and facilitating conditions. Effort expectancy is defined as "the degree of ease associated with the use of the system" [126, p. 450]. This factor captures the same core factors from existing models and theories: the perceived ease of use factor from TAM and the complexity factor from DOI. Performance expectancy refers to "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" [126, p. 447]. The constructs from other theories that pertain to the concept of performance expectancy are the perceived usefulness factor from TAM and the relative advantage from DOI. The third factor is facilitating conditions; It determines the extent to which users perceive that the necessary technological infrastructure is available to improve the usage of a particular technology [126]. This definition represents concepts embodied by other constructs, such as TPB's perceived behavioral control factor and DOI's compatibility factor. Social influence refers to "the degree to which an individual perceives that important others believe he or she should use the new system" [126, p. 451]. The social influence factor is represented as the perceived subjective

norms factor in the TPB.

Moreover, The UTAUT postulates moderating variables that significantly impact users' behavioral intention to use technology: age, gender, experience, and voluntariness. According to the construction of UTAUT as an assembling of many existing theories and models, it is considered one of the latest and most comprehensive models in the technology acceptance field and has been widely adopted to predict users' acceptance behavior towards technology [126].

2.3.5 IS Success Model

This model was developed in 1992 by Delon and Mclean, and it was called D&M IS Success Model [127]. It postulated that the purpose of Management Information Systems (MIS) is to achieve the actual goal of IS use and fulfill user satisfaction, which in turn leads to the main organizational aim, IS success. This model was tested, developed, and validated by tremendous research works that demanded a common approach to encompass the vast progress of IS in business and society. Therefore, an updated version of the IS success model was provided ten years later, 2003 [132]. Three core factors are proposed in this model, which are: system quality, information quality, and service quality, as antecedents to use and user satisfaction. System quality measures the process of the information system itself. In the Internet environments, system quality measures the system's specific characteristics, such as usability, reliability, availability, adaptability, and response time, which are qualities evaluated by system users [127, 132]. Information quality measures the information system output. It identifies the web content issues related to personalization, relevance, completeness, security, and ease of understanding [127, 132]. The last factor is the service quality; it represents all the support delivered by service providers, such as assurance, responsiveness,

and empathy [132]. Its importance has proliferated since users become customers of the organization, and poor customer support will lead to customers and benefits lost.

2.3.6 Trust Model

Trustworthiness in the IS research area has been defined as "the perception of confidence in the electronic marketer's reliability and integrity" [133, p. 252]. In the e-government context, trust is associated with privacy and security matters concerning citizens when they get involved in using the offered e-government services. In this research, we adopt the most used trust model in the e-government systems proposed by [97]. It is an exploratory model that contributes to identifying the unique constructs of trust and risk in the e-government context. This model consists of four core trust determinants that influence users' intention to use and adopt e-government services, which are: trust of the Internet, trust of the government, disposition to trust, and perceived risk [97].

The trust of the Internet is recognized as an essential indicator of adopting delivered e-services [27, 55]. It is labeled institution-based trust that refers to "an individual's perceptions of the institutional environment, including the structures and regulations that make an environment feel safe" [97, p. 167]. It measures the extent to which citizens trust the electronic channel used to deliver e-government services. While trust of the government refers to "one's perceptions regarding the integrity and ability of the agency providing the service" [97, p. 167]. This factor sheds light on the importance of building a strong bond of trust between the government and citizens. Users need to believe that government agencies provide e-services for benefiting purposes, not controlling or monitoring citizens.

Disposition to trust is defined as "one's general propensity to trust others" [97, p. 167]. It consists of two components: faith in humanity and a trusting stance. Faith in humanity

presumes that others are good and trustworthy. While the trusting stance postulates that good outcomes emerge from expecting that people we deal with are well-intentioned and dependable [134]. Disposition to trust is also referred to as personal-based trust as it refers to one's tendency to either believe in others or not [135]. Therefore, users' general tendency is the initial fundamental step that positively impacts e-government adoption, as it significantly controls the trust of the Internet and trust of government factors. The last factor is perceived risk, and it refers to "the citizen's subjective expectation of suffering a loss in pursuit of a desired outcome" [55, p. 160]. This model mediates the impact of trust on the intention to use e-government systems. The trust of the Internet and the trust of government factors negatively affect the perceived risk factor, which in turn has a significant negative impact on intention to use or adopt e-government services as it reduces users' willingness to use the offered e-services [97].

2.4 Conclusion

This chapter provided a comprehensive overview on e-government development and adoption worldwide. It consists of three main sections: Overview of E-government, E-government over the world, and Technology Acceptance theories and Models. In the first section, we have presented a comprehensive review related to the e-government phenomenon. After that, we defined the 'e-government' term by providing various definitions of the e-government concept. A consensus of all definitions of e-government indicates that it is a strategic plan that adopts modern ICTs to enhance target users' adoption, interactions, participation, engagements, and trust with the government sector through the available government services and information. We then reviewed and discussed the main e-government classifications: G2G, G2B, G2C, and G2E. After that, the e-government maturity and development stages have

been explained and discussed to better understand the e-government implementation process. The subsequent subsections have highlighted the assorted benefits and challenges related to the e-government concept. Finally, in this section, we have explored and investigated the difference between developed and developing countries regarding their e-government implementation and the critical factors for adopting the offered government e-services from both perspectives of the supply side and demand side.

In the second section, we have highlighted the current state of e-government development in different countries worldwide to give a more comprehended global insight into e-government implementation. We have divided the world into five regions, based on the United Nations annual survey: Europe, Asia, Africa, the Americas, and Oceania [2]. Then we explored the e-government development state of these regions. Also, we randomly selected two countries from each region and discussed in-depth their e-government development strategies and plans.

The last section elaborated on several technology acceptance models and theories that have been widely adopted and used in prior studies in e-government adoption literature. For instance, TAM, DOI, TPB, UTAUT, IS Success Model, and Trust Model. Next, chapter 3 elaborates on the knowledge gap identified from the investigation of the literature review and presents the proposed solution for the research problem.

Chapter 3

Problem Definition

Enhancing e-government services and supporting the adoption behavior of citizens have attracted many research interests. Prior research studies have discussed the e-government adoption and implementation from technical and structural perspectives [15]. Others worked on investigating challenges and barriers to the e-government adoption [54, 61]. In addition, the adoption of IT in public agencies is no longer considered a linear process through which the agency adapts to technological change or the technology determines the organizational use of IT; otherwise, it incorporates a complex understanding of the interaction emerging between social and technological aspects [136].

However, numerous research studies have focused on exploring the critical factors that affect e-government adoption [27, 63, 96, 109, 124]. These adoption factors differ from country to country based on several conditions such as the budget assigned for the project, the readiness of the stakeholders to deal with the internet instead of traditional interactions, the readiness of the existing government processes to be transformed into electronic processes, etc [2]. To summarize, to have successful e-government services, the adoption factors should be considered from different related contexts.

Moreover, the literature showed that the e-government implementation process may be affected by environmental factors. This means the surrounding environment of implementing e-government services in developed countries is very different from developing countries. For instance, 87% of Australians use the internet regularly, compared to only 12.9% of

Bangladesh's population [137]. Therefore, the significant factors for adopting e-government in these two countries are expected to be different.

In 2020, 47 countries in the world were designated to be the least developed countries, and this classification is based on the following characteristics: weak human and institutional capacities, scarcity of domestic financial resources, low and unequally distributed incomes, and usually experience governance crises and political instability within occasional internal and external conflicts [2]. Although the research targeting adoption factors of e-government services is vastly investigated, there is a huge demand in these countries to improve and support the citizens' adoption of e-government services [52, 78].

Chen et al. [6] have proposed the criteria for distinguishing between developed and developing countries, as summarized in Table 2.4. Also, they proposed a strategic plan for developing countries, and they implemented the plan based on a case study of e-government implementation in China. The study found that due to significant differences in many e-government key aspects related to technological and social sides between developed and developing countries, it is highly required to create new strategic plans for implementing e-government in developing countries. Hence, differentiating between developing and developed countries in e-government implementation and adoption plans is an efficient step to improve e-government systems in developing countries.

However, it is not practical to deal with all developing countries in the same way and similarly deal with all developed countries in the same way. For instance, what is proposed for Brazil may not be applicable to Saudi Arabia. The specific contexts and situations in these two countries are entirely different, although they are considered developing countries. Therefore, a strategy for assessing the e-government adoption for a country based on whether it is developed or developing is not realistic. It is necessary to have a generic criterion that considers all possible adoption factors of e-government services and matches them with the

different aspects and circumstances of the given country.

Although many studies showed significant efforts to facilitate the adoption of e-government services, there is, in fact, a global consensus on the need for a deeper investigation to generate a comprehensive framework that guides government agencies globally to have a successful e-government adoption. The e-government implementation has many challenges that should be addressed to enhance citizens' adoption of e-government services. These challenges can be summarized as follows:

- E-government projects grow vastly, and a constant evaluation is necessary to ensure the successful adoption of the offered services which requires a considerable amount of time and effort during each evaluation.
- There are various factors influencing e-government adoption, which belong to different aspects, such as technical and human factors. Therefore, researchers face many challenges to decide on which factors they have to use for evaluating the adoption behavior of e-government services.

The research gap can be defined as the lack of a systematic review that deeply investigates user experience towards e-government services and identifies the critical factors that significantly affect users' adoption behaviors worldwide. Also, there is a lack of a holistic conceptual framework that consolidates significant factors influencing e-government adoption behavior worldwide. In addition, there is no comprehensive study that explains in a systematic approach the guidelines needed to evaluate users' adoption behaviors of e-government services that could be easily applied to any country.

Therefore, this research contributes to enhancing the user experience of e-government services and ensures that everyone has fair access to e-government services by evaluating users' adoption behaviors efficiently. A systematic literature review will be conducted to thor-

oughly investigate user experience towards e-government services and identify significant adoption factors from citizens' perspectives globally. Then, the most common factors which significantly affect users' adoption behaviors worldwide will be integrated into a conceptual framework for evaluating users' e-government adoption behaviors from citizens' perspectives. This framework provides an overarching established methodology to evaluate users' adoption behaviors of e-government services which saves time and effort. Therefore, targeting this problem would be an added value to the literature on adopting e-government services worldwide. Next, in chapter 4, we provide the results of the systematic literature review conducted to determine the critical adoption factors and then develop the proposed conceptual framework alongside the research hypotheses.

Chapter 4

Conceptual Framework

In this chapter, we aim to propose a conceptual framework for evaluating the adoption of e-government. First, in section 4.1, we provide a theoretical background that defines different research concepts, such as theory, model, theoretical framework, and conceptual framework. Then, we conduct a comprehensive systematic literature review in the e-government context for the past two decades to explore the factors that significantly affect e-government adoption worldwide in section 4.2. After that, in section 4.3 we analyze the findings of the systematic review study to explore the most frequent significant factors that globally influence the e-government adoption behavior. In section 4.4, we propose the conceptual framework and discuss in depth the critical factors that are adopted alongside the research hypotheses developed to determine the relationship among the adopted factors (independent variables) and the e-government adoption factor (dependent variable). Finally, in section 4.5 we provide a brief comparison between the proposed conceptual framework and the EGDI framework.

Regarding the research contributions: this chapter contributes to achieving research goal 1 by fulfilling the following tasks: "Task-1: identify the significant factors that affect citizens' adoption behaviors of e-government services" and "Task-2: develop the conceptual framework for evaluating the e-government adoption behaviors from citizens' perspectives". It includes the research contributions that have been accomplished so far, which are: conducting the systematic literature review and developing the holistic conceptual framework for evaluating users' adoption behaviors of e-government services.

4.1 Theoretical Background

The research methodology should be underpinned with research theories, models, or frameworks to strengthen the research study and ensure the validity of its findings. In the research context, the terms theory, model, and framework are widely used, and sometimes scholars use them interchangeably, causing more confusion due to their lack of understanding of the difference among these terms [138]. Therefore, it is essential to understand the meaning of these research concepts prior to discussing the conceptual framework developed in this research, as follows:

A theory: is a set of interrelated concepts and definitions that provide a systematic perspective for explaining particular phenomena by specifying the relationships among its variables. It serves as a blueprint that guides the modeling structure. The theory provides the required constructs and focuses on the causal relationship among these constructs to clarify the boundaries of specific phenomena. It also explains how certain events occur, when, and why. Moreover, it estimates various predictions of what is going to happen under particular conditions. Finally, it provides explicit explanations for structuring particular phenomena [139, 140].

A model: is a scientific visual representation that describes constructs of a theory or framework alongside their relationships to the specific phenomenon but not to each other as the theory. It provides a consistent representation of a specific theory regarding a real situation.

A framework: can be defined as underlying structures that include and support a set of constructs for a given context. The framework term is widely divided into two concepts: theoretical framework and conceptual framework [141]:

- **Theoretical framework:** refers to a theory selected by researchers to guide their research. It is the application of a theory or a set of constructs selected from the same theory to shed light on a particular context and provide a comprehensive explanation of a specific event.

- **Conceptual framework:** refers to a set of constructs and their relationships from different theories for better understanding a particular phenomenon. It provides an integrated explanation of the phenomenon by consisting of many constructs related to any theory. A conceptual framework provides the logic of how the chosen constructs are interconnected by investigating the causal relationships among them [142].

  The conceptual framework is widely used when a particular research problem cannot properly be explored based on only one theory or constructs related to one theory. In these cases, a researcher might synthesize and collect the existing literature reviews regarding the given context, which represents an integrated approach to looking at the problem from a new perspective. To summarize, the conceptual framework can be referred to as the final result of bringing together various related constructs from different theories based on the context of the problem.

Thus, we can consider the conceptual framework as the logical master plan for the entire research project, while the theoretical framework can be considered a subset of the conceptual framework [143]. Table 4.1 shows a brief comparison among these research concepts.

Table 4.1: Fundamental differences among theory, model, and framework.

Concept	Explanation
Theory	A set of defined concepts or constructs within proposing why, when, and how they are related, based on the assumptions of reality.

Table 4.1: Fundamental differences among theory, model, and framework.

Concept	Explanation
Model	Graphical or symbolic representation of a theory or framework that explains the constructs and their relation to the situation.
Theoretical framework	It is the application of a theory or a set of constructs selected from the same theory to explain a specific event.
Conceptual framework	It refers to a set of constructs and their relationships from different theories for better understanding a particular phenomenon. It provides an integrated explanation of the phenomenon by consisting of many constructs related to any theory.

4.2 A Systematic Literature Review (SLR)

We conducted a thorough, extensive investigation to explore the proposed frameworks and models to support user experience towards e-government services worldwide. This SLR study aims to provide a valuable reference of theories and factors critical for enhancing and supporting user experience in the context of e-government systems based on the carefully selected primary studies.

Systematic Literature Review Questions

Four review questions were formed in this SLR study:

- *RQ1 What are the factors that significantly influence the user experience towards the e-government systems from citizens' perspectives?*

This question investigates the significant factors that affect the user experience towards the offered e-government services. It helps focus on significant, influential factors in e-government systems.

- *RQ2 What are the user experience concerns investigated in a country from citizens' perspectives?*

This question provides a focused insight into the user experience of e-government services by categorizing the behaviors and concerns of e-government services based on specific quality metrics. It helps researchers to properly understand the current state of user experience in e-government for each country.

- *RQ3 What are the information systems models or theories that have been widely adopted to identify these factors?*

This question provides insight into the well-known theories and models of technology use and acceptance to identify the dominant theories for the user experience in the e-government sector.

- *RQ4 What are the future recommendations for a better e-government experience?*

This question provides future perspectives for enhancing and improving citizen experience with e-government systems. It defines the current challenges of e-government systems to help researchers provide future proposals for enhancing citizen experience with e-government.

Search Strategy

We have explored digital databases which include peer-reviewed and high-impact materials related to the research topic of user experience and e-government systems. Hence, the research was conducted using six databases: ACM Digital Library, IEEE Xplore, ScienceDirect, VT Library, Digital Government Reference Library (DGRL), and Springer Link.

Search Phrase

We have identified the keywords that help to answer the research questions. These keywords then were combined using AND, OR logical operators to form the search phrase. Table 4.2 illustrates the primary and secondary search keywords along with the final search phrase.

Table 4.2: Search phrase.

Primary search terms	User Experience and e-Government
Secondary search terms	UX, attitude, perception, perceive, emotion, intention, adoption, electronic government, e-government, digital government
Search phrase	("User experience" OR UX OR adoption OR emotion OR attitude OR intention OR perception OR perceive) AND ("electronic government", e-government, "digital government")

Eligibility Criteria

The search results produced 527 relevant studies on the research topic. Then, the screening phase has been applied to scrutinize these studies and keep studies that meet the inclusion criteria. The eligibility criteria were defined as follows:

- Inclusion Criteria:

- Publication Year: 2000-2022, both years included.
- Peer-reviewed document.
- Document focuses on the experience with e-government from citizens' perspectives.
- Document discusses current challenges of citizen experience with e-government systems.
- Document is available online to ensure accessibility.
- Document answers to the research questions.

- Exclusion Criteria:

- Document is not related to the research topic.
- Any workshop, panel, tutorial, interview, or poster session.
- Document is a book or magazine.
- Marginal publication venue.

Conducting a Review

The review process was conducted in three main steps:

Phase-1: we evaluated the relevance of studies based on their: titles, abstracts, and introductions.

Phase-2: we assessed the credibility of the selected studies based on two credibility conditions. The study is included once it meets either one of these two credibility conditions:

- The study should be published in a high-impact journal or conference. In this study, we set up the criteria to include journal articles with an impact factor greater than three and adopt only top-tier conferences.
- The number of citations of each study was recorded because they reflect the significance of the study. Therefore, only studies with more than ten citations are included.

Phase-3: the final phase includes a thorough screening of the included studies. The full texts of these studies were scrutinized based on the eligibility criteria.

As a result of this SLR study, a total of 75 primary studies were selected due to their relevance to the topic of user experience in e-government systems. Figure 4.1 demonstrates the complete screening process. We have analyzed these studies and extracted the factors that significantly affect the e-government adoption behavior in order to develop the proposed conceptual framework in this dissertation. In Appendix A, Table A.1 provides a complete list

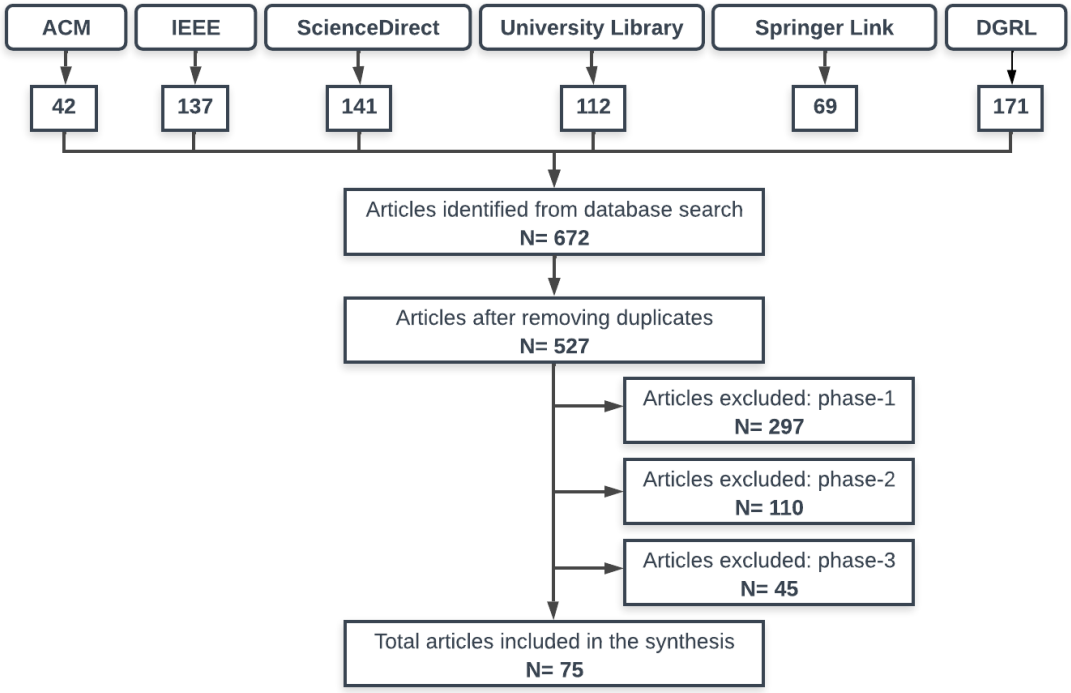


Figure 4.1: Flowchart demonstrating method of screening phases.

of the selected primary studies related solely to the adoption behavior theme of e-government alongside the adopted theories and the significant affecting factors. We have noticed that some models and theories have been widely supported by the adopted studies- including TAM, TPB, DOI, UTAUT, IS Success, and Trust, which are explained in-depth in chapter 2.

4.3 Development of the Conceptual Framework

This dissertation aims to develop an exploratory conceptual framework that seeks to identify the current state of users' adoption behaviors of the offered e-government services. The results of the systematic literature review serve as a guide to develop the framework, which will include the most prevalent factors that significantly influence users' adoption behaviors of e-government services, as well as insights from various IS models and theories commonly

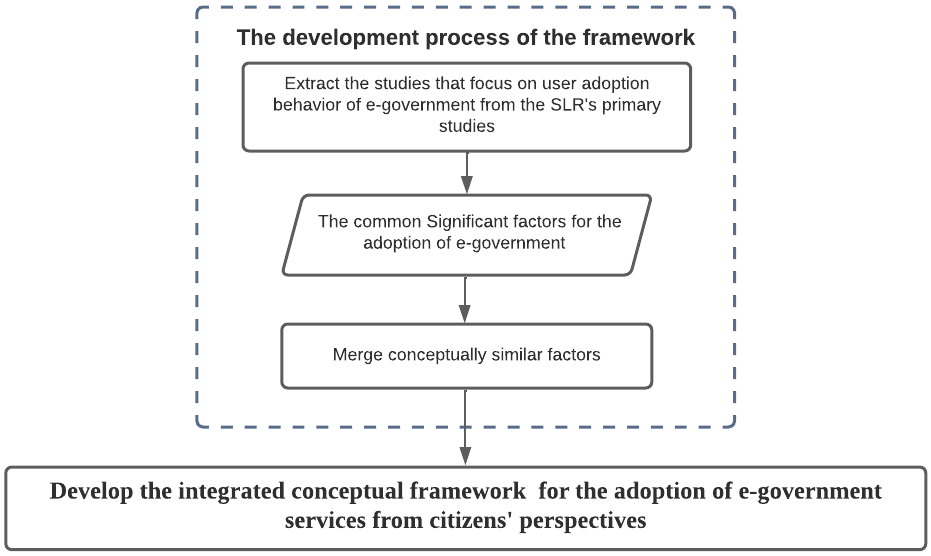


Figure 4.2: The development process of the conceptual framework.

utilized to assess technology usage and acceptance. Figure 4.2 illustrates the process followed to develop the conceptual framework in this research. We have focused solely on the adoption behavior and imported the SLR studies that investigate users' adoption behaviors. Then, we have imported the most frequent significant factors that significantly influence users' adoption behaviors. After that, We have merged conceptually similar factors that belong to different models but convey the same concept. Finally, We have integrated these factors into the proposed conceptual framework as shown in Table 4.3, which proposes five key factors that are likely to affect users' adoption behaviors of e-government services along with the merged factors and the list of the supporting SLR studies. It has been noticed that TAM, UTAUT, and Trust are the most frequently applied models in e-government adoption.

Table 4.3: The critical adoption factors of e-government services.

Factor	Model	Merged Factors	Supporting SLR studies

Table 4.3: The critical adoption factors of e-government services (continued).

Factor	**Model**	**Merged Factors**	**Supporting SLR studies**
Perceived ease of use	TAM	• Effort expectancy–UTAUT • Complexity–DOI.	[36], [90], [100], [101], [102], [107], [111], [112], [124], [144], [145], [146], [147], [148], [149], [150], [151], [152], [153], [154], [155], [156], [157], [158], [159].
Perceived usefulness	TAM	• Performance expectancy–UTAUT • Relative advantage–DOI.	[86], [89], [90], [100], [101], [102], [103], [107], [111], [112], [144], [145], [146], [147], [149], [150], [151], [152], [154], [156], [157], [158], [159], [160].
Social influence	UTAUT	• Subjective norms–TPB	[86], [89], [103], [111], [124], [151], [154], [155], [159], [160], [161], [162].
Facilitating conditions	UTAUT	• Compatibility–DOI	[101], [111], [144], [147], [148], [150], [151], [152], [153], [154], [156], [160], [163].
Trust of government	Trust	—	[89], [97], [100], [103], [146], [147], [150], [155], [157], [158], [160], [161], [164].

4.4 The Conceptual Framework and Hypotheses

The proposed conceptual framework contains one dependent variable, namely: the adoption of e-government services, and two primary independent constructs, which are: Design Factors (DF) and Human Factors (HF). These independent constructs comprise a group of the adopted key factors based on their perspectives on influencing the dependent variable. Figure 4.3 shows the proposed conceptual framework and demonstrates the hypotheses concerning the relationships among the adopted factors (independent variables) and the e-

government adoption behavior factor (the dependent variable).

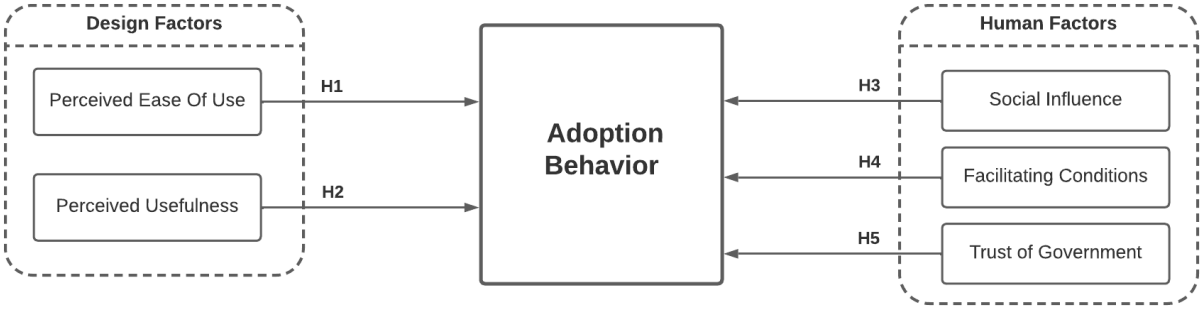


Figure 4.3: The proposed conceptual framework.

The proposed relationships between the factors in the framework are represented by the arrows. Table 4.4 shows the developed relationships between the dependent factor and the proposed five independent factors. The following sections provide a further discussion of each proposed factor alongside the developed hypotheses.

4.4.1 Design Factors (DF)

When considering the adoption or rejection of the offered services, the design features of the e-government medium channel, such as the web portal, are essential aspects as they provide the users' first impression towards the e-government services. Design factors provide the requirements to fulfill users' acceptance of the e-government web portal [165]. A well-design web portal provides a convenient environment for users to interact with government agencies and request services efficiently [166, 167]. Also, the government web portal's design level influences users' motivations to adopt and utilize e-government services [76]. Two fundamental factors are included in this construct: Perceived Usefulness (PU) and Perceived ease Of Use (PEOU) imported from TAM [87].

TAM postulates that higher perceptions of PU and PEOU will increase the intention to

adopt the technology. The easier the system is to adopt, the more useful it can be [87, 149]. Davis [87] mentioned that both factors are crucial to reflect the user's subjective evaluation of a system and do not necessarily represent objective reality. They heavily affect the system's acceptance by users. Therefore, we have adopted them in the proposed framework.

Table 4.4: The hypotheses of relationships in the conceptual framework.

The relationship	**Type**	**Direction**
H1: Perceived Ease Of Use (PEOU) influences the adoption of e-government services.	Direct	PEOU $\longrightarrow$ Adoption.
H2: Perceived Usefulness (PU) influences the adoption of e-government services.	Direct	PU $\longrightarrow$ Adoption.
H3: Social Influence (SI) influences the adoption of e-government services.	Direct	SI $\longrightarrow$ Adoption.
H4: Facilitating Conditions (FC) influences the adoption of e-government services.	Direct	FC $\longrightarrow$ Adoption.
H5: Trust of Government (TOG) influences the adoption of e-government services.	Direct	TOG $\longrightarrow$ Adoption.

Perceived Ease of Use (PEOU)

PEOU in TAM, complexity in DOI, and effort expectancy in UTAUT all encompass the perception of the system's easiness and users' ability to use it. As mentioned above, these factors merged, and the PEOU factor represents this concept in the framework. It has been noted that effort-oriented factors are usually found to be more essential in the early stages of adoption [126]. The PEOU reflects the usability of the system and users' intention to adopt the system which is free of effort [87]. It is considered the essential indicator of acceptance and adoption of e-government. Also, in TAM, the Perceived Usefulness (PU) is impacted by the PEOU because the effortless system with no complexity is considered more useful [108].

In the context of e-government, user-friendly services that save time and effort have a positive impact on users [151]. Hung et al. [154] noted that the PEOU significantly affects users' attitudes toward adopting e-government services. They noticed that it is a critical interpreter and predictor of adopting e-government systems. Also, Al-Hujran et al. [36] claimed that the PEOU is the critical factor in adopting new e-services offered by government agencies. Furthermore, several studies in the e-government research area have integrated the PEOU factor into their models to examine users' adoption and acceptance of the current e-government systems [158, 168, 169, 170]. They all agreed that perceived ease of use positively affects and enhances users' adoption of e-government services.

Alhammad and Elmouzan [171] found that the critical success of the e-government system is measured by the fewer efforts provided by users. Therefore, perceived easiness alongside effortless systems would increase users' willingness to adopt the offered services [110]. Consequently, the following hypothesis is developed:

H1: Perceived Ease Of Use (PEOU) influences the adoption of e-government services.

Perceived Usefulness (PU)

The PU refers to the extent to which a user believes that adopting a particular system would enhance his/her job's efficiency and performance [87]. The PU in TAM, performance expectancy in UTAUT, and relative advantages in DOI are effective in evaluating the absolute benefits users obtained while using the system. Shareef et al. [163] reported that effectiveness, efficiency, accessibility, timesaving, convenience, cost saving, and availability are all benefits that users look to receive from the system. PU is considered a fundamental factor that leads to the acceptance or rejection of new technology. There is no meaning in deliver-

ing e-government services that provide utility and little information, which discourages users from future use. Davis [87] asserted that PU positively influences adoption behavior.

Many recent research studies found that the PU has a significant positive influence on the intention to use and adopt the offered e-government services [112, 146, 156, 160]. Phang et al. [102] investigated the innovative e-government services delivered to senior citizens and recognized that the PU was the most significant factor of e-government adoption. In the same vein, Carter et al. [90] conducted a cross-national evaluation of the e-government adoption in the US and the UK that shed light on the high importance of the PU factor on the e-government adoption supported by both samples.

Additionally, Chatzoglou et al. [103] mentioned that users are more interested in the system's benefits and usefulness. They asserted that e-government services must add value to users by delivering useful services that attract them and expand the number of users. Hence, the PU has proven its critical influence in users' adoption of the offered e-government services [158, 172]. AL-Zahrani [173] also claimed that PU of e-government services plays a crucial and positive role in determining their effectiveness and usage. To investigate the effect of PU on e-government adoption behavior, the following hypothesis is presented:

H2: Perceived Usefulness (PU) influences the adoption of e-government services.

4.4.2 Human Factors (HF)

This construct concerns users' perceptions and the impact of their relationship with the system they interact with. It is pivotal in shaping users' decisions to adopt e-government systems. This construct contains three critical factors that widely affect the e-government adoption behavior: Social Influence (SI), Facilitating Conditions (FC), and Trust of Government (TOG). In this research, we thoroughly investigate these factors to analyze their

impact on e-government adoption efficiently.

Social Influence (SI)

The SI is one of the UTAUT's constructs and is considered an essential determinant of users' behavioral intention to adopt new technology [128, 129, 174]. This construct is defined in different models as Social Influence in UTAUT, the image in DOI, and subjective norms in TPB. It refers to the degree to which peers affect the use of a system, whether positive or negative. SI may come from any relevant references, such as relatives, family, friends, opinionated leaders, work colleagues, neighbors, or social media influencers who can affect users' behaviors and change their decision positively or negatively to use the technology [174, 175]. Generally speaking, people are more likely to adopt the new technology, especially if their social peers around them, whom they respect and trust, benefit from this new technology. SI is exerted via signs and messages that support the formation of the perception and decision to adopt new technology [175].

In the e-government context, Weerakkody et al. [176, p. 725] defined SI as "the normative pressure of associated members like family or friends that influences the intentions to use e-government through intermediates." Prior research studies mentioned that the SI is a significant key predictor that affects e-government adoption and acceptance [86, 103, 162]. They confirmed that e-government adoption is significantly affected by social peers and their effect on users' decisions. A study in the US on the adoption of e-government services by taxpayers confirmed the importance of SI impact Schaupp et al. [89], and another study in Taiwan on citizens' adoption of e-government services found that it was largely determined by social peer influence Lian [155]. Moreover, Albesher [177] emphasized the importance of SI to determine users' trust of e-government systems, leading to e-government adoption. Several e-government studies from different countries have investigated and proved the significance

of social influence on affecting the e-government services adoption, such as Kuwait [109], Qatar [124], Jordan [178], Africa [160], Canada [152], Egypt [151], and Saudi Arabia [161, 171].

In this research, we expect that the SI determinant has a significant impact on users' behavioral intention to adopt e-government services. It assumes that if e-government adopters are affected by their social networks' positive messages, they are more likely to have a strong behavioral intention to adopt the e-government system. As more users use e-government services, the effect of peer influence will increase. Therefore, the following hypothesis is presented:

H3: Social Influence (SI) influences the adoption of e-government services.

Facilitating Conditions (FC)

The FC factor refers to the extent to which the user believes that organizational and technical infrastructure exists to support the system while using it [125, 126, 129]. Venkatesh et al. [174, p. 159] defined it as "consumers' perceptions of the resources and support available to perform a behavior." It is measured by users' perception of being able to access and use the required e-government resources to achieve a particular task. It obtains the knowledge and the necessary support to use e-government services. From DOI, the compatibility factor is considered conceptually similar to the FC factor. Additionally, the FC is influenced by the perception of technology fitting into the users' lifestyle, requirements, and routines as well as the users' preferences to access the e-government services [179, 180].

In the e-government context, FC is one of the important factors that affect the adoption behavior of e-government services [150, 160, 181]. Shanab and Haider [178] referred to FC as a critical determinant of the decision-making to adopt e-government services. In another

study of adopting e-government, AlAwadhi and Morris [109] found that users' acceptance and adoption of the e-government were determined by the FC factor, an essential predictor. Also, Lallmahomed et al. [156] concluded that FC has been found to have a significant positive relationship with users' intention to use e-government. Moreover, Kumar et al. [182] empirically investigated the FC effect on e-government systems. The results indicated that users are very concerned with FC, such as adequate infrastructure and service support. Therefore, government agencies should focus on improving their Information technology (IT) infrastructure and supporting facilities to make e-government services available and accessible. To investigate the influence of FC on e-government adoption behavior, the following hypothesis is developed:

H4: Facilitating Conditions (FC) influences the adoption of e-government services.

Trust of Government (TOG)

Trust is fundamental for examining the different aspects of interactions. It is the fulfillment of expectations by ensuring that the other parties behave in a trusting and responsible manner [55]. In online environments, user trust is considered an essential determinant because of associated risks [134]. It plays a central role in examining users' adoption of technologies. It refers to the users' confidence in the ability of the services' mediums and providers. User trust in an entity providing electronic services is imperative for the adoption of technology initiatives [183].

In the e-government context, trust refers to citizens' belief in the security of the offered e-government services [156]. Bélanger and Carter [97] proposed the trust model in the e-government domain, as mentioned in subsection 2.3.6. They proposed several factors affect-

ing users' trust in e-government. Trust of Government (TOG) is one of the trust factors that significantly influence citizens' level of trust in e-government. Worldwide, citizens are mainly concerned about the use of their information. Therefore, before adopting e-government initiatives, citizens must be confident that the government agency can implement secure and trustworthy systems. Accurate and trustworthy interactions with e-government providers would significantly enhance citizens' trust and adoption of e-government services.

TOG has been considered a significant direct determinant of adoption behavior towards the offered e-government services [89, 157, 160, 161]. Chatzoglou et al. [103] developed a novel framework to identify the critical factors affecting the adoption of e-government services. The findings show a significant direct impact of the trust of government (TOG) factor on users' adoption behaviors of e-government services. They found that when users trust the government agency in securing their data, it is more likely to increase the adoption of the offered e-government services. In another study, Lee et al. [158] examined the factors that affect individuals' willingness to adopt e-government services. The study revealed that TOG is a crucial factor that influences citizens' adoption behavior. The findings suggest that individuals who have confidence in the government are more likely to embrace and utilize e-government services. Ozkan and Kanat [150] uncovered the factors affecting the adoption of e-government services. The results showed that the TOG is the second significant, influential factor. Therefore, governments need to make e-government services more trustworthy to increase the level of adoption behavior. To investigate the influence of TOG on e-government adoption behavior, the following hypothesis is developed:

H5: Trust of Government (TOG) influences the adoption of e-government services.

4.5 Comparison with the EGDI Framework

The United Nations developed the E-Government Development Index (EGDI) framework as a comprehensive survey to evaluate the e-government development across the UN members. It is a benchmark to assess the e-government ranking numerically [2, 184]. This framework is calculated by finding the weighted average of three critical dimensions of e-government, which are:

- Online Service Index (OSI): refers to the design and quality of the offered services.
- Telecommunication Infrastructure Index (TII): refers to the status of the development of the ICT infrastructure.
- Human Capital Index (HCI): refers to the inherent Human Capital.

Each dimension is composed of a set of indices to measure the e-government development of a given country. First, the OSI dimension evaluates the technical features of the e-government services, such as the web portal design. It is based on a survey of the online presence of the offered e-government services. Well-trained researchers were instructed to assess the design of the e-government web portal based on the relevant features and the usability of the web portal. Second, the TII dimension comprises five metrics that reflect the state of the e-government infrastructure. These metrics include the estimated number of internet users per 100 inhabitants, the number of main fixed telephone lines per 100 inhabitants, the number of mobile subscribers per 100 inhabitants, the number of wireless broadband subscriptions per 100 inhabitants, and the number of fixed broadband subscriptions per 100 inhabitants. Finally, the HCI dimension consists of four primary measures: adult literacy rate, the gross enrolment ratio, expected years of schooling, and average years of schooling [184].

By comparing the EGDI framework with the proposed conceptual framework, we have noticed that the EGDI is used to measure the readiness and capacity of national institutions to use ICTs to deliver public services. It refers to the level of technology adopted by the government to develop the services and offer them to the target users. It does not focus on the actual users' perception or experience of the e-government services. Otherwise, it uses predefined indices and measurements to give a numeric ranking of the e-government index for a given country. On the contrary, the proposed conceptual framework sheds the light on the evaluation of e-government services by focusing on users' perceptions and experiences while using the offered e-government services. It concerns what users think of the offered services rather than the development index of the e-government services. The proposed framework focuses on different aspects that affect the user experience of e-government services. All these aspects are measured from users' points of view.

Due to the differences between both frameworks, we have compared them through three primary aspects: human aspects, design aspects, and technical aspects. The human aspects refer to the users' characteristics used to evaluate the e-government. In the EGDI framework, they imply the HCI dimension. While in the proposed framework, the social and trustworthiness factors imply the human aspects as they evaluate the e-government services based on the user's perceptions. The design aspects pertain to the evaluation of the actual design of e-government web portals. In the EGDI framework, the OSI dimension refers to the design aspect, as a couple of researchers evaluate the design and usability of the web portals. On the other hand, the proposed framework focuses on the user experience to evaluate the web portal's design. The usefulness and usability factors are used to evaluate the design aspects. Finally, the technical aspects imply the underlying infrastructure of the e-government system. The EGDI framework evaluates the infrastructure based on internet usage rates in a given country. Otherwise, the proposed framework evaluates the technical

aspects by considering users' opinions on the infrastructure's availability by considering the facilitating conditions factor. To sum up, the EGDI framework provides an e-government development ranking in advance based on a given country's technical and economic characteristics. On the other hand, the proposed framework concerns the users' experiences and opinions of the offered services. Table 4.5 illustrates the evaluation aspects of e-government services based on the EGDI framework and the proposed framework.

Table 4.5: The relation between the EGDI framework and the proposed framework.

The aspect	**EGDI dimension**	**Proposed framework's factor**
Design aspects	OSI	Perceived Ease Of Use (PEOU) Perceived Usefulness (PU)
Human aspects	HCI	Trust of Government (TOG) Social Influence (SI)
Infrastructure aspects	TII	Facilitating Conditions (FC)

Governments tend to improve their services by adopting new and advanced technologies. However, there is a gap between developed e-government systems and the experience and perception of target users. Governments should pay attention to the relationship between e-government development and what citizens feel and prefer while using the systems. Focusing on getting a very high EGDI level will not enhance the user experience of a given country if they do not focus on their citizens and try to narrow down the technology-user experience gap. Hence, it does not matter how developed e-government services are if they cannot enhance the citizens' experience. By considering this issue, we assume that the proposed conceptual framework would work to narrow down this gap and enhance the user experience of the offered e-government services by focusing on citizens' needs and perceptions rather than providing high-level services.

4.6 Conclusion

This chapter presents a conceptual framework for e-government adoption that serves as a foundation for conducting an explanatory research study aimed at gaining a deeper understanding of e-government adoption. The development of this framework involved an extensive systematic literature review of research studies in the e-government context over the past two decades, which identified the most significant factors that influence e-government adoption. Based on the review's findings, five critical factors were proposed and integrated into two independent constructs: Design factors (DF) and Human factors (HF). The Design factors construct includes Perceived Ease Of Use (PEOU) and Perceived Usefulness (PU) from the Technology Acceptance Model (TAM), while the Human Factors construct consists of Social Influence (SI), Facilitating Conditions (FC), and Trust of Government (TOG) from the Unified Theory of Acceptance and Use of Technology (UTAUT) and Trust theories. The proposed factors and their relationships with the dependent variable (e-government adoption) are thoroughly defined and explained through five hypotheses. These hypotheses can be used to assess users' perspectives on e-government services and determine the e-government adoption level in a particular country. Next, chapter 5 provides a detailed explanation of the adopted research methodology used to evaluate the proposed conceptual framework. The data analysis steps are identified to pave the way for developing the reference implementation for e-government adoption.

Chapter 5

Research Methodology

This chapter details the research methodology used to apply the proposed conceptual framework and achieve the research goals. The methodology adopted in this study is quantitative data methodology, which is explained in section 5.1. Then, in section 5.2 we identify the required steps for developing the survey instrument (questionnaire), specifying how the data can be collected, and the statistical equation for calculating the sample size for this research study in the e-government domain. The questionnaire items will be tested to evaluate the research hypotheses developed in chapter 4. After that, the data analysis process is explained in-depth in section 5.3. hence, the statistical assessments are identified to examine the reliability and validity of the proposed framework. The structural equation modeling techniques are selected to evaluate the collected data in this research. We implement procedural steps to conduct the data analysis and determine different tests required for each step.

Regarding the research contributions: this chapter contributes to achieving research goal 2 by fulfilling task-3, which is "implement the conceptual framework to evaluate citizens' adoption behaviors of any e-government service". It provides systematic procedural steps to conduct future contributions, which are: developing a valid and reliable web-based questionnaire and developing a UCD-based reference implementation to evaluate the e-government adoption behavior in specific contexts.

5.1 The Adopted Research Methodology

The research employs a quantitative approach to address the research question and accomplish its goals. Hence, we aim to investigate the significant factors affecting the e-government adoption behavior, confirmatory in nature. It is the most suitable methodology to conduct this research study due to its ability to explore and identify the causal relationships between the conceptual framework's factors by gathering and analyzing numerical data [22, 185]. It is also the most dominant research methodology in the IS research field; 75% of IS research studies have been conducted following the positivist paradigm that employs the quantitative methodology. In contrast, only 17% of studies adopted the interpretivism paradigm [186]. Appendix B provides a brief explanation of the research paradigms, research approach, and research methodology concepts.

Moreover, the proposed framework incorporates the critical factors that are likely to influence the adoption of e-government services on a worldwide basis. The framework can be tested by evaluating each factor, asking related questions, and collecting responses that could be evaluated mathematically to determine how important it is in e-government adoption. As we mentioned before, we aim to provide a comprehensive and generalizable framework suitable to be adopted by different countries and in different contexts. Hence, it is essential to adopt a large sample size to be statistically significant. The quantitative research method facilitates obtaining statistical results that can be generalized to larger communities or different contexts [23, 187].

5.2 Research Strategy

A survey research strategy is adopted to collect quantitative data due to its capability to explore the current e-government adoption patterns and measure and validate research hypotheses for the proposed conceptual framework. The survey is the most widely used research strategy in social science as it facilitates researchers to obtain accurate, valid, and reliable data on the sample population's behaviors within a time limit [188]. This strategy allows the generation of quantitative data by enabling questions about the influence of each factor from the conceptual framework on the adoption of e-government services. Therefore, to test the proposed framework, a survey-based questionnaire will be developed to collect the quantitative empirical data. The questionnaire is a cost-effective method that is easily disseminated to multiple locations simultaneously. It also improves the ease of access by respondents, which increases the likelihood of receiving truthful responses [187].

In this research study, we develop a self-administered questionnaire to collect data from participants within a short time, which refers to the cross-sectional study. Therefore, great effort is essentially required to ensure that participants can easily understand the questions and answer them [22, 185].

5.2.1 Questionnaire Development

The development of the questionnaire requires identifying the constructs and creating measuring items for each construct. The conceptual framework and its constructs are developed and identified through the comprehensive literature conducted by the SLR study to investigate the e-government adoption constructs, as shown in chapter 4. That leads to the identification of Perceived Ease Of Use (PEOU), Perceived Usefulness (PU), Social Influence (SI), Facilitating Conditions (FC), and Trust of Government (TOG) factors for investigat-

ing users' adoption behaviors of e-government services. Generating the measuring items for each construct is conducted by reviewing the related literature and considering the research study's domain regarding the e-government adoption behavior from citizens' perspectives. The questionnaire will be developed to guarantee the validity and accuracy of the questions.

A brief explanation of this research is included in the questionnaire to provide a better understanding of its purpose to all participants. Also, the consent information is included at the beginning of the questionnaire and before starting the questions. It clearly states that the responses will be treated confidentially, and participants will be completely anonymous, which would increase the likelihood of participation. Also, participation is voluntary, and participants can withdraw anytime with no consequences; their responses will also be deleted. The IRB ethical approval will be obtained before commencing the data collection process.

Two main sections are included in the questionnaire. The first section consists of demographic questions that capture participants' profiles. This section contains multiple-choice questions with a single answer: age, gender, and education level. A nominal scale will be adopted to capture and identify respondents' information in this section. The second section includes the questions used to evaluate each of the adopted factors. It encompasses close-ended questions using a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5) to accurately address respondents' perception of each question [189]. An interval scale will be used to measure respondents' perceptions of the influence of each factor on e-government adoption. The questionnaire will take approximately 15-20 minutes for the subjects to complete.

5.2.2 Data Collection

Data collection refers to the procedural steps of gathering relevant and valid data to conduct the research study. It consists of three main steps: developing a survey instrument and ensuring its validity and reliability, specifying the size of the sample population, and implementing the process of the data collection alongside the selected sampling size for achieving the research objectives [22]. A web-based questionnaire will be created using QuestionPro survey system [190]. The survey instrument will be distributed by posting the link of the questionnaire on social sites, especially job seekers' forums, and social groups, and using Google ads campaigns to promote the link among all target users [191].

This research study required data from citizens' perspectives to determine their willingness to adopt e-government services. The cross-sectional approach will be used rather than a longitudinal data collection approach, which means that the essential data will be collected only once in a relatively short period. The longitudinal approach allows researchers to observe the changes in citizens' adoption of e-government services over time [22]. Unlike the longitudinal approach, the cross-sectional one lacks the ability to explore changes over time, which would be considered a limitation. However, the cross-sectional is a cost-effective, flexible, easy-to-use, and more accurate data collection approach than the longitudinal approach, which requires extensive efforts to accurately compare behavioral adoption over time [5, 22]. Therefore, the cross-sectional approach will be adopted in this research study.

5.2.3 Population and Sampling

To test the conceptual framework in a realistic and practical way, this research adopted the self-administered web-based questionnaire to engage a wide range of participants (citizens). As mentioned before, quantitative methods are used to generalize the research findings to a

larger population. The population of this research study is all citizens or legal residents who can use and benefit from the offered e-government services. However, the generalizability has many challenges that would affect the findings. The scientific value of the research findings will be reduced if they cannot be generalized to other samples. Therefore, determining the correct sampling technique and size for the study are the critical keys to its success [5, 22]

The sampling technique is mainly categorized into probability and non-probability sampling techniques [5]. Non-probability sampling presumes that the likelihood of choosing an individual from the sample population to participate in the research study is unknown. This technique is not suitable for studies investigating a large number of participants. It does not represent the entire population, leading to some restrictions on the generalizability of the research findings [5, 187]. On the other hand, the probability sampling technique presumes that selecting the study's participants from the whole sampling population is predefined and known. The probability sampling technique allows a random selection of participants. It is a proper technique for collecting data from a large population and ensuring that the selected sample represents the study population in the given context [5, 187]. This research aims to explore the e-government adoption behavior of citizens who are allowed and able to use such e-government services. Therefore, the probability sampling technique is adopted to identify the sample frame and sample size of this research. The probability sampling technique consists of different sampling methods. In the context of this research, the random sampling method will be adopted to recruit participants. It refers to the selection of the sample size from the sampling frame at random basis [5].

Prior to specifying the sample size, we have to determine the sampling frame from the entire population based on the research context, which is the actual users of a specific e-government service. Therefore, some conditions will be added to the questionnaire to ensure that only current users can participate in this study. Therefore, participants should meet the following

conditions to be able to proceed in evaluating the e-government services:

- Participants should be citizens or legal residents.
- They should be 18 years or above; as the adulthood age recognized in law in the majority of countries worldwide.
- They are current users of the given e-government service.
- Due to the dramatic developments in e-government services, we aim to explore citizens' adoption behaviors of the most recent and updated version of e-government services. Therefore, we added another condition: the sampling frame is limited to users who have been using the given e-government service for the past two years.

Various scholars defined different procedures to identify the required number of participants for such a study. Identifying a proper sample size is essential for providing reliable and solid findings for the given research context [5, 22]. The sampling formula from Yamane [192] is adopted to specify the proper sample size, as illustrated in Equation 5.1.

$$Sample\ Size = N/[1 + N(e)^2] \tag{5.1}$$

Herein, 'N' refers to the sampling frame, while 'e' represents the precision level that is a 97% confidence level with a probability of 0.03. The confidence level represents the percentage of how often the true percent of the population would pick a specific answer that lies within the confidence interval [5]. Many IS research studies adopt a 95% confidence level which refers to the percent of accurate and valid responses [5, 185]. However, we selected the confidence level to be 97% with an error margin rate of 3% to ensure recruiting a larger size of accurate answers and returning valid and complete responses. Hence, we will be 97% confident that the results represent true population value.

5.2.4 Questionnaire Validation

This research study follows the survey instrument development procedure for the web-based self-administered questionnaire. Two main processes are followed to ensure the efficiency of this research, which are developing and refining the questionnaire. Prior to disseminating the questionnaire to the predefined sampling frame and collecting data from the participants, we have to ensure the validity and reliability of the questionnaire items for highly realistic and efficient findings. The survey instrument refinement includes different forms to assess the questionnaire validation [23, 193]. In this research study, we will evaluate the content validity and reliability of the questionnaire items.

Validity Testing

Instrument content validity is the issue of data representation. The crucial action posed by this step is determining whether the questionnaire items are provided in a representative manner that could be used to measure and evaluate the content of a corresponding construct [193, 194]. Straub et al. [23, p. 424] defined content validity as "The degree to which items in an instrument reflect the content universe to which the instrument will be generalized. This validity is generally established through literature reviews and expert judges or panels."

The questionnaire items were adopted through literature reviews on the e-government adoption context with adding some changes and rewording. Hence, to guarantee that the reworded items are valid and represent the given construct, the content validity procedure will be conducted. In this step, experts and academics in the field of e-government will be invited to validate the questionnaire items for clarity, validity, and consistency [23, 194]. In this method, panelists will be invited to compare each construct's definition with its items

and score them using a scale of 1 (not relevant), 2 (important), and 3 (essential). Moreover, the panelists will be asked to add any comments or recommendations that would improve the validity of the constructs' items and enhance their relevance to the context. After that, the Content Validity Ratio (CVR) will be calculated based on the data received from the content validity test by using the following formula, as shown in Equation 5.2 [195]:

$$Content\ Validity = [n - (N/2)]\ /\ [N/2] \tag{5.2}$$

In this equation, n represents the number of panelists who scored the items as "essential" and N is the total number of panelists. It enables computing the percentage of panelists who rated a specific item as "essential" to the corresponding construct. "Essential" responses will be considered positive indicators of the relevance of the questionnaire items to the corresponding construct. The CVR will be tested for each questionnaire item for statistical significance at 0.05, which means that more than 50% of the panelists rate the items as "essential"; hence, the item has content validity to the corresponding construct [194, 195]. Based on the content validation measures and comments from these experts, the survey instrument will be modified.

Reliability Testing

Construct reliability also refers to the internal consistency that is utilized to assure a high level of consistency for the questionnaire items used to evaluate a corresponding construct and confirm their ability to represent that construct by obtaining the right information [23, 196]. Reliability is defined by [23, p. 426] as "The extent to which a variable or set of variables is consistent in what it is intended to measure."

A pilot study is the recommended test to evaluate the response rates and investigate the

survey instrument's credibility. It aims to evaluate the internal consistency of each item and determine its suitability for the main data collection, which eventually ensures the consistency of the corresponding construct [23, 197, 198]. Johanson and Brooks [199] recommended that 30 participants from the target population are the appropriate and reasonable minimum size for the pilot study. Accordingly, a pilot survey will be distributed to more than 30 representative participants.

To conduct this test, Cronbach's alpha will be measured to confirm the reliability of the survey instrument [200]. It is a standard method used to assess the reliability and internal consistency of the questionnaire items. A high value of Cronbach's alpha indicates that the construct is reliable and consistent, and the questionnaire items reflect the corresponding construct [187, 199]. It is recommended that 0.70 is the acceptable cutoff point for Cronbach's alpha value ($\alpha >= 0.70$) [187, 196]. Therefore, items with acceptable Cronbach's alpha values will be retained while others, with Cronbach's alpha values less than 0.70, will be refined according to the feedback from the pilot respondents. Hence, we can confirm that the constructs and their measurement items are internally consistent and reliable, and can be used to start the data collection process [197, 198, 201]. Cronbach's alpha is calculated by the following formula Equation 5.3 [200]:

$$\alpha = N * \bar{c} \ / \ \bar{v} + (N - 1) * \bar{c} \tag{5.3}$$

In this equation, N represents the number of items, $\bar{c}$ is the average covariance among items, and $\bar{v}$ is the average variance.

5.3 Data Analysis

Data analysis refers to the procedural steps applied to the collected data to achieve the research objectives. It aims to apply logical analysis for a better understanding of the research data. The research design, methodology, approach, and data collection process all determine the appropriate and suitable data analytical methods required to be conducted [22, 192].

In a quantitative research methodology, multivariate data analysis is commonly used to evaluate and assess the research study's hypotheses and identify the relationship between the defined constructs. Structural Equation Modelling (SEM) is a prominent and widely used method for analyzing multivariate data for a given research. It refers to a set of statistical models adopted to accurately explore the relationships among multiple variables or constructs [196, 202]. It facilitates researchers to model the relationship between constructs and their measurement items, which are the survey questions for a specific construct, and also the relationships among constructs in the proposed framework by using a series of equations [203]. Additionally, SEM assesses whether the hypotheses in the proposed conceptual framework are backed by the quantitative data in the research study. If the collected quantitative data does not align with the conceptual framework, that means the related hypothesis is not supported and will be rejected. It can have a flexible interaction between the proposed conceptual framework to be examined and the quantitative data collected for a given research study [202, 204]

This research adopts the SEM method to analyze and evaluate the quantitatively collected data for exploring the significant factors affecting e-government adoption behavior. It is adopted in this research due to its ability to analyze all correlated relationships among the constructs simultaneously while taking into account the measurement errors of the research [196, 204, 205]. In this research, five main steps will be followed to perform the

SEM analysis for evaluating the collected data obtained in this research study, as illustrated in Figure 5.1:

- **First step** refers to the data screening and conducting a preliminary analysis of the collected data. Therefore, the collected data is analyzed to eliminate missing data, and outliers. In addition, the normality, reliability, and multicollinearity tests will be applied to the data to prepare it for further analysis.

- **Second step** focuses on assessing the dimensionality of the collected data to explore whether or not the measurement items are relevant to each other to align with a corresponding construct [196]. The Exploratory Factor Analysis (EFA) is conducted in this step.

- **Third step** evaluates the extent to which the entire measurement model is valid and reliable. The SEM helps identify whether the proposed framework fits the collected data [196]. The Confirmatory Factor Analysis (CFA) is conducted in this step to examine the entire measurement model. Therefore, to guarantee that the measurement model is valid, the Goodness of Fit (GOF) indices must meet the acceptable threshold values [196, 206]. If the measurement model fails in satisfying the GOF threshold indices, the analysis of the one-factor congeneric measurement model is performed. The model is going through an iterative assessment process that refines and tests the model until confirming that the one-factor congeneric measurement models are valid, which leads to ensuring the validity of the entire measurement model. During the iterative procedure, measurement items that do not meet the acceptable threshold are dropped to ensure the validity of the indices.

- **Fourth step** refers to the assessment of the structural model validity that evaluates the strength and significance of the paths between the constructs in the proposed concep-

tual framework. It allows the understanding of the proposed relationships (developed hypotheses) among these constructs. It is evaluated via the magnitude of variance provided for the constructs, the path coefficient, and the P-value [196, 202, 204].

- **Fifth step** is the final step in the SEM analysis that summarizes the results imported from analyzing both the measurement model and the structural model.

5.3.1 Preliminary Data Analysis

A preliminary data analysis prepares the collected quantitative data and ensures its readiness and validity for further analysis [196]. It confirms that the presumptions underlying the multivariate analysis are achieved prior to conducting the SEM analysis. In this research, three preliminary data analysis assessments will be performed, including missing data, outliers, and reliability.

Missing Data Assessment

Missing data refers to the questions (measurement items) in the questionnaire that were dropped and left unanswered by a respondent. They affect the reliability of the data analysis, which negatively impacts the research findings [196, 204]. Therefore, it is essential to handle the issue of missing data in the research to enhance the data analysis process and ensure the efficiency and accuracy of the research findings. Preventive actions should be considered to confirm that the data are complete and free from any missing values. In this research, we will be using a web-based questionnaire, which helps prevent missing data. Hence, we will make answering all questions mandatory; so, participants are reminded if any items are left unanswered. Also, the survey cannot be submitted unless participants answer all measurement items.

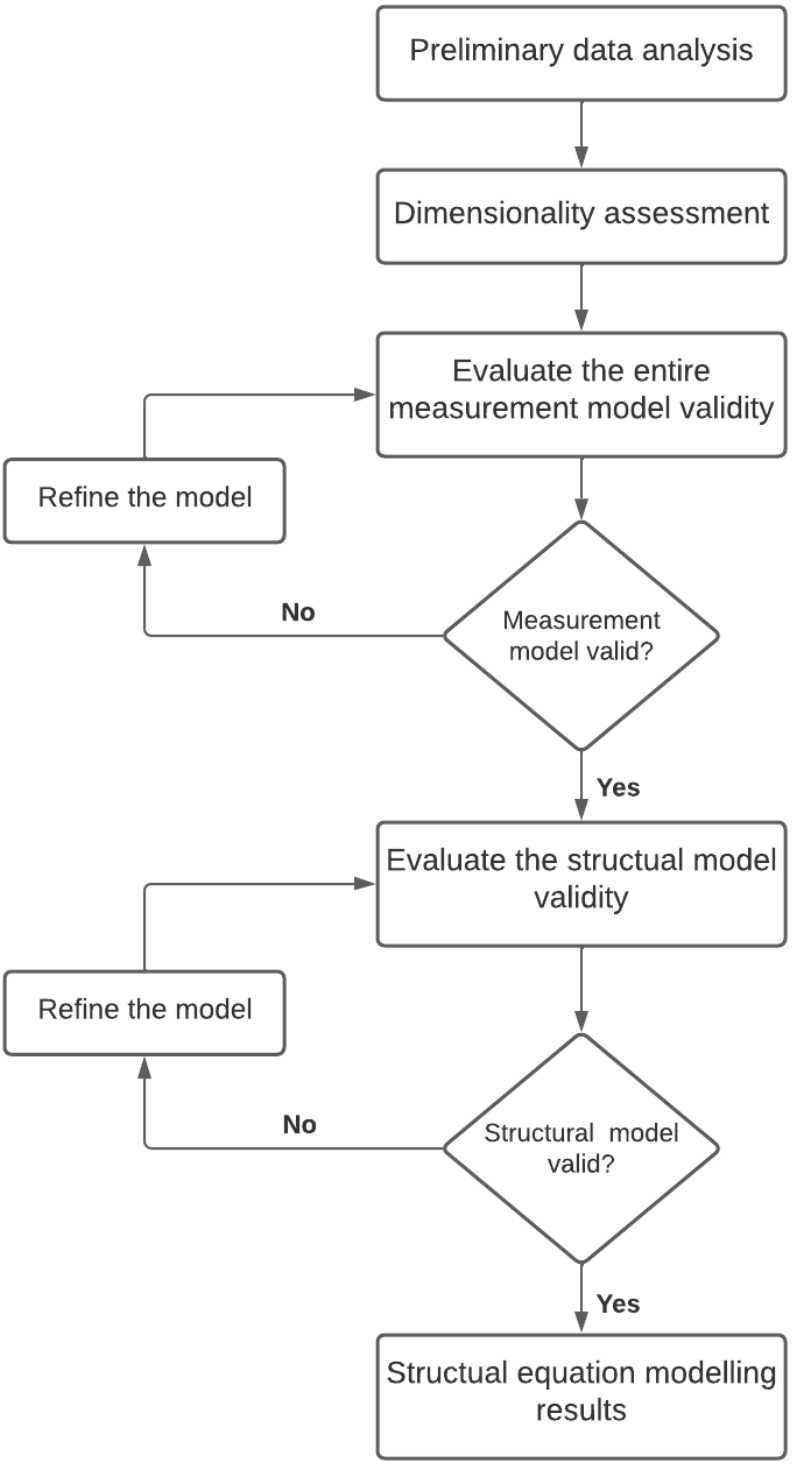


Figure 5.1: An overview of the data analysis steps

Reliability Assessment

Construct reliability is also known as internal consistency, as mentioned in section 5.2.4. The reliability of the quantitative collected data should be examined using Cronbach's alpha, the same as the pilot study step. A Cronbach's alpha value that is greater than or equal to 0.70 indicates the reliability of the construct ($\alpha >= 0.70$) [187, 196]. In case Cronbach's alpha value is lower than 0.70, it is recommended to drop measurement items with a low-reliability value within the particular corresponding construct to increase Cronbach's alpha value for that construct. However, if the construct still has no acceptable reliability value, it should be excluded from further analysis [196].

Outlier Assessment

Outliers refer to the different data values that lie at an abnormal distance from the other data values. They exist in the data due to data entry errors, observational errors, and instrument errors. It is essential to identify outliers and mitigate them since they have a significant impact on the data analysis process and influence the SEM model fitness [196, 202]. Therefore, outliers should be managed and controlled using available statistical procedures [202]. The Mahalanobis distance (D_2) is measured to effectively detect outliers [196]. It evaluates the distance between two points (an individual observation, and the average of other observations) [205]. In this research, we will evaluate D_2 of each data value by applying the chi-square distribution (X^2) and degrees of freedom equal to the number of independent constructs in the conceptual framework. A specific data value is classified as an outlier if the D_2 exceeds the X^2 value, with p value ($p < 0.001$) [196, 204]. Table 5.1 summarizes the required assessments to prepare the data for further analysis.

Table 5.1: Required assessments for the preliminary data analysis.

Assessment	Definition	Threshold value
Missing data	Refers to any questionnaire items that are missing and not completed by a participant.	Drop incomplete responses.
Reliabillity	Refers to the internal consistency used to confirm the high consistency of the survey items.	Cronbach's alpha ($\alpha >= .70$) [196, 202].
Outliers	Refer to the different data values that lie at an abnormal distance from the other data values.	$D_2 < X^2$ [196, 204].

5.3.2 Dimensionality Assessment

Dimensionality assessment refers to exploring whether a set of measurement items are relevant to each other to align with a corresponding construct. This assessment is essential for further SEM analysis due to its capability in encompassing the entire structure of measurement items [206]. The EFA test will be employed in this step to assess and ensure the construct validity of the conceptual framework [23, 196]. EFA refers to the significant test for investigating and confirming the distinction between the constructs of the proposed conceptual framework. It allows exploring the structure of measurement items corresponding to their representations of a particular construct [196]. It focuses on reducing and combining measurement items into a relevant set of constructs. The EFA assessment is usually used when the association between measurement items (observed variables) and independent constructs (unobserved variables) are uncertain [202].

However, a set of assessments should be considered before performing the EFA test: data adequacy, communality, and eigenvalue [196, 207].

Data Adequacy Assessment

It assesses whether the collected data are adequate and of anticipated quality [196]. The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity are usually used to check data adequacy. They are used to determine the sample's suitability for running the factor analysis. The value of the KMO measure diverges between 0 and 1. Kaiser [208] stated that KMO values greater than 0.9 are marvelous and evidence of excellent sampling adequacy, while values below 0.5 are unacceptable (KMO > 0.5). Therefore, the KMO value should range between these two values to consider the significant sampling adequacy. In addition, Bartlett's test of sphericity is used to compare an observed correlation matrix to the identity matrix. It checks to see if there is any specific redundancy between the variables that can be summarized with some factors. It is employed to ensure that the sampling adequacy is significant with a p-value below 0.05 ($p < 0.05$). [196].

Communality Assessment

For each measurement item, the communality indicates the common variance found in that item. It calculates the sum of the squared loadings for each measurement item. The measurement item gets a better fit to explain the corresponding construct when the communality value gets greater [207]. It usually ranges from 0 to 1 where a value close to 1 shows more variance. However, the minimum acceptable communality value for each measurement item is set to be 0.5 to confirm that each measurement item shares a common variance with other items for the corresponding construct ($communality >= 0.5$). With a low communality value, the measurement item will be removed as it cannot be loaded on any construct [196, 207].

Eigenvalues Assessment

It is also known as characteristic roots. The eigenvalue is a condition that is employed to retain the number of constructs according to their measurement items' loading [23]. It computes the amount of variation in the total measurement items accounted for by each construct. If the eigenvalue of a construct is low, then the contribution of that construct to supporting the dependent construct in the proposed framework is not significant [196, 207]. Therefore, constructs with low eigenvalues might be ignored and removed from the framework. According to kaiser's rule [209], to define the number of factors with which their measurement items are supposed to be loaded, the eigenvalue should be equal to or greater than 1 ($eigenvalue >= 1$) [196].

EFA Assessment

It is a reduction technique that aims to identify the covariance structure of the observed measurement items by reducing the number of measurement items that represent each construct. It explores the actual number of factors that the measurement items are supposed to load. Hence, these items increase the demonstrated variance in the corresponding construct. Therefore, the factor loading will be verified for each measurement item. A load of items above 0.5 meets the minimum acceptable threshold value in the IS research to consider that item as a representative of the corresponding construct ($factorloading > 0.5$) [196]. With factor loading above 0.5, no cross-loading can be detected between the measurement items. The EFA test will be applied with the varimax rotation method to evaluate constructs' validity [196, 202]. Table 5.2 summarizes the required assessments for evaluating the EFA for the given data.

Table 5.2: Required assessments for the exploratory factor analysis.

Assessment	Definition	Threshold value
Data adequacy	It assesses whether the collected data are adequate and of anticipated quality.	($KMO > 0.5$) [208], Bartlett's test ($p < 0.05$) [196].
Communality	It represents the shared and common variance that exists in a measurement item.	($communality >= 0.5$) [196, 207].
Eigenvalue	It is a condition that is employed to retain the number of constructs according to their measurement items' loading.	($eigenvalue >= 1$) [196, 209].
EFA	It explores the actual number of factors that the measurement items are supposed to load.	($factor\ loading > 0.5$) [196].

5.3.3 Measurement Model Analysis

It examines how the latent variables (the independent constructs) are related to their measurement items in the proposed framework. In the quantitative study, observed variables are usually computed numerically by obtaining participants' response values to a particular question in the developed questionnaire. We cannot measure the latent construct directly. Otherwise, it is usually evaluated through its corresponding observed variables (measurement items) [196, 202]. To guarantee the reliability and validity of the measurement model, every observed variable (measurement item) must be appropriately attached to only one individual latent variable (independent construct). The CFA measures are usually conducted to evaluate the GOF indices to assess the full measurement model [196].

CFA is a statistical method used to ensure that the measurement model fits the data collected in a specific context. It examines whether the measures of independent constructs (latent variables) and their corresponding measurement items (observed variables) are consistent

with the proposed conceptual framework. CFA refers to a better understanding of the shared variance among the measurement items [196, 202]. This shared variance reflects the measurement items assembled to represent a corresponding construct. Therefore, in the measurement model, the CFA presents how every measurement item is contributed to its corresponding independent construct.

Two major steps should be taken into consideration while performing the CFA assessment:

- **The first step** focuses on evaluating the measurement model's specifications and its adequacy. At first, the entire measurement model is assessed based on the GOF indices that meet the satisfactory threshold values. In case the GOF indices fail to meet the satisfactory threshold values, the entire measurement model should be divided into separate one-factor congeneric measurement models, each of which assesses one latent variable along with its measurement items individually. This step provides an iterative modification process of the individual model for obtaining a group of measurement items that best fit a corresponding construct. After reaching satisfactory fitness values from all these individual one-factor congeneric measurement models, they will be aggregated in an entire updated measurement model. Then, the GOF indices will be examined to ensure they meet the satisfactory threshold values in the updated measurement model. The measurement model will go through iterative processing and reassessment until all GOF indices meet the satisfactory threshold values. During this iterative procedure, the measurement items that fail to statistically fit with other items will be dropped.

- **The second step** examines the extent to which the entire measurement model is reliable and valid by evaluating the convergent and discriminant validity [196, 202].

The Measurement Model Assessment

As mentioned above, the measurement model is considered valid when it meets the satisfactory GOF indices values [196, 202]. The satisfactory GOF values show that the sample data is properly represented by the proposed framework. They are used as a guideline rather than a confirmation of the model fitness [196, 202, 205]. Table 5.3 illustrates the list of common GOF assessments alongside their definitions, sensitivity to the sample size (N), measures the type of fit index, and acceptable cutoff values [196, 210, 211, 212].

Table 5.3: The GOF assessments of the full measurement model.

Assessment	**Definition**	**Sensitive to N?**	**Measure type**	**Cutoff value**
Ratio of X^2 to degrees of freedom (X^2/df)	It evaluates the overall fit and the discrepancy between the sample data and fitted covariance matrices. It signifies the difference which is the ratio of X^2 to the df.	Yes	Badness	<= 5.0
Goodness of Fit Index (GFI)	It refers to the proportion of variance accounted for by the estimated population covariance. It is similar to X^2.	Yes	Goddness	>= 0.90
Adjusted Goodness of Fit Index (AGFI)	AGFI is the extended version of GFI measure. It corrects GFI based on the df. It favors more restrictions and parsimony.	Yes	Goddness	>= 0.80
Comparative Fit Index (CFI)	It is a frequently reported fit index. It is a replacement of fit indices that are affected by (N). It compares the fit of a target model to the fit of an independence or null model by measuring the extent to which it is superior to the independence model.	No	Goddness	>= 0.90

Table 5.3: The GOF assessments of the full measurement model (continued).

Assessment	Definition	Sensitive to N?	Measure type	Cutoff value
Tucker-Lewis Index (TLI)	It is an incremental fit index that indicates the model of interest improves the fit by 90% relative to the null model. It can detect model mis-specifications.	No	Goddness	>= 0.90
Root Mean Square Error of Approximation (RMSEA)	It is an index of the difference between the observed covariance matrix per the df and the hypothesized covariance matrix which denotes the model. It is a parsimony-adjusted index.	Yes to small N	Badness	<= 0.05
Standardized Root Mean Residual (SRMR)	It represents the square root of the difference of the average of standardized residuals between the sampled (observed) and the posited (hypothesized) covariance matrices.	Yes	Badness	<= 0.09

The initial full measurement model should be first assessed in the study by applying the GOF assessments. The results of GOF values should be acceptable and meet the acceptable threshold value mentioned in Table 5.3. In case any GOF value is not satisfactory and below the recommended threshold value, that means the entire measurement model fails to properly fit the data [196]. Consequently, refinements to the measurement model are necessary by separately analyzing every independent construct alongside its corresponding measurement items, by creating one-factor congeneric measurement models.

One-Factor Congeneric Measurement Model is a subset model of the entire measurement model. A measurement model is considered congeneric if a measurement item loads only on one individual underlying construct and there are no correlations between error terms [196, 202]. This practice will be adopted in this research study to detect the fit indices

measures separately for every construct alongside its measurement items. The refinement process of the entire measurement model begins with constructing six one-factor congeneric measurement models according to the proposed conceptual framework, namely, Perceived Ease Of Use (PEOU), Perceived Usefulness (PU), Social Influence (SI), Facilitating Conditions (FC), Trust of Government (TOG), and Adoption Behavior (ADOPT). These models are evaluated by applying the GOF indices provided in Table 5.3.

If any one-factor congeneric measurement model fails to meet the acceptable GOF indices, it needs to be reassessed and refined to ensure its validity and to meet the cutoff GOF indices values. The model can be reassessed to improve its fitness to the full measurement model by using diagnostic measures, including standardized factor loadings (SFL), standardized residuals (SR), and the GOF indices threshold [196, 202]:

1. **Standardized Factor Loadings (SFL)**, also known as "standardized regression weights," refers to the level to which each measurement item converges with the corresponding construct. It indicates the convergent validity of the construct. It is indicated that the measurement item fails in explaining the corresponding construct when the SFL value is below 0.5. As a result, measurement items with ($SFL < 0.5$) should be dropped from the model [196]. This measure helps eliminate measurement items that are not relevant.

2. **Standardized Residuals (SR)** indicates the disparity between the actual and predicted covariance. A good SR value, which shows that a particular relationship is well considered, should fall in the range from -2.58 to +2.58 ($SR = \pm 2.58$). The SR values that do not fall in this range indicate an unsatisfactory level; therefore, the corresponding measurement item should be eliminated [196, 213]. A summary of the above three diagnostic measures is represented in Table 5.4.

Table 5.4: The diagnostic measurements to improve model fitness.

Measure	Definition	Threshold
SFL	It indicates the level to which each measurement item converges with the corresponding construct.	($SFL >= 0.5$) [196].
SR	indicates the disparity between the actual and predicted covariance.	($+2.58 > SR > -2.58$) [196, 213].

It is highly recommended that each construct should have at least three measurement items to provide an acceptable coverage of that construct [196]. Therefore, it is crucial to ensure that the number of measurement items for each construct remains consistent during the iterative processing and refinement measures mentioned earlier.

The Measurement Model Validation

The Convergent Validity refers to the convergent degree between several measurement items to measure an individual underlying construct. It is evidenced when measurement items corresponding to a particular construct show significant correlations with each other, compared to the other measurement items convergent to other constructs [196]. Convergent validity can be assessed by examining the value of the SFL, applying the composite reliability to measure the internal consistency in scale items for each construct, and measuring the Average Variance Extracted (AVE) [23, 196]:

1. **The SFL** is evaluated for each individual measurement item that existed in the valid one-factor congeneric measurement model to assure the validity of the respective construct. The cutoff value should be equal to or greater than 0.5 ($SFL >= 0.50$) as mentioned in Table 5.4 [196].

2. **Composite Reliability (CR)** estimates the internal consistency of a set of mea-

surement items to the corresponding factor. It represents the extent to which the measurement items for a given factor are measuring the same underlying factor [214]. Composite reliability is calculated by using the formula explained by Wynne W [215]:

$$CR = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum_i \epsilon_i} \tag{5.4}$$

Where λ is the standardized factor loading of each measurement item to the given factor, and ϵ is the respective error variance for each item. ϵ is calculated for each measurement item as:

$$\epsilon_i = 1 - \lambda_i^2 \tag{5.5}$$

The acceptable CR value should be 0.70 or greater to support the construct reliability ($CR >= 0.70$) [215, 216].

3. **Average Variance Extracted (AVE)** focuses on evaluating the amount of variance captured by a particular construct to the amount of variance due to random measurement error. It is calculated by using the following formula [214, 215]:

$$AVE = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum_i \epsilon_i} \tag{5.6}$$

Where λ is the standardized factor loading of each measurement item to the given factor, and ϵ is the respective error variance for each item. ϵ is calculated using the Equation 5.5. An AVE value of 0.5 or greater is considered a good rule of thumb for supporting the convergent validity for each construct ($AVE >= 0.5$) [196].

Table 5.5 summarizes the above three measurements used to confirm the convergent validity

of all refined measurement models.

Table 5.5: The convergent validity assessments.

Measure	Definition	Threshold
SFL	It indicates the level to which each measurement item converges with the corresponding construct.	$(SFL >= 0.5)$ [196].
CR	It estimates the reliability of a construct based on its corresponding measurement items.	$(CR >= 0.70)$ [215].
AVE	It is the average of the amount of variance captured by a particular construct to the amount of variance due to random measurement error.	$(AVE >= 0.5)$ [214].

The Discriminant Validity indicates the extent to which a construct is distinct from other constructs in the proposed framework [196]. It seeks to confirm that two underlying constructs that existed in the framework that are not supposed to be related are unrelated; it seeks to discriminate among different independent constructs. The discriminant validity can be assessed by comparing the value of $\sqrt{AVE}$ for each construct with its relationship to other constructs [196, 214]. To establish discriminant validity of the measurement model, the the values of each construct's correlation should be lower than its $\sqrt{AVE}$ value.

Once this step is completed, the CFA measurement analysis helped to verify the suitability of the updated measurement model for the sample data in the given research, enabling us to proceed with additional SEM analysis to examine the structural model.

5.3.4 Structural Model Analysis

The last step of the analysis procedure is assessing the structural model's validity. It examines how constructs are related to each other by measuring the path among them in the proposed conceptual framework. The path coefficient evaluates the magnitude, direction,

and significance of the connections between the constructs [196, 213]. The developed hypotheses would be either accepted or rejected based on the significance of the relationship among constructs [202, 213]. Before measuring the path coefficient, it is important to guarantee the fit of the structural model by measuring the GOF indices values and obtaining the acceptable threshold values as shown in Table 5.3. If the structural model does not meet satisfactory GOF values, it requires further refinement to ensure its validity [196].

Once the structural model has confirmed an acceptable fit, the SEM analysis can continue to compute the path coefficient to decide whether the developed hypotheses are accepted or rejected. Individual estimates of parameters for every developed relationship (hypothesis) between two theoretical constructs will be assessed. The Maximum Likelihood Estimation (MLE) method is commonly used to estimate these parameters in the SEM analysis. It determines the values for the parameters in the model that best describe the observed relationships by maximizing the likelihood function to find the probability distribution [211, 217]. In hypothesis testing, the z value and the p value are considered statistically significant tests of the estimated parameters. Therefore, the z value is defined by calculating the ratio of each parameter estimate to its standard error. The z value is statistically significant if it exceeds the range of ± 1.96, with a significant p value less than 0.05 ($p <= 0.05$). Hence, the relationship will be considered significant, and the developed hypothesis will be supported. Otherwise, the developed hypothesis will be rejected [211, 217]. These structural model assessments are shown in Table 5.6.

Table 5.6: The assessments of the structural model.

Measure	Definition	Significant value
Z **value**	It is the ratio of each parameter estimate to its standard error.	$(-1.96 > Z > +1.96)$ [211, 217].
P **value**	It represents the probability value of obtaining the results of the z value.	$(P <= 0.05)$ [211, 217].

5.4 Conclusion

In this chapter, we have discussed different research paradigms, and then we adopted the appropriate ones for this research study. We also have outlined the methodology of the study and the procedures employed to collect data. The quantitative research method is adopted to answer the research questions due to its capability in exploring the relationships among the constructs by analyzing numeric data and the possibility of generalizing the research findings to larger communities. This chapter mainly aims to statistically identify the steps required to analyze and understand the quantitatively collected data. The research methodology is designed to analyze citizens' adoption behavior of e-government services.

The SEM analysis technique is adopted for data analysis due to its effectiveness in increasing the accuracy and credibility of the results. It confirms that the data are well prepared for measuring the theoretical constructs. It also ensures the reliability and avidity of the underlying constructs by employing specific measures. Hence, in this chapter, we explained the phases of SEM procedures alongside the particular assessments for each phase. The following chapter, chapter 6, focuses on the case study employed in this dissertation to apply the proposed framework and ensure effective implementation of the data analysis techniques discussed in this chapter.

Chapter 6

Case Study

This chapter intends to contribute to enhancing the employment services and labor sector by investigating e-government employment services and exploring the critical factors that affect adoption behavior. In section 6.1, we provide a general overview of the unemployment rates in the world, followed by a comparative analysis of job seeking web portals' usability between the US and Saudi Arabia in section 6.2. The comparative study findings shed light on the lack of usability in the Saudi job seeking web portal. Therefore, The Saudi e-government employment services, especially the job seeking web portal, will be investigated using the proposed holistic framework. In section 6.3, we provide a general overview of the Saudi country, followed by exploring the development of Saudi e-government systems in subsection 6.3.1, and previewing the current state of the Saudi labor sector and the offered employment services in subsection 6.3.2. After that, we explore the Saudi e-government adoption behavior from citizens' perspectives by previewing some studies in the literature in subsection 6.3.3.

However, the Saudi government has performed significant amendments to Saudi law toward Saudi females' rights, including getting jobs without family members' permission. Therefore, we discuss this dramatic change in Saudi society in subsection 6.3.4. We conduct an extended user study to evaluate the usability of the Saudi job seeking web portal based on gender perspective. Finally,in section 6.4, we develop the sample size and questionnaire wordings for the Saudi employment services context.

Regarding the research contributions: this chapter contributes to achieving research goal 2 by fulfilling task-4, which is "use the framework in a specific context to evaluate the e-government adoption behavior from citizens' perspectives". It includes the research contributions that have been accomplished so far, which are: the comparative analysis of the usability of e-government employment services and the gender disparity in the usability of the Saudi job seeking web portal. In addition, this chapter provides the procedural steps to conduct the future research contribution, which is: An empirical evaluation of citizens' adoption of the Saudi e-government employment services using the proposed conceptual framework.

6.1 Unemployment Rates in the World

According to the world bank, the unemployment rate increased in the world by 6.471% in 2020 compared to 5.373 in 2019. Figure 6.1 shows the unemployment rates worldwide since 1991 [3]. Governments pay attention to reducing unemployment rates by providing various e-services that boost the labor sector and support job seekers to find the right jobs. One of the 2030 agenda for Sustainable Development is to spur economic growth through decent employment [2].

In this research, e-government employment services are adopted to deeply investigate the significant factors for the adoption of such services from citizens' perspectives. We start the investigation by comparing the usability of job seeking web portals between a developing country (Saudi Arabia) and an e-government development leading country (The United States). The following section elaborates on this comparative analysis.

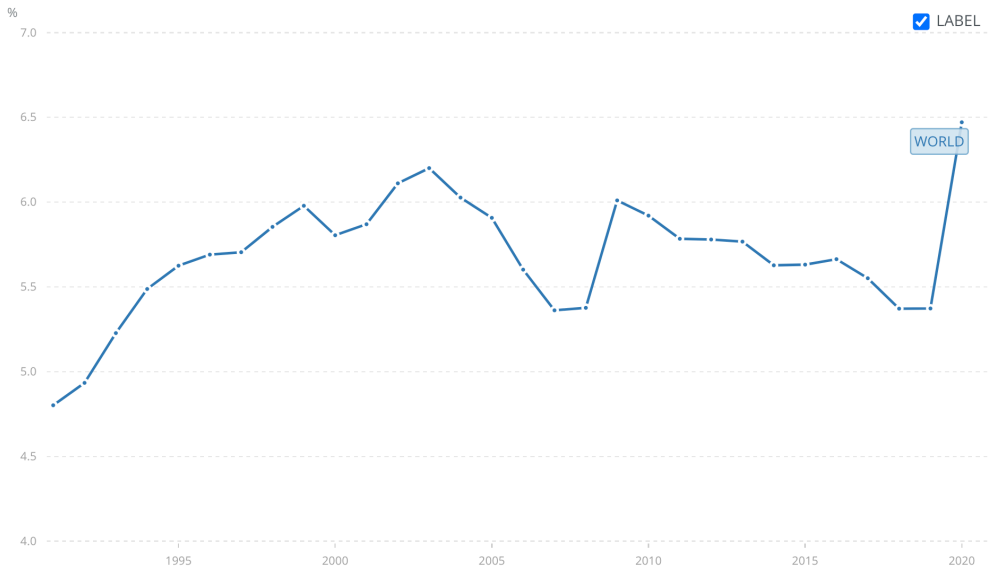


Figure 6.1: The Unemployment rates in the world 1991-2020 [3].

6.2 A Comparative Analysis Between Two Job Seeking Web Portals

We have conducted an empirical comparative analysis study to investigate and compare the cultural usability between the Saudi job seeking web portal 'Taqat' [218], and the United States (US) job seeking web portal, 'USAJOBS' [219], from the perspective of Saudi and US citizens. We mainly aimed to determine where the Saudi e-government employment services stand, especially the job seeking web portal compared to dominant global countries in the e-government sectors, the US. Hence, we have investigated the multicultural usability of both web portals to improve the Saudi web portal and gauge its extent to serve multicultural societies [24].

Both the Saudi and US job seeking web portals are official government portals that require users to register using their real information. Therefore, we built and designed two prototypes that match and mirror both web portals. The web prototypes allow participants to explore

them as if they were using the original web portals. They can apply for a job and submit the request. Additionally, we paid attention to a significant cultural difference between Saudi and US citizens regarding the language. Therefore, we designed the prototypes of both portals in English and Arabic. The English version was distributed among the US participants, while the Saudi participants explored the Arabic version. Moreover, we anonymously designed both prototypes by removing the portals' titles, logos, and recognizable keywords. The web prototypes are just abstract designs of both portals to prevent any bias in the usability evaluation. Figure 6.2 and Figure 6.3 show the homepage of both web portals and the mirroring web prototypes in both languages.

The study revealed that the USJOBS web portal's usability showed no cultural difference between the Saudi and US citizens with p value ($p = .077$). While there was a significant cultural gap in the usability of the Taqat web portal based on p value ($p = .000$). Hence, Saudi e-government developers should take serious actions to narrow down the culture gap in the usability of the Taqat web portal. For a further investigation of the Taqat web portal, the Social Influence (SI) factor is included in the proposed framework will to investigate its impact on adopting the Saudi e-government employment services, represented by the Taqat web portal.

Therefore, a deeper investigation is conducted towards the Saudi e-government employment services to enhance citizens' experience while using the services that would contribute to reducing the unemployment rates in the country. Before previewing the labor sector in Saudi Arabia and the statistics of unemployment rates, a comprehensive overview of the country and its e-government initiatives are explained to provide a clear picture of the current state of Saudi e-government services in general. We then shed light on the employment services offered to Saudi citizens for further investigation regarding the adoption behavior. The following sections elaborate on the Saudi e-government system.

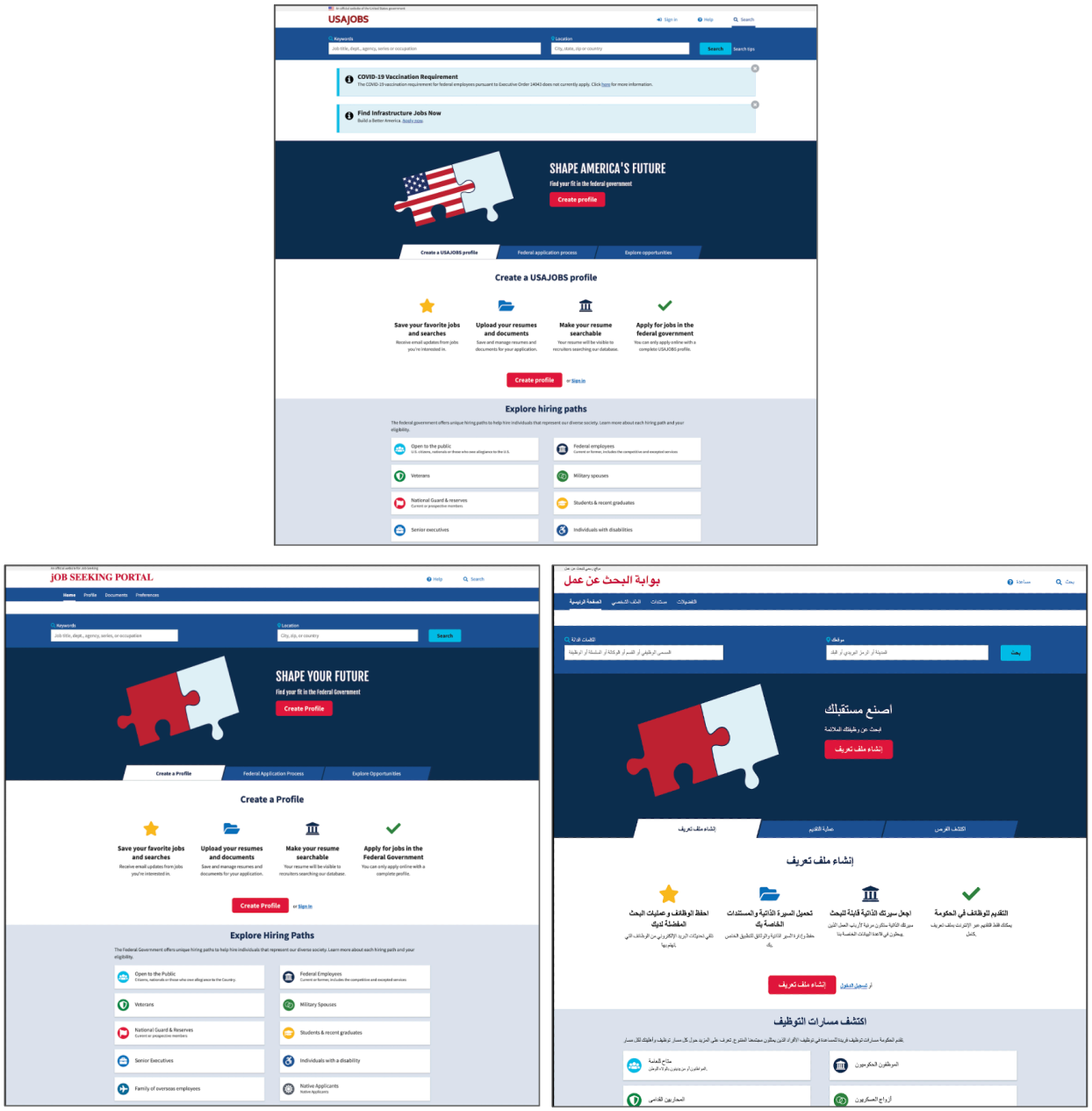


Figure 6.2: The US Job seeking web portal: **Above:** *the real web portal.* **Bottom-left:** *The web prototype in English.* **Bottom-right:** *The web prototype in Arabic.*

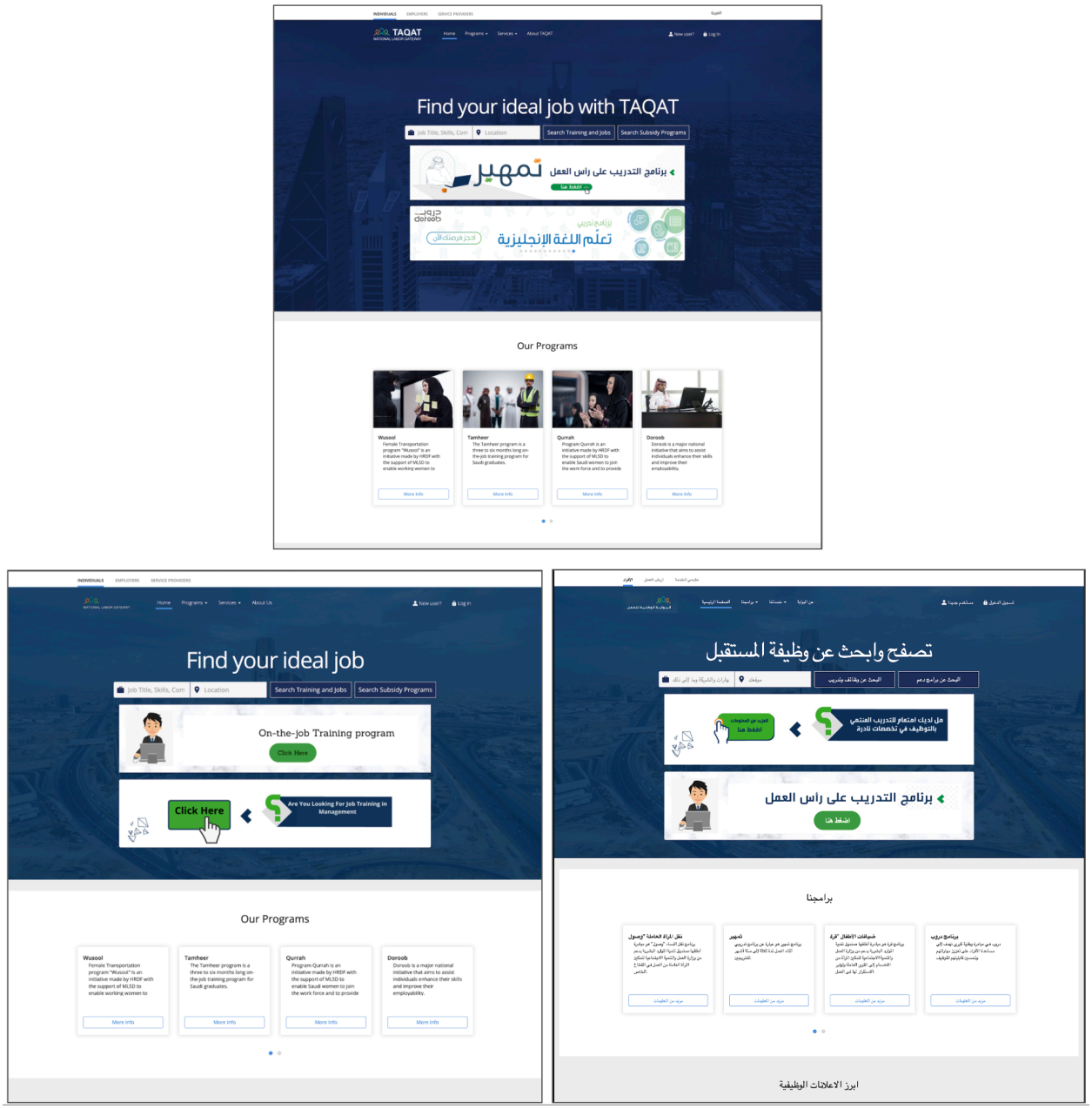


Figure 6.3: The Saudi Job seeking web portal: **Above:** *the real web portal.* **Bottom-left:** *The web prototype in English.* **Bottom-right:** *The web prototype in Arabic.*

6.3 Saudi Arabia Overview

Saudi Arabia is officially called the Kingdom of Saudi Arabia (KSA). It is the birthplace of Islam and home of the religion's two holiest sites, Mecca and Medina. It is located in the middle east, in the southwestern region of Asia, and it covers a vast portion of the Arabian Peninsula, encompassing an area of around 2,149,690 km^2. Saudi Arabia is the largest country in the world without a river, as a substantial percentage of its land is occupied by deserts and mountains. Riyadh is the capital of Saudi Arabia and is located in the middle of the country [220].

The modern Saudi state was founded in 1932 by King Abd Al-Aziz bin Abd al-Rahman Al Saud. The government regime is an absolute monarchy, as King Abdulaziz's sons have inherited the kingship. The current monarch is King Salman bin Abdulaziz and the crown prince Mohammad bin Salman. The official title of the King of Saudi Arabia is the Custodian of the Two Holy Mosques [220].

According to the most recent population statistics (in July 2021), Saudi Arabia has a total population of 34,783,757, with a population growth of 1.62%. Immigrants represent 38.3% of the total population. In terms of gender, the total population constitutes 1.3 males/females, with 55.57% males and 44.42% females. The majority of the Saudi population is young, as nearly 40.22% of the Saudi population is under 25 years. Regarding age, 24.84% of the population is between 0-14 years, 15.38% is between 15-24 years, 50.2% is between 25-54 years, and 9.58% is from 55 years and above. The population is overwhelmingly Muslim, and Arabic is the official language, followed by English as the second dominant language [220, 221].

The economy of Saudi Arabia is oil-based with focused government controls over major economic activities. It holds approximately 16% of the world's confirmed petroleum reserves.

Furthermore, it ranks eighth globally in terms of natural gas production [220, 221].

6.3.1 Saudi E-government

Saudi Arabia is a developing country with an extraordinary ambition to enhance government services and improve the current government level. It has recognized the benefits of adopting the latest technologies to improve public service delivery to all potential users. Therefore, it has adopted various strategies, plans, policies, and initiatives to develop the government system. For instance, it started by introducing the internet in public organizations in 1994 and developed many strategies that allow Internet access by citizens in 1999 [222]. Nowadays, the majority of the Saudi population has a good internet experience, with 97.862% of the population being internet users [223].

Within the rapid growth of Internet use in 2003, the Saudi government founded the Ministry of Communications and Information Technology Commission (CITC) to organize Internet use and develop the ICT infrastructure in the country [224]. The main tasks of the Saudi CITC include the provision of adequate and affordable telecommunications services, the provision of access to public networks, ensuring transparency of procedures as well as equality and non-discrimination principles, and maintaining the confidentiality of telecommunications information [224, 225].

In 2005, the first Saudi e-government program had been launched by the CITC, called "Yesser" to transform the Saudi government digitally and enhance the delivery of public e-services [224, 226]. Yesser program refers to the Arabic word, which means 'make it easy.' Therefore, this program serves as a facilitator for e-government services and makes plans to provide public services electronically and equally to all potential users [33]. This program mainly aims to increment the efficiency of Saudi organizations, improve the provision of e-

services, and accurately provide target users the necessary services in a timely manner [226, 227].

Saudi Arabia maintains a solid digital infrastructure to speed up the digital transformation of the government system. This digital transformation enables the public and private sectors to face disruptive issues, assure business continuity, and facilitate all citizens' requirements. Therefore, the Saudi government has developed a five-year strategy within three action plans [227, 228]:

- The first action plan was implemented during the period of 2006 to 2010 to develop the Yesser program and facilitate its functions. This plan aimed substantially to offer all government stakeholders better and enhanced public e-services and improve public organizations' efficiency. The e-government vision stated that everyone in the country must be able to access government e-services electronically through seamless and user-friendly electronic means by the end of 2010 [227, 229].

- The second action plan was formulated from 2012-2016. This plan aimed to support e-government with integrated human resources, enhance communication among government agencies and their users, and enhance society's cooperative environment. The e-government vision of this plan stated that everyone would be able to use government services effectively and efficiently through integrated, secure, easy-to-use multiple electronic channels [226, 228].

- The third action plan refers to the current e-government strategy towards smart government initiatives and is taking place over 2020-2024. It aims to provide a world-leading digital government by focusing on government beneficiaries, offering innovative government services, and enhancing an adequate digital environment. The e-government vision in this stage stated that enabling, accelerating, and stimulating the development

of digital government through leading an innovative, sustainable, and advanced digital transformation of government sectors in Saudi Arabia [226, 228].

In 2016, Saudi Crown Prince Mohammad bin Salman announced a new Saudi vision called 'Vision 2030' [230]. It is a strategic plan adopted as a roadmap for improving Saudi economics and developmental actions. It aims to grant the Saudi government a leading position in all fields. It also aims to deliver integrated and ultimate public e-services and build a robust ICT infrastructure. The main objectives of this vision include reinforcing Saudi economic activities, supporting non-oil international trade, and promoting an enhanced and softer image of Saudi Arabia [230, 231].

According to the United Nations' annual report, the Saudi e-government has currently shifted from a high to a very high EGDI group for the first time in 2020. Saudi Arabia's rank has dramatically increased to 43rd compared to the 52nd in 2018, with an EGDI value of 0.7991. However, Saudi Arabia has not yet accomplished significant e-government development progress with the Online Services Index (OSI) of 0.6882. although it has a very high EGDI value, its OSI value is considered low [2]. Therefore, it's required to conduct continuous investigations for accelerating the development of the Saudi e-government e-services.

On March 10th, 2021, Saudi Arabia's government approved establishing and launching the Digital Government Authority (DGA) and canceling the 'Yesser' program. This authority aims to: participate in preparing the national strategy for digital government, organize digital government services, platforms, websites, and networks, establish technical standards for government digital transformation models, and regulate the Saudi government cloud. The authority builds specialized national capabilities in the digital government to adopt and empower modern technologies. Also, it approves policies related to the authority's activities, plans, and projects required to implement them to enhance the digital government experience and upgrade digital services to satisfy citizens, residents, and visitors. Based on

this authority, the Saudi government is expected to accelerate the digital transformation of e-government services and drive further regulations in the Saudi government development [232].

6.3.2 Saudi E-government Employment Services

The Human Resources Development Fund (HRDF) is a Saudi governmental authority that was established in 2000. This authority works under the Saudi Ministry of Labor and Social Development. HRDF has mainly focused on financially supporting organizations that train and prepare Saudi citizens for working in the private sector. Therefore, in the first year of employment, the HRDF pays 30% of Saudis' salaries who work in the private sector to motivate the private sector to hire Saudi citizens. Moreover, it supports entrepreneurs of citizens to establish their businesses. During the time of 2000-2010, the Saudi government represented by HDRF authority established many programs to support the labor market in Saudi Arabia and ensure its prosperous future [233].

In 2011, HDRF established job placement centers, which intend to promote a productive employment process by providing inclusive training for Saudi citizens and developing employment strategies for citizens with disabilities to help them be an active part of society. They also enable employers to participate in the labor market and respond to its changes, ensuring positive impacts on economic growth in the country. The job placement centers reached 47 centers across the country, with 24 male centers and 16 female centers.

In the continuous participation and contribution to thrive the labor market, HRDF established the job seeking web portal, called 'Taqat', in 2016 [218]. Taqat is the Saudi National Labor Gateway that delivers job offers and helps Saudi job seekers find the right jobs with care and concern. It also facilitates smooth communication channels between citizens and employers. Taqat web portal serves as an employment support channel that encompasses all

necessary information regarding the Saudi labor market. This National Labor Gateway tends to provide a high-level digital labor market to improve the Saudi workforce and empower job seekers. It mainly aims to provide an integrated platform for all Saudi labor market beneficiaries: job seekers and employers. It also enhances transparency in the labor market and supports employers in their decision-making. Besides its employment services, Taqat also provides various training services to prepare job seekers for their future jobs [233].

In 2019, the Saudi government established the Ministry of Human Resources and Social Development after merging the Ministry of Labor and Social Development with the Ministry of Civil Service. This new Ministry is responsible for offering Saudi citizens and legal residents support, development, and protection in their work. It is also in charge of labor affairs, issues, and rights by creating legislation and laws to regulate the Saudi labor market [234].

According to the survey's findings on the Saudi labor market by the General Authority for Statistics (GASTAT) for the fourth quarter of 2020, the unemployment rates of the total population, Saudis and non-Saudis who are 18 years and above, decreased to 7.4% compared to 8.5% during the third quarter of the same year. Moreover, the unemployment rates of Saudis, males, and females, decreased to 12.6% compared to 14.9% during the third quarter of the same year. Figure 6.4 shows the statistical changes in unemployment rates among Saudis and non-Saudis for the last two years, 2019-2020. The survey also showed that during the fourth quarter of 2020, the labor force participation rate of the total population increased to 61.0% compared to 59.5% in the third quarter of 2020. The total male population's participation rate reached 80.6%, up from 79.4% during the third quarter of the same year. Whereas, the females' participation rate increased to reach 32.1%, compared to 30.0% in the previous quarter of the same year [4].

In this research study, the Saudi National Labor gateway, Taqat, is adopted as a case study to apply the proposed conceptual framework and investigate the key factors that

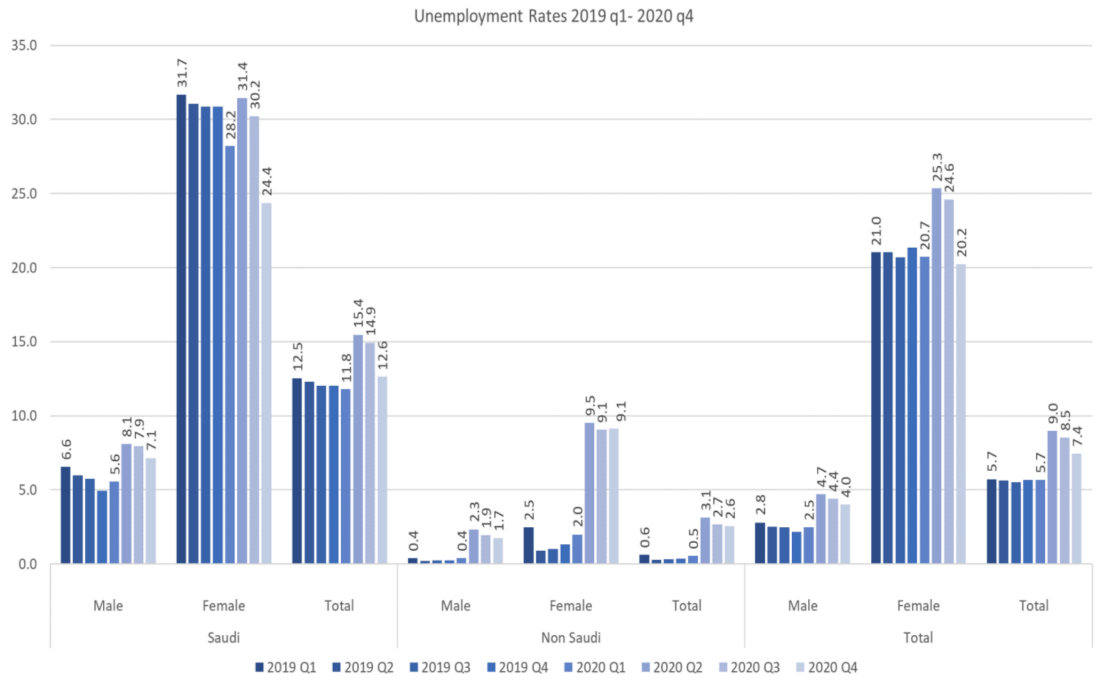


Figure 6.4: The Unemployment rates in the Saudi market during 2019-2020 [4, p. 2].

influence the citizens' adoption behaviors of the Taqat web portal.

6.3.3 Saudi E-government Adoption Studies

As mentioned in subsection 6.3.1, the vision of the first Saudi e-government action plan over 2006-2010 aimed to facilitate the accessibility to e-government services by the end of 2010 by all citizens. Since 2010, almost all Saudi citizens have had access to Saudi e-government services electronically. Therefore, we have reviewed the Saudi literature studies published in 2010 and after because we aim to investigate citizens' perception of the Saudi e-government, which was not fully accessible before 2010.

Saudi Arabia is recognized as a developing country that has made significant advancements in the development of e-government. Hence, we have reviewed some Saudi studies for a

better understanding of e-government adoption behavior. Alsaif [235] explored the significant factors for adopting Saudi e-government services moderated by socio-cultural values, such as religion, culture, and traditions. The study proposed a framework that adopted the UTAUT alongside external factors from other theories, such as the IS Success model, DOI, and trust model. The study adopted an online quantitative questionnaire to survey Saudi citizens from different areas of the country. A total of 692 valid responses were returned. The regression analysis tests were carried out to investigate the influence of the proposed factors. The study revealed that performance expectancy is the strong determinant of the intention to use Saudi e-government, followed by Effort expectancy, social influence, facilitating conditions, perceived trust, and the quality of the system and information. Additionally, computer self-efficacy and the system's compatibility were found to be significant predictors of adoption behavior.

Alrowili et al. [172] investigated the significant factors for adopting Saudi mobile government services. TAM was adopted along with some external factors to obtain the Saudi citizens' perceptions regarding the adoption of the Saudi mobile government. The quantitative methodology was adopted to collect responses using a web-based questionnaire, a total of 451 Saudi citizens participated in this study. Then, the SEM techniques were adopted to analyze the collected responses. The study's findings emphasized that the perceived time saving, perceived usefulness, perceived ease of use, perceived trust, usage experience, and attitude are the significant determinants for adopting the Saudi mobile government from the citizens' perspectives.

In another Saudi e-government study, Babullah et al. [236] adopted UTAUT and other external factors to investigate the significant factors that affect the Saudi mobile government adoption from the citizens' perspectives. The survey instrument was adopted to collect responses. A total of 396 responses were returned, and the SEM techniques were used to

analyze the collected responses. The results revealed that performance expectancy, effort expectancy, perceived risk, innovativeness, social influence, facilitating conditions, perceived value, motivation, and behavioral intention significantly influence the adoption of Saudi mobile government services.

Another study was conducted to investigate the factors influencing the acceptance of mobile government services by Saudi citizens [237]. The study proposed an integrated conceptual framework combining TAM, IS Success model, and trust models. A survey was administered to collect responses, and 695 valid responses were received, which were then analyzed using SEM techniques. The study found that the main factors significantly influencing Saudi citizens' acceptance of mobile government services were perceived ease of use, perceived usefulness, perceived trust, mobility, service quality, and user satisfaction.

Alshrari et al. [238] investigated the extent to which Saudi citizens were satisfied with the Absher system. Absher is an electronic system launched by the Saudi Ministry of Interior that allows Saudi citizens and residents to conduct their transactions electronically as it connects all government sectors. Absher platform serves around 20 million users and provides more than 200 e-services [239]. TAM was adopted to answer the research questions regarding Saudi citizens' perceptions and acceptance of using the Absher system. The quantitative methodology was adopted, and a total of 733 valid responses were returned. To examine the impact of the proposed factors, regression analysis tests were conducted. The study revealed that using the Absher system as a one-stop access point for all Saudi e-services can be predicted by the perceived ease of use and perceived usefulness.

Moreover, AL-Zahrani [173] investigated the factors that significantly affect the adoption of Saudi e-government services. A new framework was adopted from TAM, IS Success model, and external cybersecurity factors to investigate Saudi citizens' perceptions towards using the offered e-services by the Saudi government. A survey instrument was used to collect

responses, and a total of 211 valid responses were returned. Then, SEM techniques were adopted to analyze the collected responses. The study revealed that the IS Success factors directly influence users' satisfaction. TAM factors alongside the cybersecurity factors significantly influence the perceived risk, which all affect the adoption of e-government services. To summarize, the following factors showed their significance in adopting Saudi e-government services from citizens' perspectives: perceived usefulness, perceived ease of use, system quality, service quality, information quality, perceived security, perceived privacy, perceived trust, perceived risk, and user satisfaction.

Overall, many prior Saudi research studies have been conducted to explore the significant factors that influence the Saudi e-government adoption behavior from citizens' perspectives. We briefly discussed some of these studies. Table 6.1 provides an overview, not limited to, of the critical factors influencing the Saudi citizens' adoption behavior of Saudi e-government services.

Table 6.1: An overview of Saudi e-government adoption studies.

Perspective	Critical factors		Reference
Demand side	• Perceived usefulness • Perceived ease of use • Performance expectancy • Effort expectancy • Computer self-efficacy • Facilitating conditions • Social influence • Perceived trust • System quality • Service quality • Information quality • Trust of the e-government • Trust of the Internet • Perceived risk	• Perceived privacy • Perceived security • Awareness • Usage experience • Compatibility • Trust propensity • Innovativeness • Perceived benefits • Socio-culture • Perceived simplicity • Mobility • Perceived time saving • Perceived value	[170] [171] [172] [173] [177] [180] [181] [235] [236] [237] [238] [240] [241] [242] [243]

6.3.4 Gender Disparity and Saudi E-government

For the past two years 2019-2020, the Saudi government has performed significant amendments that cause dramatic changes in Saudi society, especially for Saudi women. During Saudi Arabia's history, women's rights have been limited in some sectors, especially the government sector. Women did not have full access to Saudi government services as some

services required male guardianship (father, brother, husband, or even son), such as issuing an ID card or passport. In the labor market, women needed their guardian's consent to apply for a job.

However, 2019 was the turning point for all Saudi women, as the amendments have changed to protect women's rights and empower them in different government positions [244, 245]. Saudi women have widely embraced new laws that allow them to drive, travel, get a job, and use all government systems with no restrictions the same as Saudi men [246]. Since 2019, the Saudi government has committed to supporting Saudi women and protecting their rights at national and global levels [247]. This dramatic change in Saudi women's lives motivates us to adopt Saudi e-government employment services and investigate the gender disparity in adoption behavior.

Regarding the survey's findings on the Saudi labor market by the General Authority for Statistics in 2020, the total unemployment rate of males, Saudis, and non-Saudis, decreased to 4.0% compared to 4.4% in the previous quarter. While females' overall unemployment rate decreased to 20.2% compared to 24.6% in the third quarter of the same year, as shown in Figure 6.4. For Saudi citizens, the overall unemployment rate of Saudi males in the fourth quarter of 2020 is 7.1%, while the unemployment rate of Saudi females is 24.4%. That indicates a significant gap between Saudi males and females regarding the unemployment rates, which intrigues further research efforts to explore whether there is gender disparity in the adoption of Saudi e-government services, specifically employment services [4].

Moreover, Saudi 'Vision 2030' has robust goals for obtaining significant employment rates for Saudi citizens. It aims to reduce the unemployment rate for Saudi citizens and to increase the proportion of Saudi women who are active in the labor force. Currently, Saudi youth and women face higher unemployment rates than other groups in society, which needs more efforts to investigate the causes of the high unemployment rates for the sake of reducing

them [230]. Therefore, in this research, we mainly aim to examine the factors that have a substantial impact on the adoption of the Taqat web portal, the Saudi National Labor gateway from the perspective of Saudi males and females in order to explore any potential gender disparity in the adoption behavior.

Review of Literature on Gender Disparity in Saudi E-government Context

From prior research studies, gender has been recognized as a significant determinant of public e-services and technology usage [248]. In the e-government context, several studies have explored the significance of gender differences in adopting e-government services [35, 78, 124, 249, 250]. However, in the Saudi context, the current state of Saudi women has highly motivated us to further research in investigating any potential gender disparities between males and females to investigate the Saudi e-government adoption behavior from the lens of gender.

In prior Saudi studies, gender differences have been mentioned in their findings as an obstacle hindering an equal experience of Saudi e-government services. For instance, Alsaif [235] revealed that the Saudi society's characteristics have an impact on the adoption of e-government services, which reflects the small number of female participants due to the lack of their interests, as many females are completely dependent upon male relatives to deal with government services and transactions. The study also revealed that 74% of Saudi male participants have never used the e-government system before, as they prefer to do face-to-face transactions. Therefore, gender separation and the women's driving ban motivated many females to adopt e-government transactions electronically, which makes them better at using the e-government systems.

Alghamdi [240] also discussed the study's limitations regarding the biased sampling of partic-

ipants in favor of males over females, with 92.4% Saudi males and only 6.7% Saudi females. They claimed that it is due to the Saudi society where males usually conduct almost government transactions than females. That is because Saudi males have full access to all e-services and are in charge of their female relatives by law. As for many government transactions, Saudi females need authorization or consent from one of their male family members to conduct such transactions themselves. Although the study revealed no significant differences between males and females regarding the intention to adopt e-government services, the imbalanced sample size in gender prevents generalizing the study's study findings to potential female users.

In another Saudi study, Alotaibi [241] revealed that Saudi female participants have a stronger attitude and higher adoption of e-government systems than males. Due to Saudi society's regulations, many Saudi females prefer to conduct their transactions electronically. They feel free while using e-government services because it is difficult for them to conduct face-to-face transactions. Moreover, the authors discussed the limitation of the study regarding the sample size. The study includes 22% Saudi female participants compared to 78% male participants, which calls for future research focusing on involving more female participants and ensuring the balance of the sample size to allow the generalizations of the study's findings across the entire population.

Almukhlifi [243] also revealed a significant gender gap in the sample size, with 88.1% males and only 11.9% female participants. They claimed this gap is due to the low uptake of Saudi e-government services from women than men. Although the sample size is biased, the study concluded that male usage of e-government services is higher than that of females because of Saudi society's traditions and regulations.

A Saudi research study was published after the amendments to Saudi women's rights in 2019. Alonazi [180] revealed that the number of Saudi females conducting e-transactions

is more likely to increase due to the current law that allows them to conduct government transactions themselves without any authorization from their male family members. While the study revealed that a higher percentage of Saudi males access e-government services than females, it is anticipated that the percentage of females adopting and accessing e-government services will soon be very close to that of males. However, the authors noted a limitation in the study regarding the unbalanced sample size. Despite recruiting a higher number of female participants than in previous studies, the sample size was still not entirely balanced. A total of 1286 participants were recruited, with 813 male participants (63.2%) and 473 female participants (36.8%). The authors noted the unbalanced sample size and called for further research efforts to investigate the adoption of Saudi e-government services from the perspectives of Saudi females.

In conclusion, due to the findings of the research studies discussed above and the dramatic changes in Saudi society regarding Saudi females' rights, it is highly essential to preview the current state of Saudi e-government systems and understand the e-government adoption behavior from the perspectives of males and females equally. Hence, the findings of this research study could be generalized.

An Analysis of Gender Disparity of the Saudi Job Seeking Web Portal's Usability

For an initial investigation of the potential gender disparity in the Taqat web portal, we have conducted an empirical study to explore the usability of the web portal from the perspectives of Saudi men and women [25]. The user study shed light on the importance of detecting gender differences in the usability of government web portals to apply further improvements. The Mann-Whitney U test was used to inspect the gender gap in the usability of the web portal. The results showed significant gender disparities between Saudi males and females in the usability of the Taqat web portal ($p = 0.002$). They revealed that Saudi females use

the Taqat web portal easily and efficiently compared to Saudi males.

6.4 Questionnaire Development In Relation to Saudi Job Seeking Services

6.4.1 Saudi Population and Sampling

According to the annual report of the Saudi Human Resources Development Fund (HRDF) [233, p. 40], the total number of registered users to the Taqat portal is 258,214, where 122,444 are males and 135,770 are females. Hence, after identifying the sampling frame, 258,214 Taqat's users, we can identify the sample size out of this frame. As mentioned in chapter 5, the sampling equation Equation 5.1 is used to specify the size of participants in the context of Taqat's users. Based on this formula, the data will be collected from approximately 1106 participants registered in Taqat, the National Labor Gateway.

However, this research study investigates the gender disparity in adopting e-government employment services in Saudi Arabia, especially the Taqat web portal. Hence, an equal number of responses should be received from each gender group. Therefore, we divide the sample size by two to determine the required number of responses from each group. So, we will recruit 553 males and 553 females who meet the study's conditions, as mentioned in subsection 5.2.3, to provide their perceptions of adopting the Taqat web portal. A summary of the population and sampling characteristics related to the Saudi context is provided in Table 6.2.

Table 6.2: Population and sampling of the Saudi user study.

Characteristics	Definition
Population	Saudi citizens
Sampling frame	• Age >= 18, • Current users of Taqat web portal, • Users who have experience with Taqat for the last two years, 2020-2021.
Sampling frame size	258,214 Saudi citizens: 122,444 males / 135,770 females
Confidence level	97%
Error margin rate	3%
Sample size	**1106** Saudi participants
Gender distribution	**553 males / 553 females**

6.4.2 Questionnaire Wording and Translation

The words used in questionnaires can affect the accuracy of results; thus, researchers must carefully select the questionnaire's wording. The questions should be easy to understand using clear language to ensure participants' accurate responses [5, 22, 187].

In the context of Saudi e-government services, the participants are Saudi citizens, and the official language in Saudi Arabia is Arabic. Therefore, the questionnaire will be translated into Arabic to ensure the accuracy of the responses. Saunders et al. [5, p. 375] stated that "Translating questions and associated instructions into another language requires care if your translated or target questionnaire is to be decoded and answered by respondents in the way you intended." The quality of translation and validation of the translated instrument plays a significant role in ensuring that the results obtained in cross-cultural research are not due to errors in translation [251]. The questionnaire's translation should consider participants' feelings and ideas influenced by their socio-political-cultural context. The equivalence between

languages is always an issue in translation work.

To meet these accuracy requirements, the forward-backward translation technique will be used to translate the questionnaire [252]. Hence, the English version survey will be sent to linguistic specialists to translate into Arabic. Then, back-translation techniques will be used by translating the survey back from Arabic into English. This technique ensures the linguistic equivalence of the instrument and the quality of translation across cultures [5]. Therefore, we can obtain credible results when following this accurate translation process.

6.5 Conclusion

In this chapter, we have discussed the unemployment rates in the world. Then, we have conducted a comparative analysis of the cultural usability between two job seeking web portals, the US and Saudi portals from the perspectives of Saudi and US citizens and legal residents. The comparative analysis emerged the lack of the Saudi job seeking web portal's usability. Hence, the employment services in Saudi Arabia will be investigated and studied to explore the factors that significantly affect the adoption behavior of the Saudi job seeking web portal.

Therefore, we explored Saudi Arabia in-depth concerning its e-government systems. We narrowed down the Saudi e-government systems and focused on employment services, specifically Taqat National Labor Gateway. We have also reviewed the prior Saudi studies pertaining to the adoption of Saudi e-government services from citizens' perspectives. After that, we discussed the dramatic changes in Saudi society regarding the amendments of Saudi law toward Saudi females' rights. Since August 2019, Saudi females have had full access to all Saudi e-government services, the same as males. They can conduct e-government transactions and issue their IDs, and passports, get jobs and have driving licenses without consent from one

of their male family members. Therefore, we have discussed this event and evaluated the prior studies regarding Saudi e-government adoption with respect to a potential gender gap in their findings. Hence, the current state of Saudi society motivates us to investigate and understand the Saudi e-government adoption from Saudi males' and females' perspectives equally to shed light on any potential gender disparity in Saudi society towards adopting Saudi employment e-services; Taqat web portal.

In the last section, we have specified the population, sample frame, and specific sample size for the empirical study we aim to conduct on Saudi e-government systems, specifically the Taqat web portal. A total of 1106 valid responses are expected to be returned from the Saudi participants. To ensure the sample size balance, we aim to recruit the same number of Saudi males and females, with 553 Saudi males and 553 Saudi females. Moreover, the native language in Saudi Arabia is Arabic; therefore, we have translated the questionnaire into the Arabic language to ensure the accuracy and efficiency of the responses.

Chapter 7

Results

This chapter mainly aims to examine the factors that significantly affect Saudi citizens' adoption behavior of e-government, especially job seeking services. It provides the final results of all steps mentioned in chapter 5.

Regarding the research contributions: this chapter contributes to achieving research goal 2 by providing the results of all steps explained in task-3, regarding the development of the survey instrument. It also contributes to providing the results of task-4 by conducting the user study in a specific context. It provides the user study results regarding citizens' adoption behavior of the Saudi job seeking web portal using the proposed conceptual framework along with the UCD-based reference implementation. Then, it will provide a revised framework for e-government adoption in Saudi Arabia per each demographic data.

7.1 Questionnaire Validation Results

To understand the user experience of e-government services properly, we conducted the validity and reliability testing processes to provide a valid and reliable benchmarking web-based questionnaire to measure users' adoption behaviors of e-government services globally. The survey instrument is developed as a self-administered questionnaire. Below, we will explain in detail the results of this validation process.

7.1.1 Validity Testing Results

The crucial action posed by this step is determining whether the questionnaire items are provided in a representative manner that could be used to measure and evaluate the content of a corresponding construct [193, 194]. Figure 7.1 explains the required steps to conduct the validity testing. The preliminary stage in developing the survey instrument is providing a set of questionnaire items to measure each key factor proposed in the conceptual framework. In this case study, the questionnaire consists of five main factors: PEOU, PU, IS, FC, and TOG. The questionnaire items were retrieved from the literature studies on e-government. Initially, there were 55 questionnaire items, ten to evaluate each corresponding key factor and five to evaluate the dependent factor (the adopting behavior). For easy reference, the questionnaire items were coded based on the corresponding factor; for example, the PEOU factor includes the following items (PEOU01, PEOU02,...., PEOU10).

The second stage is the judgment process. In this step, academics and experts are invited to validate the questionnaire items based on their clarity, wording, and validity [23, 194]. In this process, panelists compare each factor's definition with its items and score them using a scale of 1 (not relevant), 2 (important), and 3 (essential). After that, the CVR formula is calculated based on the data received from the content validity test. Then, the survey instrument is modified based on the experts' content validation evaluation and comments.

The criteria for selecting experts in the recruitment process has been developed and is outlined below:

- Experts who have conducted extensive research in user experience in e-government including quantitative research methods and developing questionnaires.

- Experts working in e-government centers or authorities.

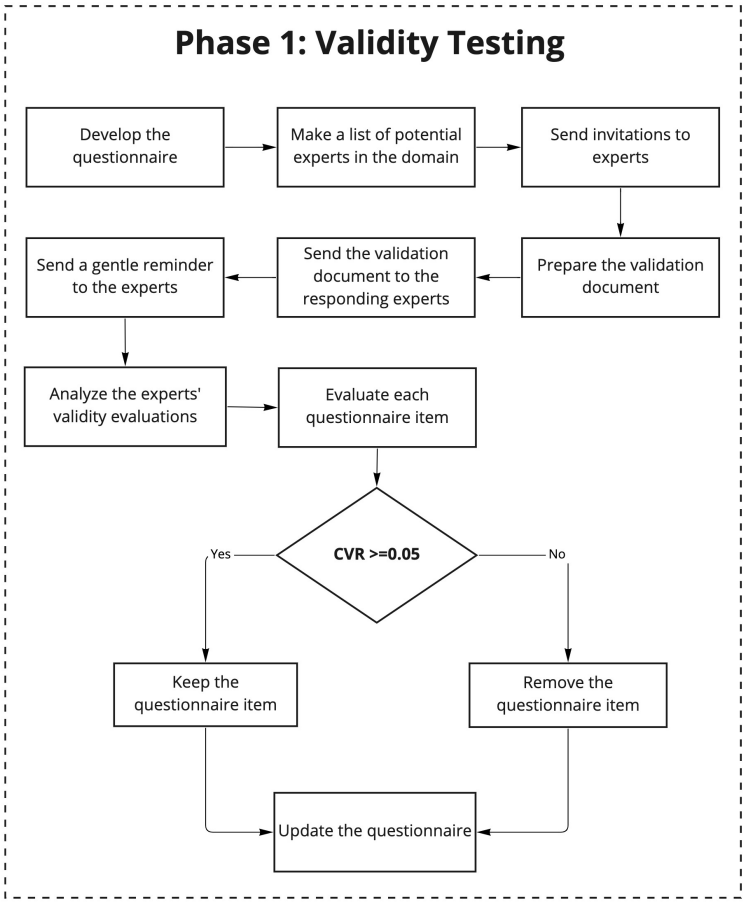


Figure 7.1: The validity testing steps.

- Experts who developed and participated in formulating well-known technology acceptance theories and models.
- Experts whose papers are included in the SLR study we have conducted.

Using the aforementioned criteria, we have curated a list of 60 experts hailing from 30 different countries who we believe would be an ideal fit for evaluating the developed questionnaire. After sending out an invitation email to all of the experts, we received apologies from eight experts due to their busy schedules. However, 20 experts expressed their willingness to evaluate the questionnaire items.

Following this, we compiled a PDF file consisting of the questionnaire items for each corre-

sponding key factor. The first page provided a brief explanation of the proposed conceptual framework and the definition of each factor included within the framework. The following six pages presented the questionnaire items, with every page designed to contain the items for one of the five independent factors and one dependent factor. Each item was accompanied by a dropdown list to score and provide optional comments. Additionally, the experts were encouraged to offer their comments and suggestions to improve the validity of the factors' items and their relevance to the given context. Figure 7.2 shows a snapshot of one page of the validation document. After preparing and sending the validation document to the 20 experts, the research team received three responses in the first week. In order to give the experts enough time to evaluate the document, the team waited for two more weeks before sending a gentle reminder to the remaining 17 experts. However, due to the busy schedules of the experts, who were also located in different time zones, response times were significantly delayed. After waiting for approximately three months, the team eventually received 16 evaluation documents from experts in 13 different countries. Table 7.1 presents a summary of the demographic data of the participating experts.

Table 7.1: Experts' demographic data.

Demographics	**Category**	**Total**	**Frequency**
Sample size		16	
Gender	Male	13	81%
	Female	3	19%
Institution country	USA	2	13%
	Indonesia	2	13%
	Saudi Arabia	2	13%
	Oman	1	6%
	UAE	1	6%
	Qatar	1	6%
	Kuwait	1	6%

Table 7.1: Experts' demographic data (continued).

Demographics	Category	Total	Frequency
	Jordan	1	6%
	Solvenia	1	6%
	France	1	6%
	South Africa	1	6%
	New Zealand	1	6%
	Mexico	1	6%

Then, we analyzed the evaluation documents by measuring the CVR for each item and modified the questionnaire by removing invalid questionnaire items. Table 7.2 illustrates the validation results of the PEOU factor. We ended up with four questionnaire items to measure each independent key factor and four items to measure the dependent factor. In total, the questionnaire includes 24 close-ended questions using a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5) to evaluate users' adoption behaviors of the offered e-government services.

Table 7.2: The validity testing results of the PEOU factor.

Reviewer	PEOU01	PEOU02	PEOU03	PEOU04	PEOU05	PEOU06	PEOU07	PEOU08	PEOU09	PEOU10
Expert 1	Essential	Not relevant	Essential	Essential	Important	Essential	Not relevant	Essential	Not relevant	Important
Expert 2	Essential	Essential	Essential	Essential	Not relevant	Important	Essential	Essential	Essential	Essential
Expert 3	Essential	Essential	Essential	Important	Essential	Essential	Important	Important	Important	Important
Expert 4	Important	Important	Important	Important	Important	Important	Not relevant	Important	Important	Important
Expert 5	Essential	Essential	Important	Essential	Important	Important	Essential	Important	Important	Essential
Expert 6	Essential	Essential	Essential	Essential	Essential	Essential	Essential	Essential	Important	Important
Expert 7	Essential	Essential	Essential	Essential	Essential	Not relevant	Not relevant	Not relevant	Not relevant	Not relevant
Expert 8	Essential	Important	Essential	Important	Essential	Essential	Not relevant	Not relevant	Not relevant	Important
Expert 9	Essential	Essential	Important	Essential	Essential	Essential	Important	Important	Important	Essential
Expert 10	Essential	Important	Not relevant	Essential	Important	Essential	Not relevant	Important	Important	Not relevant
Expert 11	Essential	Essential	Essential	Essential	Essential	Essential	Not relevant	Essential	Essential	Essential
Expert 12	Essential	Essential	Not relevant	Essential	Important	Essential	Not relevant	Important	Important	Important
Expert 13	Essential	Essential	Important	Essential	Important	Essential	Essential	Essential	Important	Essential
Expert 14	Important	Important	Not relevant	Essential	Important	Not relevant	Important	Important	Important	Important
Expert 15	Essential	Important	Important	Essential	Important	Important	Not relevant	Essential	Essential	Important
Expert 16	Essential	Important	Essential	Essential	Important	Important	Not relevant	Not relevant	Not relevant	Essential
Count: Essential	14	9	8	13	6	9	4	6	3	6
CVR= [n-(N/2)]/[N/2]	0.75	0.125	0	0.625	-0.25	0.125	-0.5	-0.25	-0.625	-0.25
CVR>=0.05	included	included	Excluded	included	Excluded	included	Excluded	Excluded	Excluded	Excluded

Independent Factor 1: Perceived Ease of Use

Please rate the following items regarding their relevance to this factor:

Code	Item	Score	Comments (Optional)
PEOU01	I would find the [e-gov service] system easy to use.	Select score	
PEOU02	[e-gov service] is flexible to interact with.	Select score	
PEOU03	My interaction with the [e-gov service] system would be clear and understandable.	Select score	
PEOU04	It is easy to complete my transactions while using the [e-gov service].	Select score	
PEOU05	It would be easy for me to become skillful at using the [e-gov service] system.	Select score	
PEOU06	Learning to operate the [e-gov service] system would be easy for me.	Select score	
PEOU07	The [e-gov service] provided online help instructions to learn how to use it easily.	Select score	
PEOU08	Using the [e-gov service] system requires a lot of effort.	Select score	
PEOU09	I believe using the [e-gov service] is cumbersome to use.	Select score	
PEOU10	I easily find what I'm looking for in the [e-gov service].	Select score	

Do you have any recommendations regarding this independent factor, for example: removing some items or adding others?

Figure 7.2: A snapshot of the validation document of the PEOU factor.

Comments Analysis

Regarding the open-ended questions for comments and suggestions, we received many insightful and helpful comments from experts. We then analyzed and aggregated the comments based on the issues they discussed. The most common comments were regarding the rewording of the questionnaire items due to their ambiguity. In addition, merging similar questionnaire items to reduce redundancy. Many experts mentioned the use of simple words to ensure that respondents will understand them properly and provide their opinions accord-

ingly. Other experts asserted avoiding negative words and double-barreled questions, which usually include more than one issue to discuss. Most of these issues have been addressed and discussed in the literature. Krosnick et al. [253] provided recommendations and best practices for survey research. They addressed the abovementioned issues along with recommendations to tackle them. Accordingly, we followed the experts' advice and improved the questionnaire items based on their comments.

Another important issue has been raised concerning the questionnaire items within the TOG factor. Many experts addressed the difference between trust in government and trust in the technology offered by the government (e-government). They believed in the importance of clearly distinguishing between these two concepts and properly choosing the questionnaire items that reflect the correct concept. One of the experts mentioned: *"You may want to distinguish between trust in government vs. trust in (e-gov) technology" (Expert 1).* While another expert commented on this issue: *"Trust is a multifaceted construct. In my own research, I consider trust in government, trust in government systems, and trust in technology used by the government as separate components/constructs that shape an individual's trust in e-government"(Expert 13).* In addition, another Expert said: *"I'd suggest tailoring trust of government to be more specifically related to the online interaction. I may not trust the government to do its best for me, e.g. in terms of taxes, but perhaps I trust their competency to keep my personal data safe through their IT systems" (Expert 15).*

Trust has received significant attention in social science. Trust in government indicates the trust in the current regime and the citizens' attitude to its actual performance, rather than focusing on the offered services [254]. While the e-government concept deals with the technical issues and the trust in the use and security of the technology that is offered by a specific government organization. It is not necessarily related to the trust of the actual government personnel or regime. Citizens may be more likely to use the offered e-government services if

they are confident that their information is protected and secured even though they do not trust the current government from the political point of view [255]. Morgeson and Petrescu [256] found that citizens who adopt e-government services did not have great satisfaction with the current government agency. The study indicated that citizens' adoption of e-government services was due to the technical performance rather than the agency. Moreover, Goldfinch [254] asserted that the adoption of e-government demands trust in technology itself and the technology performance offered by the given organization in the government sector.

Hence, we have taken this issue into consideration. As we mentioned earlier, we aim to develop a global conceptual framework that investigates users' adoption behaviors of the offered e-government services. The working definition of the TOG refers to the trust in the services and medium, not the government regime. We mainly focused on users' adoption behaviors towards the electronic services offered by the government organization from the perspective of technology use and performance. Therefore, we have revised the questionnaire items for the TOG factor and made sure that they focus on the trust in the offered electronic services, not the actual government agency.

Another issue was raised regarding the confusion between adoption and acceptance in the adoption behavior factor (the dependent variable). We provided one questionnaire item that states the acceptance of the service as equivalent to the adoption behavior. However, one of the experts mentioned the issue of using these two concepts interchangeably: *" You need to have a clear distinction between adoption and acceptance." (Expert 16).* Renaud and van Biljon [257] asserted the distinction between the adoption and acceptance of technology. The adoption of technology refers to the process of the user starting to know the technology and ending with adopting it. While acceptance is the attitude towards a technology before even using it. Besides, the technology theories and models used to evaluate the acceptance of technology are different from those used for the adoption behavior evaluation [258]. There-

fore, we have revised the questionnaire items on the adoption behavior and removed the item that includes the acceptance term.

7.1.2 Reliability Testing Results

In this step, we measure the internal consistency of the questionnaire and scale questionnaire items to ensure they are closely related to each corresponding factor. Figure 7.3 explains the required steps to conduct the reliability testing. First, the study was reviewed and approved by our university's Institutional Review Board (IRB). Then, a pilot study was conducted by recruiting 100 participants to provide their opinions regarding a specific e-government service. Next, we analyzed the responses collected from the pilot study and calculated Cronbach's alpha to evaluate the internal consistency of the questionnaire items for each factor and for the entire questionnaire.

As shown in Table 7.3, Cronbach's alpha for each factor is greater than 0.70, which is the acceptable cutoff point. We proved the reliability of the questionnaire, and no changes are required to the questionnaire items. Therefore, after ensuring the validity and reliability of the questionnaire, it is now ready to be used for the given user study. Appendix C provides the final version of the developed questionnaire items.

Table 7.3: The results of Cronbach's alpha.

Factor	**Name of factor**	**Number of items**	**Chrobach's alpha**
Independent factors	Perceived Ease of Use	4	0.932
	Perceived Usefulness	4	0.898
	Social Influence	4	0.793
	Facilitating Conditions	4	0.785
	Trust of Government	4	0.829
Dependent factor	Adoption Behavior	4	0.854

Table 7.3: The results of Cronbach's alpha (continued).

Factor	Name of factor	Number of items	Chrobach's alpha
	Overall questionnaire	24	0.951

7.2 Demographic Data Analysis

This section provides an overview of the demographic data collected from the user study aimed at investigating the gender disparity of e-government adoption behavior in Saudi Arabia, specifically job seeking services. The demographic data is analyzed across the participants' gender, age group, and education level. It provides an overview of the Saudi participants' profiles. Table 7.4 presents a summary of demographic data.

Table 7.4: Demographic data.

Demographics	Category	Total	Frequency
Sample size		1110	
Gender	Male	555	50%
	Female	555	50%
Age	18-30 years old	349	31%
	31-40 years old	348	31%
	41-50 years old	349	31%
	51-60 years old	64	6%
Education level	High school or less	202	18%
	Associate degree	324	29%
	Undergraduate degree	345	31%
	Graduate degree	239	22%

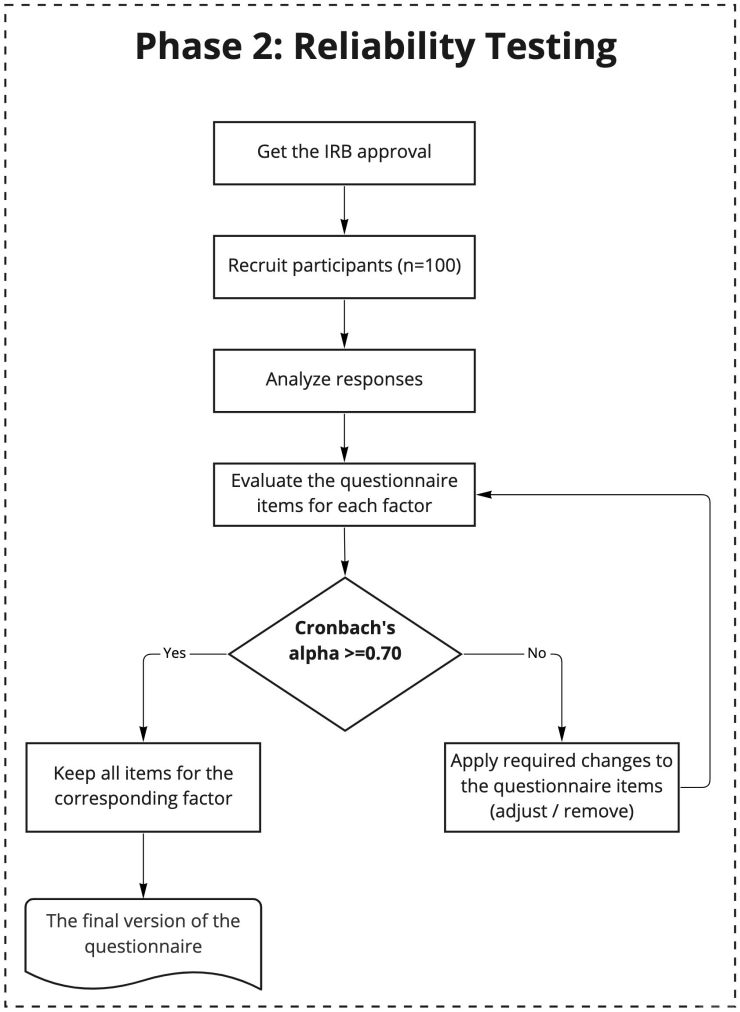


Figure 7.3: The reliability testing steps.

This study focuses on the gender disparity of adopting e-government services in Saudi Arabia. Therefore, we have recruited an equal number of males and females with 555 participants per group. Regarding age, there are four main categories of age groups, each has a ten-year interval. There is an equal percentage of participants from three age groups (31%), which are: 18-31 years old, 31-40 years old, and 41-50 years old. While only 6% of participants are from the 51-60 years old age group. This is because the majority of the Saudi population is young, as nearly 40.22% of the Saudi population is under 25 years, as mentioned in section 6.3 . Regarding the age, 24.84% of the population is between 0-14 years, 15.38% is between 15-24

years, 50.2% is between 25-54 years, and 9.58% is from 55 years and above [220]. The last demographic factor is the education level, 18% of the participants have a high school degree or less while 29% have an associate degree. Undergraduate participants are around 31% while participants with a graduate degree are 22%.

7.3 Data Analysis Results

After following the data analysis steps mentioned in section 5.3 by applying the SEM techniques, the final results regarding the adoption behavior of e-government services in Saudi Arabia are explained below. Herein, we have provided the final structural model results which show the significance of each factor on the adoption behavior of e-government services in Saudi Arabia, especially the job seeking e-government services. We have provided the results per the whole population, then per each demographic data.

7.3.1 Preliminary Data Analysis Results

A preliminary data analysis prepares the collected quantitative data and ensures it is ready for further analysis [196]. In this research, three preliminary data analysis assessments are performed, including missing data, outliers, and reliability.

Missing Data Results

Missing data are the incomplete responses by participants. The existence of missing data affects the reliability and credibility of the data analysis. Hence, it is mandatory to check for any missing data and drop them prior to starting the data analysis. The use of the web-based questionnaire helps to reduce the missing responses. All questions are marked as

required to remind participants if any question is unanswered, and participants can submit the questionnaire only when it is completed. However, if the participants do not give their consent to proceed with the questionnaire and select the 'No' option, their responses are considered complete too. Therefore, dropna() function is used to get rid of all incomplete responses. This function drops all rows that contain null values. As a result, a total of 436 responses are removed due to missing data.

Reliability Assessment Results

Cronbach's alpha is applied to examine the internal consistency of the instrument. The factor is considered reliable if Cronbach's alpha value is equal to or greater than 0.70 ($\alpha >= 0.70$). Table 7.5 displays Cronbach's alpha coefficients for each factor, with values ranging from 0.89 to 0.91. These results indicate that the factors employed in this research are reliable, and consequently, the internal consistency of the instrument is deemed acceptable.

Table 7.5: Results of the reliability assessment.

Factors	**Cronbach's alpha values**
PEOU	0.89
PU	0.90
SI	0.91
FC	0.91
TOG	0.90
ADOPT	0.90

Outlier Assessment Results

The Mahalanobis distance (D_2) is used to detect outliers along with the chi-square (X^2) distribution with ($p < 0.001$). An outlier is identified when the D_2 value exceeds the X^2 value for a specific data point. In this study, $X^2 = 51.1785$, and D_2 distances for all data values are below this value. There is no abnormal distance between data values. Hence, no outliers are detected in this study and no further action is required.

7.3.2 Dimensionality Assessment Results

Dimensionality assessment refers to exploring whether a set of measurement items are relevant to each other to align with a corresponding construct. The EFA test is employed in this step to assess and ensure the construct validity of the conceptual framework [23, 196]. A set of assessments are considered before performing the EFA test: data adequacy, communality, and eigenvalue [196, 207].

Data Adequacy Assessment Results

Data adequacy is evaluated by calculating the KMO value ($KMO > 0.5$). The result of the KMO value in this study is ($KMO = 0.81$), which is above the threshold value. Moreover, Bartlett's test of sphericity is highly significant (Chi-Square value = 20371.38161) with ($p = 0.0$) which is less than the threshold value ($p < 0.05$). Hence, the test is statistically significant, indicating that the observed correlation matrix is not an identity matrix. That means the data is sufficient for additional analysis.

Communality Assessment Results

Communality represents the extent to which the measurement items share common variance. It is recommended that the communality value for each item should exceed 0.5. In this study, the findings demonstrate that the communalities range from 0.51 to 0.84. These results suggest that the constructs can be sufficiently accounted for by the shared variance among all the measurement items.

Eigenvalues Assessment Results

This assessment computes the amount of variation in the total measurement items accounted for by each construct. Constructs with low eigenvalues might be ignored and removed from the framework. According to kaiser's rule [209], to define the number of factors with which their measurement items are supposed to be loaded, the eigenvalue should be equal to or greater than 1 ($eigenvalue >= 1$).

As shown in Figure 7.4, the number of variant factors is six, which is the same number of factors in the proposed framework (five independent factors and one dependent factor). Hence, there is a significant variation among measurement items accounted for each factor. Also, the eigenvalues are calculated for all factors, and it appears that all eigenvalues are above 1. The eigenvalues for the corresponding factors (PEOU, PU, SI, FC, TOG, and ADOPT) are V1= 3.71, V2= 3.19, V3=2.87, V4= 2.79, V5= 2.56, and V6= 2.08 respectively.

EFA Assessment Results

In this evaluation, a set of 24 measurement items were examined, and the outcomes demonstrate that the factor loadings of the measurement items surpass the recommended threshold of 0.5 for each corresponding factor. Furthermore, the results indicate that all 24 measure-

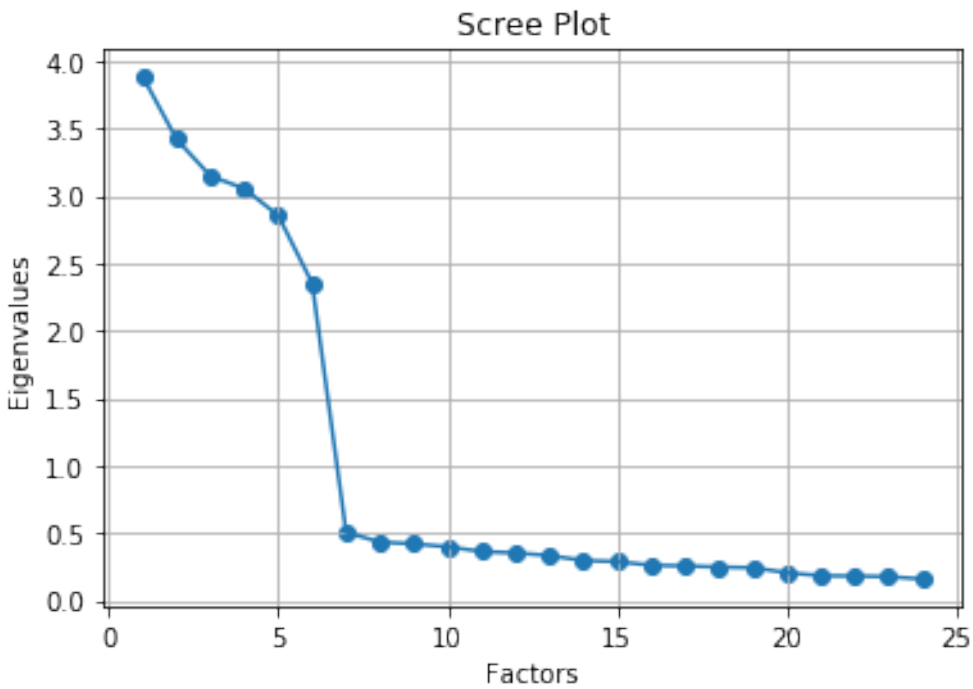


Figure 7.4: Scree plot for choosing the number of factors

ment items align with their respective constructs. Hence, there were no instances of cross-loading of the measurement items across the factors. Consequently, these results confirm the dimensionality of the constructs and validate the retention of all 24 measurement items in the web-based questionnaire. Table 7.6 displays a summary of the EFA results.

Table 7.6: Results of the Exploratory Factor Analysis (EFA).

Factors	**Number of measurement items**	**Range of factor loadings**
PEOU	4	0.75 - 0.86
PU	4	0.71 - 0.91
SI	4	0.76 - 0.90
FC	4	0.77 - 0.91
TOG	4	0.76 - 0.91
ADOPT	4	0.81 - 0.89

7.3.3 Measurement Model Analysis Results

Measurement model analysis examines the relationship structure between the latent variables (the independent constructs) and their measurement items in the proposed framework. To guarantee the reliability and validity of the measurement model, every observed variable (measurement item) must be appropriately attached to only one individual latent variable (independent construct). The CFA measures are conducted to analyze the measurement model. Two major steps are taken into consideration while performing the CFA assessment. The first step evaluates the GOF indices. The second step examines the extent to which the entire measurement model is valid by evaluating the convergent and discriminant validity.

GOF Assessment Results

The first step in measurement model analysis is measuring its specifications and how well it developed. Hence, the entire measurement model was assessed based on the GOF indices that meet the satisfactory threshold values. In case the GOF indices fail to meet the satisfactory threshold values, the entire measurement model should be divided into separate one-factor congeneric measurement models, each of which assesses one latent variable along with its measurement items individually. The results indicate that the GOF values meet the required criteria, signifying that all the measurement models conform well to the data. Therefore, there is no need to conduct a one-factor congeneric measurement model assessment, and no measurement item needs to be removed.

All GOF indices are measured directly using the calc_stats() function from the semopy package, which is designed to employ SEM techniques in Python [259]. However, the SRMR index is missing in this function. Therefore, it is calculated using the formula explained in [260]. Table 7.7 illustrates the GOF indices results of the measurement model.

Table 7.7: GOF indices results of the measurement model.

Factors	(X^2/df) <= 5.0*	**GFI** >= 0.90*	**AGFI** >= 0.80*	**CFI** >= 0.90*	**TLI** >= 0.90*	**RMSEA** <= 0.05*	**SRMR** <= 0.09*
PEOU	2.91	0.99	0.99	0.99	0.99	0.04	0.08
PU	1.25	0.99	0.99	0.99	0.99	0.01	0.08
SI	0.26	0.99	0.99	1.00	1.00	0.00	0.07
FC	4.77	0.99	0.99	0.99	0.99	0.05	0.07
TOG	1.26	0.99	0.99	0.99	0.99	0.01	0.07
ADOPT	4.45	0.99	0.99	0.99	0.99	0.05	0.07
* Threshold value							

The Convergent Validity Results

Convergent validity refers to the convergent degree between several measurement items to measure an individual underlying construct. It is assessed by examining the value of the SFL, applying the CR to measure the internal consistency in scale items for each construct, and measuring the AVE values.

The convergent validity of all the factors employed in the study is confirmed by the evaluation of the SFL, CR, and AVE values. The SFL value of all measurement items surpasses the threshold value ($SFL >= 0.50$), indicating the significance of factor loading. Furthermore, the CR values range from 0.89 to 0.91 for all the factors, exceeding the suggested threshold ($CR >= 0.70$), while the AVE values range from 0.68 to 0.73, exceeding the recommended threshold ($AVE >= 0.50$). Consequently, the convergent validity of each one-factor measurement model is verified, and no further action is required. Table 7.8 illustrates a summary of the convergent validity results for each one-factor measurement model.

Table 7.8: The convergent validity results.

Factors	**Measurement items**	**SFL** >= 0.50*	**CR** >= 0.70*	**AVE** >= 0.50*
PEOU	PEOU1	0.75	0.89	0.68
	PEOU2	0.84		
	PEOU3	0.85		
	PEOU4	0.87		
PU	PU1	0.71	0.90	0.70
	PU2	0.85		
	PU3	0.86		
	PU4	0.92		
SI	SI1	0.77	0.91	0.73
	SI2	0.89		
	SI3	0.85		
	SI4	0.91		
FC	FC1	0.77	0.91	0.72
	FC2	0.88		
	FC3	0.84		
	FC4	0.92		
TOG	TOG1	0.76	0.91	0.72
	TOG2	0.91		
	TOG3	0.81		
	TOG4	0.91		
ADOPT	ADOPT1	0.82	0.91	0.71
	ADOPT2	0.85		

Table 7.8: The convergent validity results (continued).

Factors	**Measurement items**	**SFL** >= 0.50*	**CR** >= 0.70*	**AVE** >= 0.50*
	ADOPT3	0.81		
	ADOPT4	0.90		
* Threshold value				

The Discriminant Validity Results

Discriminant validity indicates the extent to which a factor is distinct from other factors in the proposed framework. It is confirmed if the $\sqrt{AVE}$ of each factor exceeds its correlation with the other factors. The results of this assessment show that there is no correlation between the factors. As shown in Table 7.9, the $\sqrt{AVE}$ of each factor exceeds its correlation with other factors. These results suggest that the entire measurement model displays acceptable discriminant validity. Therefore, the CFA analysis outcomes discussed above confirm the proper fit of the entire measurement model to the data collected in this user study. As a result, we can proceed with the subsequent data analysis.

Table 7.9: The discriminant validity results.

	PEOU	**PU**	**SI**	**FC**	**TOG**
PEOU	**0.83**				
PU	0.00	**0.84**			
SI	0.06	0.14	**0.86**		
FC	0.05	0.09	0.00	**0.85**	
TOG	-0.03	0.01	0.00	-0.03	**0.85**
Diagonals of the correlation matrix represent the $\sqrt{AVE}$ values.					

7.3.4 Structural Model Analysis Results

The structural model examines how factors are related to each other by measuring the path among them in the proposed conceptual framework. The path coefficient evaluates the magnitude, direction, and significance of the connections between the constructs. The developed hypotheses would be either accepted or rejected based on the significance of the relationship among factors. Before measuring the path coefficient, the fit of the structural model is guaranteed by measuring the GOF indices values.

GOF Assessment Results of the Structural Model

During the structural model analysis, it is crucial to confirm that the model has satisfactory GOF indices before proceeding with the path analysis among the factors. In case the GOF indices are not acceptable, the model needs to be modified accordingly. Table 7.10 provides a summary of the GOF indices results of the structural model. The outcomes demonstrate that the GOF indices values of the structural model are acceptable, falling within the recommended threshold values. This indicates that the structural model is deemed to be a good fit, thereby enabling the path analysis of the factors to be evaluated.

Table 7.10: GOF indices results of the structural model.

Model	(X^2/df) <= 5.0*	**GFI** >= 0.90*	**AGFI** >= 0.80*	**CFI** >= 0.90*	**TLI** >= 0.90*	**RMSEA** <= 0.05*	**SRMR** <= 0.09*
Structural model	1.17	0.95	0.94	0.99	0.99	0.02	0.01
* Threshold value							

Descriptive Analysis

This study conducts a descriptive analysis of the adoption behavior of the Taqat web portal as perceived by Saudi citizens. Based on the results presented in Figure 7.5, it appears that the frequency of adoption is evenly split among the participants. Specifically, 41% of the participants agree to adopt the web portal, 40% disagree, and 19% neither agree nor disagree with its adoption.

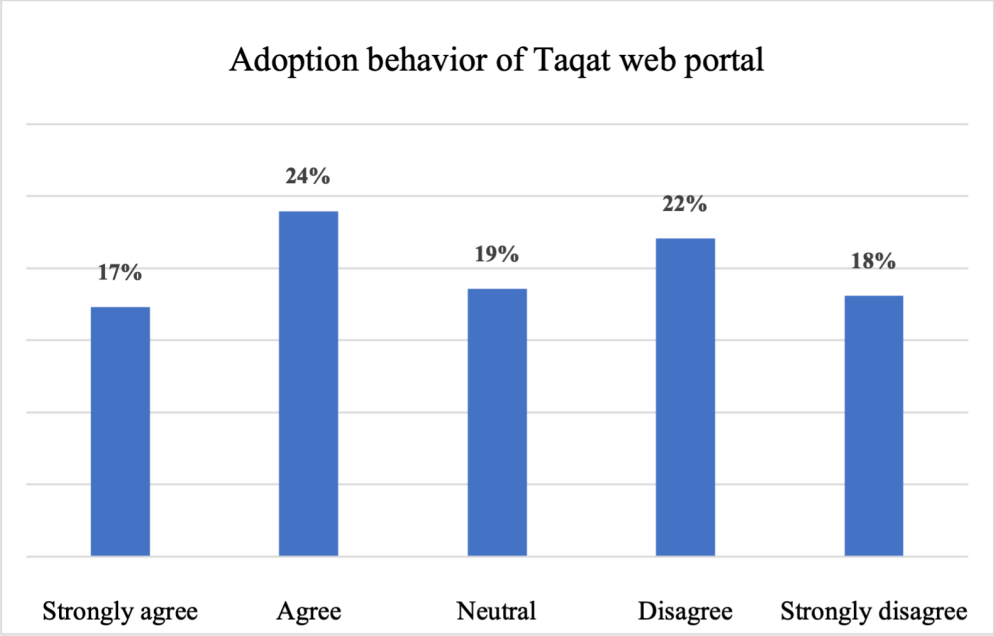


Figure 7.5: Descriptive analysis of the adoption behavior.

Path Analysis

The structural model is analyzed using significant statistics which are the z value and the p value. The z value is defined by calculating the ratio of each parameter estimate to its standard error. The z value is statistically significant if it exceeds the range of ± 1.96, with a significant p value less than 0.05 ($p <= 0.05$). Hence, the relationship will be considered significant, and the developed hypothesis will be supported. Otherwise, the developed

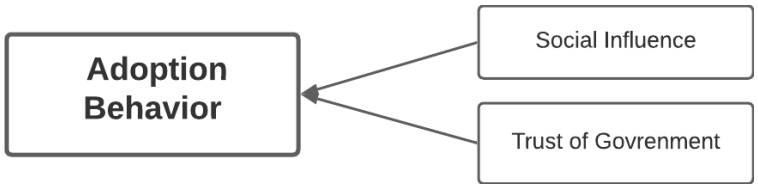


Figure 7.6: The revised framework for the adoption behavior

hypothesis will be rejected.

According to the adoption behavior of the Taqat web portal from the Saudi citizens' perspective, it appears that the adoption behavior is significantly predicted by SI and TOG factors. SI has a significant positive relationship ($z = 4.92, p < 0.001$), indicating that as SI increases, the adoption behavior increases too, supporting H3. TOG also has a significant positive relationship ($z = 2.64, p < 0.01$), indicating that as TOG increases, the adoption behavior increases as well, supporting H5. While other factors are insignificant in affecting the adoption behavior; hence their hypotheses are rejected. Table 7.11 provides the results with the z-value and p-value for each factor and explains whether the proposed hypothesis is supported. Figure 7.6 represents the revised framework for the adoption behavior of the Taqat web portal from Saudi citizens' perspective.

Table 7.11: The results of the proposed hypotheses.

Hypothesised relationships		**z-value**	**p-value**	**Results**
H1	PEOU $\longrightarrow$ Adoption	0.817979	0.413369	Not supported
H2	PU $\longrightarrow$ Adoption	1.299267	0.193852	Not supported
H3	SI $\longrightarrow$ Adoption	4.926832	0.000001***	Supported
H4	FC $\longrightarrow$ Adoption	1.767344	0.077171	Not supported
H5	TOG $\longrightarrow$ Adoption	2.642456	0.008231**	Supported
Significant levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$				

Discussion

The results of this user study show that the social influence and trust of the government encourage citizens to adopt the Taqat web portal in Saudi Arabia. The findings are echoed by previous research that emphasized the significant influence of SI and TOG factors on the adoption behavior of e-government services. Alharbi [161] conducted a study to examine the factors that may affect the citizens' intentions to engage in e-participation activities on e-government. The results showed that trust and subjective norms factors have a significant impact on citizens' intentions to engage in e-participation activities. Albesher [177] also emphasized the importance of SI to determine users' trust of e-government systems, leading to e-government adoption.

Regarding the SI factor, prior research studies mentioned that SI is a significant key predictor that affects e-government adoption and acceptance [86, 162]. A study in the US on the adoption of e-government services by taxpayers confirmed the importance of SI impact [89], and another study in Taiwan on citizens' adoption of e-government services found that it was largely determined by social peer influence [155]. Another study was conducted in the UAE to investigate the factors influencing citizens' adoption of m-government services. The study found that the SI factor has a significant positive impact on citizens' intention to adopt m-government services [261]. Moreover, Chatzoglou et al. [103] examined factors affecting the intention to use e-government services, and the results showed that SI has a positive impact on citizens' intention to adopt e-government services. The results also are aligned with many Saudi studies in the literature asserting the significant influence of SI factor on the adoption behavior of Saudi citizens [171, 180, 240]. In addition,Al-Sammarraie et al. [181] empirically investigated the long-term factors that affect the sustainability of adopting e-government services in Saudi Arabia. They found that SI is one of the significant factors affecting the adoption behavior of e-government.

Other studies in the literature also demonstrate the existence of a significant positive correlation between the adoption behavior of e-government services and TOG. They found that when users trust the government agency in securing their data, it is more likely to increase the adoption of the offered e-government services. Hence, TOG has been considered a significant direct determinant of the adoption behavior of e-government services [89, 157, 160]. Lee et al. [158] explored the factors that influence citizens' willingness to adopt e-government services. They concluded that TOG is a crucial factor that motivates citizens to use e-government services. Ozkan and Kanat [150] uncovered the factors affecting the adoption of e-government services. The results showed that TOG is the second significant, influential factor. Chatzoglou et al. [103] developed a novel framework to identify the critical factors affecting the adoption of e-government services. The findings revealed that the factor of TOG has a notable direct effect on the e-government adoption behavior among users. Al-Hujran et al. [36] also developed an integrative research model to study the factors influencing citizen attitudes toward e-government adoption in Jordan. They found that trust is among the most significant factors affecting e-government adoption. The results are also consistent with many other studies conducted in Saudi Arabia, which also indicate that the TOG factor has a significant impact on the adoption behavior of Saudi citizens when it comes to e-government services [180, 241, 242]. In addition, AL-Zahrani [173] investigated quantitatively the e-government adoption behavior in Saudi Arabia. They found that the perceived trust of e-government services has a significant positive impact on citizens' perceived risk, which encourages them to adopt the offered e-government services.

7.4 Adoption Behavior per Demographic Data

The thesis mainly focuses on promoting universal access to adopting e-government services from citizens' perspectives by providing a systematic approach to evaluate the adoption behavior accurately. In this user study, we mentioned the potential of gender disparity in adopting e-government services in Saudi Arabia. Hence, we seek to promote universal access to the Taqat web portal from a gender lens. However, as we mentioned before, this framework provides an established methodology to evaluate the adoption of e-government services from any perspective, not limited to gender. Therefore, we expanded this user study to explore the adoption behavior of the Taqat web portal from the lens of all the demographic data: gender, age group, and education level. This leads to a comprehensive overview of the adoption behavior of the Taqat web portal from Saudi citizens' perspectives.

7.4.1 Adoption Behavior Per Gender

The gender is identified in the questionnaire as either male, female, or other. In this user study, we will evaluate the adoption behavior of the Taqat web portal from the lens of gender.

Descriptive Analysis

This study includes an analysis of the adoption behavior from a gender perspective, with results presented in Figure 7.7. The data suggest that Saudi females are more inclined to adopt the Taqat web portal than Saudi males, with 51% of females agreeing to adopt compared to 32% of males. In contrast, 37% of females disagree with adoption, while 43% of males disagree. Additionally, 25% of males and 12% of females do not express a clear opinion on whether to adopt the web portal or not.

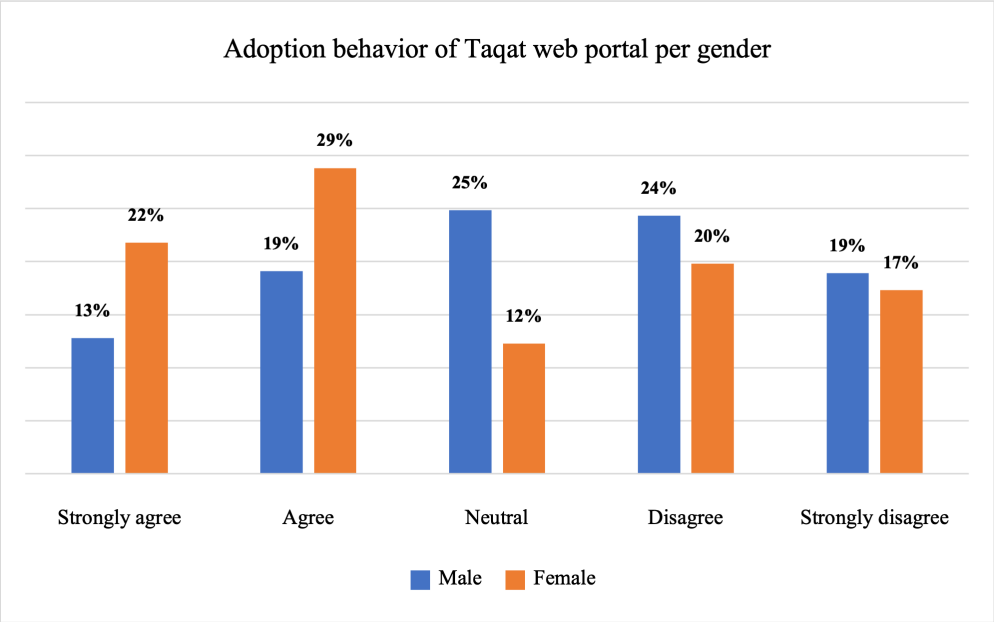


Figure 7.7: Descriptive analysis of the adoption behavior per gender.

Path Analysis

In the path analysis, the importance of the relationships is examined among the factors. The developed hypothesis will be either accepted or rejected based on the significance of the relationship. herein, we will evaluate the path analysis per each gender:

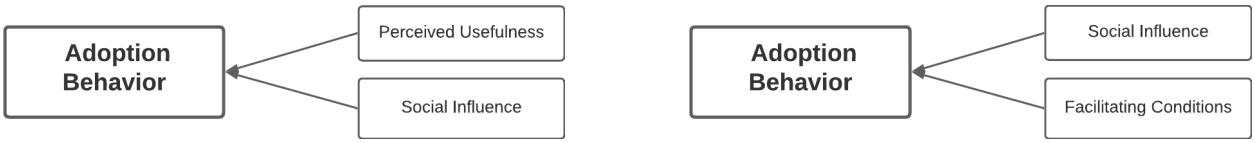
1- **Saudi males:** according to the adoption behavior of the Saudi males, it appears that the adoption behavior of the Taqat web portal among Saudi males is significantly predicted by PU and SI factors. PU has a significant positive relationship ($z = 3.13, p < 0.01$), indicating that as PU increases, the adoption behavior increases too, supporting H2. SI also has a significant positive relationship ($z = 8.69, p < 0.001$), indicating that as SI increases, the adoption behavior increases too, supporting H3. While other factors are insignificant in affecting the adoption behavior; hence their hypotheses are rejected. Table 7.12 provides the results with the z-value and p-value for each factor and explains whether the proposed hypothesis is supported.

Table 7.12: The results of the proposed hypotheses from males' perspective.

Hypothesised relationships		**z-value**	**p-value**	**Results**
H1	PEOU $\longrightarrow$ Adoption	1.341725	0.179685	Not supported
H2	PU $\longrightarrow$ Adoption	3.134265	0.001723**	Supported
H3	SI $\longrightarrow$ Adoption	8.693572	0.0***	Supported
H4	FC $\longrightarrow$ Adoption	0.885024	0.376144	Not supported
H5	TOG $\longrightarrow$ Adoption	1.177742	0.238899	Not supported
Significant levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$				

2- **Saudi females:** according to the adoption behavior of the Saudi females, it appears that the adoption behavior of the Taqat web portal among Saudi females is significantly predicted by SI and FC factors. SI has a significant negative relationship ($z = -2.21, p < 0.05$), indicating that as SI increases, the adoption behavior decreases, supporting H3. Moreover, FC has a significant positive relationship ($z = 3.45, p < 0.001$), indicating that as FC increases, the adoption behavior increases too, supporting H4. While other factors are insignificant in affecting the adoption behavior; hence their hypotheses are rejected. Table 7.13 provides the results with the z-value and p-value for each factor and explains whether the proposed hypothesis is supported.

Figure 7.8 represents the adoption behavior of the Taqat web portal from the gender lens by providing the revised framework for each gender: Figure 7.8a represents the revised framework for the adoption behavior of the Taqat web portal from Saudi males' perspective while Figure 7.8b represents the revised framework for the adoption behavior of the Taqat web portal from Saudi females' perspective.



(a) Males. (b) Females.

Figure 7.8: The revised framework for the adoption behavior from gender perspective

Table 7.13: The results of the proposed hypotheses from females' perspective.

Hypothesised relationships		**z-value**	**p-value**	**Results**
H1	PEOU $\longrightarrow$ Adoption	1.339198	0.180506	Not supported
H2	PU $\longrightarrow$ Adoption	1.163017	0.244823	Not supported
H3	SI $\longrightarrow$ Adoption	-2.211047	0.027033*	Supported
H4	FC $\longrightarrow$ Adoption	3.459533	0.000541***	Supported
H5	TOG $\longrightarrow$ Adoption	0.924375	0.355291	Not supported
Significant levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$				

Discussion

In the literature, gender has been recognized as a significant determinant of public e-services and technology usage [248]. In the e-government context, several studies have explored the significance of gender differences in adopting e-government services [78, 249, 250]. The adoption behavior of the Taqat web portal from the gender lens shows that Saudi females are more likely to adopt the web portal than Saudi males. A previous study suggests that females have a stronger habit of using technology and are more likely to engage in online communication than males [262] In this user study, Saudi males are positively affected by PU and SI factors. While Saudi females are negatively affected by the SI factor and positively affected by the FC factor.

These results are consistent with the findings of previous research showed that males are

more driven by instrumental factors (i.e., PU) while females are more encouraged by process (i.e., SI) [263]. Okazaki and Santos [264] studied the adoption of e-learning tools by faculty members in Brazil. They found that gender influences the path from PU to attitude is way stronger for males as compared to females. Similarly, other research studies revealed that gender significantly moderated the influence of Performance Expectancy (same concept as PU), more in males than females towards adoption behavior of the offered technology as males are more result oriented than females [265, 266].

Furthermore, Venkatesh et al. [126] emphasized that females are very sensitive to the influence of their social surroundings and the suggestions of peers when adopting technology. However, the findings of this user study on the Taqat web portal indicate the significance of the SI factor on both genders, but with different influences. The adoption behavior of Saudi males increases as the SI factor increases while the adoption behavior of Saudi females declines as the SI factor increases. It found that the surroundings and peers affect females negatively. More future investigations are demanded to investigate this issue, as most of the studies in the literature mentioned the significant positive effect of SI on the adoption behavior of all users [124, 159, 160].

In addition, the majority of the literature highlighted the gender disparity on the influence of FC factor on the adoption behavior, as they concluded that females faced technical challenges in using technology more than males [267] Venkatesh et al. [126] also revealed that females are more anxious than males in adopting technology which in turn led to increased perceptions of the facilitating conditions required to adopt the technology. Another study revealed the importance of FC on females' adoption behavior. They found that females who obtain external support and facilitated are more likely to use e-government than males [268].

7.4.2 Adoption Behavior Per Education Level

There are five education degrees specified in the web-based questionnaire: no formal school, high school or less degree, associate degree, undergraduate degree, and graduate degree. In this user study, we do not have participants with no formal school degree, as we focus on evaluating the Taqat web portal for job seekers. Hence, most jobs require an education degree of any level. Hence, we will evaluate the adoption behavior of the Taqat web portal from the lens of four education levels.

Descriptive Analysis

In this study, the adoption behavior was analyzed from the perspective of participants' education levels. The results shown in Figure 7.9 demonstrate that almost all education levels had similar agreement rates regarding the adoption of the Taqat web portal. Specifically, 37% of participants with a high school or less degree, 44% of those with an associate degree, 41% of those with an undergraduate degree, and 42% of those with a graduate degree agreed to adopt the web portal. However, the percentage of high school or less degree participants who disagreed with adopting the web portal was the highest among all degrees, reaching 51%. 45% of those with an associate degree disagreed with adoption, compared to 32% of those with an undergraduate degree and 36% of those with a graduate degree. In addition, a significant percentage of participants from all education levels chose neither to agree nor disagree with the adoption of the web portal (11% of high school or less degree, 12% of associate degree, 27% of undergraduate degree, and 22% of graduate degree participants).

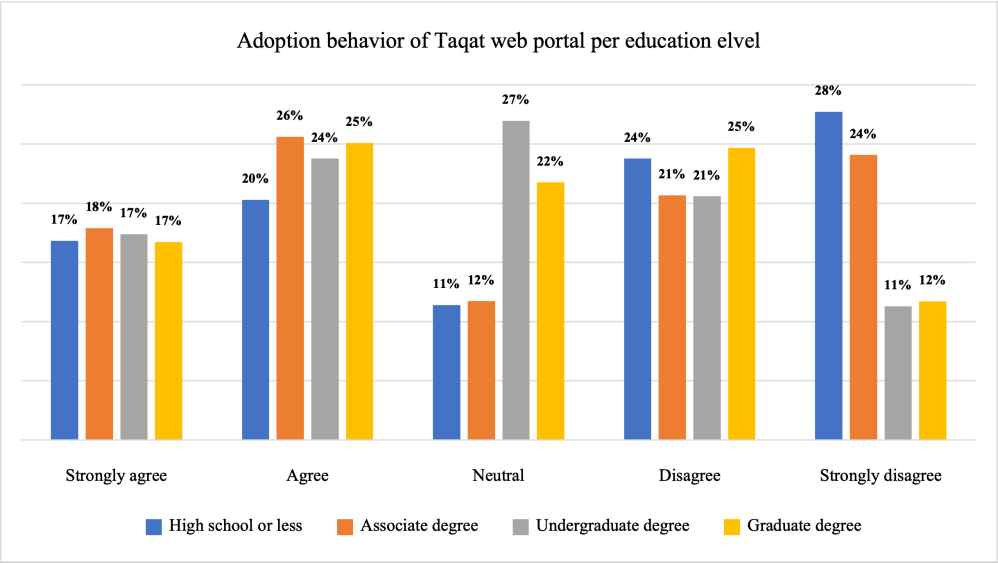


Figure 7.9: Descriptive analysis of the adoption behavior per education level.

Path Analysis

In the path analysis, the importance of the relationships is examined among the factors. The developed hypothesis will be either accepted or rejected based on the significance of the relationship. Herein, we will evaluate the path analysis per each degree:

1- **High school or less degree:** according to the adoption behavior of the high school or less degree, it appears that the adoption behavior of the Taqat web portal is significantly predicted by PEOU and SI factors. PEOU has a significant positive relationship ($z = 3.70, p < 0.05$), indicating that as PEOU increases, the adoption behavior increases too, supporting H1. SI also has a significant positive relationship ($z = 2.96, p < 0.01$), indicating that as SI increases, the adoption behavior increases too, supporting H3. While other factors are insignificant in affecting the adoption behavior; hence their hypotheses are rejected. Table 7.14 provides the results with the z-value and p-value for each factor and explains whether the proposed hypothesis is supported.

Table 7.14: The results of the proposed hypotheses from the 'high school or less degree' perspective.

Hypothesised relationships		**z-value**	**p-value**	**Results**
H1	PEOU $\longrightarrow$ Adoption	3.70663	0.027975*	Supported
H2	PU $\longrightarrow$ Adoption	0.700663	0.483513	Not supported
H3	SI $\longrightarrow$ Adoption	2.968159	0.002996**	Supported
H4	FC $\longrightarrow$ Adoption	1.173946	0.240417	Not supported
H5	TOG $\longrightarrow$ Adoption	0.208103	0.835149	Not supported
Significant levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$				

2- **Associate degree:** according to the adoption behavior of the associate degree, it appears that the adoption behavior of the Taqat web portal is significantly predicted by PEOU, SI, and TOG factors. PEOU has a significant positive relationship ($z = 2.01, p < 0.05$), indicating that as PEOU increases, the adoption behavior increases too, supporting H1. SI also has a significant positive relationship ($z = 3.73, p < 0.001$), indicating that as SI increases, the adoption behavior increases too, supporting H3. Moreover, TOG has a significant positive relationship ($z = 3.33, p < 0.001$), indicating that as SI increases, the adoption behavior increases too, supporting H5. While other factors are insignificant in affecting the adoption behavior; hence their hypotheses are rejected. Table 7.15 provides the results with the z-value and p-value for each factor and explains whether the proposed hypothesis is supported.

Table 7.15: The results of the proposed hypotheses from the 'associate degree' perspective.

Hypothesised relationships		**z-value**	**p-value**	**Results**
H1	PEOU $\longrightarrow$ Adoption	2.01345	0.044067*	Supported

Table 7.15: The results of the proposed hypotheses from the 'associate degree' perspective (continued).

Hypothesised relationships		**z-value**	**p-value**	**Results**
H2	PU $\longrightarrow$ Adoption	1.347878	0.177698	Not supported
H3	SI $\longrightarrow$ Adoption	3.738835	0.000185***	Supported
H4	FC $\longrightarrow$ Adoption	1.07945	0.280387	Not supported
H5	TOG $\longrightarrow$ Adoption	3.334892	0.000853***	Supported
Significant levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$				

3- **Undergraduate degree:** according to the adoption behavior of the undergraduate degree, it appears that the adoption behavior of the Taqat web portal is significantly predicted by PU and SI factors. PU has a significant positive relationship ($z = 4.26, p < 0.05$), indicating that as PU increases, the adoption behavior increases too, supporting H2. SI also has a significant positive relationship ($z = 2.45, p < 0.01$), indicating that as SI increases, the adoption behavior increases too, supporting H3. While other factors are insignificant in affecting the adoption behavior; hence their hypotheses are rejected. Table 7.16 provides the results with the z-value and p-value for each factor and explains whether the proposed hypothesis is supported.

Table 7.16: The results of the proposed hypotheses from the 'undergraduate degree' perspective.

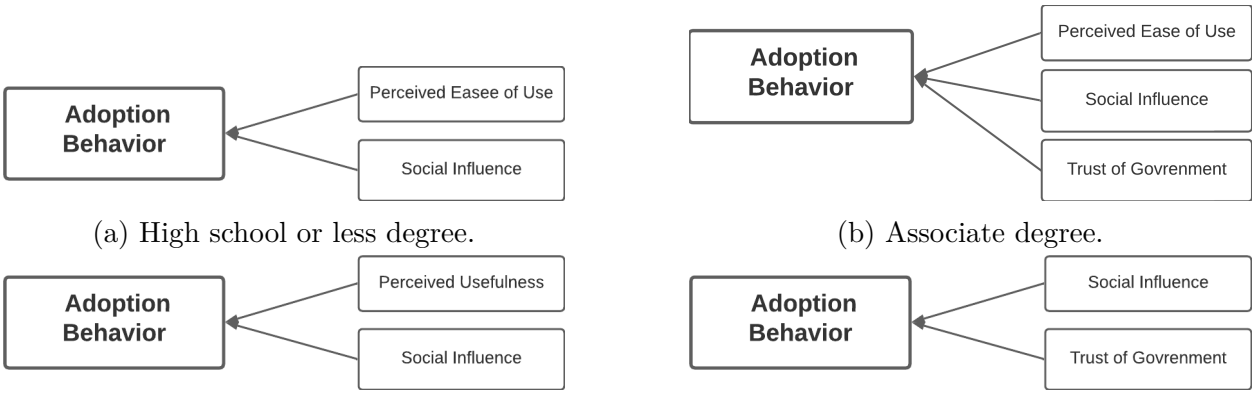
Hypothesised relationships		**z-value**	**p-value**	**Results**
H1	PEOU $\longrightarrow$ Adoption	0.663758	0.506845	Not supported
H2	PU $\longrightarrow$ Adoption	4.268677	0.018178*	Supported
H3	SI $\longrightarrow$ Adoption	2.453224	0.003387**	Supported
H4	FC $\longrightarrow$ Adoption	0.62774	0.530174	Not supported

Table 7.16: The results of the proposed hypotheses from the 'undergraduate degree' perspective (continued).

Hypothesised relationships		**z-value**	**p-value**	**Results**
H5	TOG $\longrightarrow$ Adoption	0.533652	0.593582	Not supported
Significant levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$				

4- **Graduate degree:** according to the adoption behavior of the graduate degree, it appears that the adoption behavior of the Taqat web portal is significantly predicted by SI and TOG factors. SI has a significant positive relationship ($z = 2.80, p < 0.01$), indicating that as SI increases, the adoption behavior increases too, supporting H3. TOG also has a significant positive relationship ($z = 2.27, p < 0.05$), indicating that as TOG increases, the adoption behavior increases too, supporting H5. While other factors are insignificant in affecting the adoption behavior; hence their hypotheses are rejected. Table 7.17 provides the results with the z-value and p-value for each factor and explains whether the proposed hypothesis is supported.

Figure 7.10 represents the adoption behavior of the Taqat web portal from the lense of education level by providing the revised framework for each degree: Figure 7.10a represents the revised framework for the adoption behavior of the Taqat web portal from the 'high school or less' perspective, Figure 7.10b represents the revised framework for the adoption behavior of the Taqat web portal from the 'associate degree' perspective, Figure 7.10c represents the revised framework for the adoption behavior of the Taqat web portal from the 'undergraduate degree' perspective, and Figure 7.10d represents the revised framework for the adoption behavior of the Taqat web portal from the 'graduate degree' perspective.



(a) High school or less degree. (b) Associate degree.

(c) Undergraduate degree. (d) Graduate degree.

Figure 7.10: The revised framework for the adoption behavior from the education level perspective

Table 7.17: The results of the proposed hypotheses from the 'graduate degree' perspective.

Hypothesised relationships		**z-value**	**p-value**	**Results**
H1	PEOU $\longrightarrow$ Adoption	0.349954	0.726373	Not supported
H2	PU $\longrightarrow$ Adoption	0.592062	0.553809	Not supported
H3	SI $\longrightarrow$ Adoption	2.808479	0.004978**	Supported
H4	FC $\longrightarrow$ Adoption	1.091861	0.274894	Not supported
H5	TOG $\longrightarrow$ Adoption	2.270102	0.023201*	Supported
Significant levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$				

Discussion

Education level has long been playing an important role in the adoption of technology. The results show equal adoption behavior by Saudi citizens with different education levels. The SI factor is positively influencing the adoption behavior of the Taqat web portal by of education levels included in this study. Several e-government studies have investigated and proved

the significance of SI in affecting e-government adoption [160, 161, 171, 178]. In addition, the results show that high school and associate degrees are significantly influenced by the PEOU factor, the undergraduate degree is influenced by the PU factor, and the associate and graduate degrees are influenced by the TOG factor. These results are aligned with the findings of research studies in the literature. Abu-Shanab [269] conducted an empirical study to evaluate the importance of education level in predicting Internet banking adoption by users in Jordan. They utilized three education levels (high school, undergraduate, and graduate) to moderate the factors affecting the adoption behavior of the banking system: performance expectancy (same concept as PU), self-efficacy, SI, and trust. As a moderator, education shows a significant influence on all factors affecting the adoption behavior for all education levels.

Also, Chao [270] investigated factors affecting students' behavioral intention to use mobile learning in higher education in Taiwan by recruiting 2000 students from ten different universities. The results showed that the behavioral intention to adopt mobile learning was significantly and positively influenced by satisfaction, trust, performance expectancy (same concept as PU), and effort expectancy (same concept as PEOU). The study did not mention the specific degree of students, but since they are college students, they are either undergraduate or graduate students. Another study analyzed the factors influencing students' behavioral intention to adopt the web-based e-learning system. The data was collected from 310 undergraduate students in Pakistan. The findings indicate that the SI factor has significantly affected the students' behavioral intention to adopt e-learning technology. The greater the SI will be the more adoption of new technologies by students. The study also finds a direct and significant influence of PEOU and PU factors on the adoption behavior [271].

7.4.3 Adoption Behavior Per Age Group

There are four age groups in the web-based questionnaire: 18-30 years old, 31-40 years old, 41-50 years old, and 51-60 years old. In this user study, we will evaluate the adoption behavior of the Taqat web portal from the lens of the age group.

Descriptive Analysis

In this study, the adoption behavior was analyzed from the perspective of age through descriptive analysis. According to the results presented in Figure 7.11, it can be observed that the majority of age groups showed similar levels of agreement in adopting the Taqat web portal. The highest percentage of agreement was found in the '18-30 years old' age group with 45%, followed by 41% of the '31-40 years old' age group, 39% of the '41-50 years old' age group, and 38% of the '51-60 years old' age group. However, it was observed that 50% of the '51-60 years old' age group participants disagreed with the adoption, which was the highest disagreement percentage among other age groups. Furthermore, it was found that 33% of the '18-30 years old' age group disagreed with the adoption compared to 42% of the '31-40 years old' age group participants and 44% of the '41-50 years old' age group participants. Finally, a portion of the participants did not express a clear position on adopting this web portal, with 22% of the '18-30 years old' age group, 18% of the '31-40 years old' age group, 17% of the '41-50 years old' age group, and 13% of the '51-60 years old' age group choosing neither to agree nor disagree.

Path Analysis

In the path analysis, the importance of the relationships is examined among the factors. The developed hypothesis will be either accepted or rejected based on the significance of the

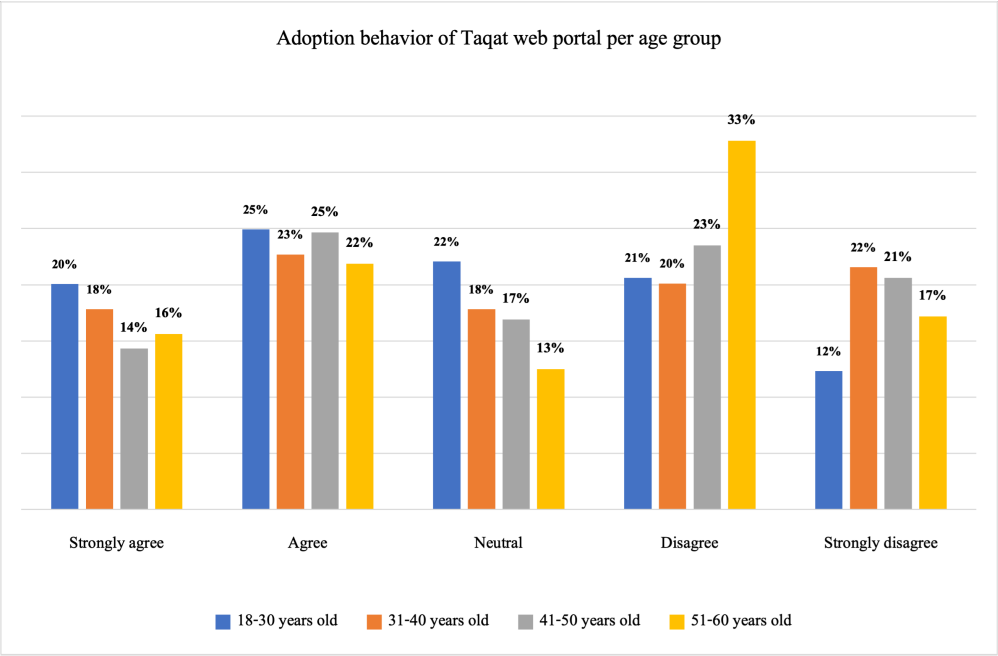


Figure 7.11: Descriptive analysis of the adoption behavior per age group.

relationship. Herein, we will evaluate the path analysis per each age group:

1- **18-30 years old age group:** according to the adoption behavior of the 18-30 years old age group, it appears that the adoption behavior of the Taqat web portal is significantly predicted by the PU factor. PU has a significant positive relationship ($z = 2.35, p < 0.05$), indicating that as PU increases, the adoption behavior increases too, supporting H2. While other factors are insignificant in affecting the adoption behavior; hence their hypotheses are rejected. Table 7.18 provides the results with the z-value and p-value for each factor and explains whether the proposed hypothesis is supported.

Table 7.18: The results of the proposed hypotheses from the age perspective (18-30 years old).

Hypothesised relationships		**z-value**	**p-value**	**Results**
H1	PEOU $\longrightarrow$ Adoption	0.820928	0.411687	Not supported
H2	PU $\longrightarrow$ Adoption	2.350701	0.023581*	Supported

Table 7.18: The results of the proposed hypotheses from the age perspective (18-30 years old) (continued).

Hypothesised relationships		**z-value**	**p-value**	**Results**
H3	SI $\longrightarrow$ Adoption	1.643652	0.100248	Not supported
H4	FC $\longrightarrow$ Adoption	1.646359	0.09969	Not supported
H5	TOG $\longrightarrow$ Adoption	0.246203	0.805525	Not supported
Significant levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$				

2- **31-40 years old age group:** according to the adoption behavior of the 31-40 years old age group, it appears that the adoption behavior of the Taqat web portal is significantly predicted by PU, SI, and TOG factors. PU has a significant positive relationship ($z = 2.82, p < 0.01$), indicating that as PU increases, the adoption behavior increases too, supporting H2. SI also has a significant positive relationship ($z = 5.41, p < 0.001$), indicating that as SI increases, the adoption behavior increases too, supporting H3. Moreover, TOG has a significant positive relationship ($z = 2.87, p < 0.01$), indicating that as SI increases, the adoption behavior increases too, supporting H5. While other factors are insignificant in affecting the adoption behavior; hence their hypotheses are rejected. Table 7.19 provides the results with the z-value and p-value for each factor and explains whether the proposed hypothesis is supported.

Table 7.19: The results of the proposed hypotheses from the age perspective (31-40 years old).

Hypothesised relationships		**z-value**	**p-value**	**Results**
H1	PEOU $\longrightarrow$ Adoption	1.90985	0.056153	Not supported
H2	PU $\longrightarrow$ Adoption	2.829995	0.004655**	Supported
H3	SI $\longrightarrow$ Adoption	5.413575	0.0***	Supported

Table 7.19: The results of the proposed hypotheses from the age perspective (31-40 years old.

Hypothesised relationships		**z-value**	**p-value**	**Results**
H4	FC $\longrightarrow$ Adoption	0.69797	0.485196	Not supported
H5	TOG $\longrightarrow$ Adoption	2.87954	0.003983**	Supported
Significant levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$				

3- **41-50 years old age group:** according to the adoption behavior of the 41-50 years old age group, it appears that the adoption behavior of the Taqat web portal is significantly predicted by the SI factor. SI has a significant positive relationship ($z = 2.00, p < 0.05$), indicating that as SI increases, the adoption behavior increases too, supporting H3. While other factors are insignificant in affecting the adoption behavior; hence their hypotheses are rejected. Table 7.20 provides the results with the z-value and p-value for each factor and explains whether the proposed hypothesis is supported.

Table 7.20: The results of the proposed hypotheses from the age perspective (41-50 years old).

Hypothesised relationships		**z-value**	**p-value**	**Results**
H1	PEOU $\longrightarrow$ Adoption	1.731069	0.083439	Not supported
H2	PU $\longrightarrow$ Adoption	0.186614	0.851963	Not supported
H3	SI $\longrightarrow$ Adoption	2.000982	0.045394*	Supported
H4	FC $\longrightarrow$ Adoption	0.562461	0.573802	Not supported
H5	TOG $\longrightarrow$ Adoption	1.181854	0.237264	Not supported
Significant levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$				

4- **51-60 years old age group:** according to the adoption behavior of the 51-60 years old age group, it appears that the adoption behavior of the Taqat web portal is sig-

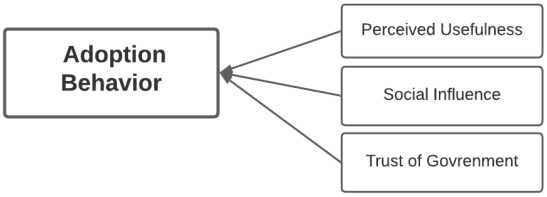
nificantly predicted by the TOG factor. TOG has a significant positive relationship ($z = 2.07, p < 0.05$), indicating that as TOG increases, the adoption behavior increases too, supporting H5. While other factors are insignificant in affecting the adoption behavior; hence their hypotheses are rejected. Table 7.21 provides the results with the z-value and p-value for each factor and explains whether the hypothesis is supported.

Figure 7.12 represents the adoption behavior of the Taqat web portal from the lense of age by providing the revised framework for each age group: Figure 7.12a represents the revised framework for the adoption behavior of the Taqat web portal from the perspective of '18-30 years old' age group, Figure 7.12b represents the revised framework for the adoption behavior of the Taqat web portal from the perspective of '31-40 years old' age group, Figure 7.12c represents the revised framework for the adoption behavior of the Taqat web portal from the perspective of '41-50 years old' age group, and Figure 7.12d represents the revised framework for the adoption behavior of the Taqat web portal from the perspective of '51-60 years old' age group.

Table 7.21: The results of the proposed hypotheses from the age perspective (51-60 years old).

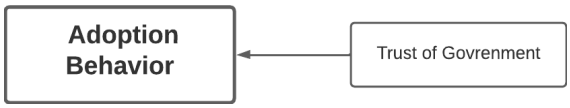
Hypothesised relationships		**z-value**	**p-value**	**Results**
H1	PEOU $\longrightarrow$ Adoption	1.258637	0.208161	Not supported
H2	PU $\longrightarrow$ Adoption	0.691685	0.489135	Not supported
H3	SI $\longrightarrow$ Adoption	-1.133404	0.257045	Not supported
H4	FC $\longrightarrow$ Adoption	0.035724	0.971502	Not supported
H5	TOG $\longrightarrow$ Adoption	2.079864	0.037538*	Supported
Significant levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$				

(a) 18-30 years old.



(b) 31-40 years old.

(c) 41-50 years old.



(d) 51-60 years old.

Figure 7.12: The revised framework for the adoption behavior from the age perspective

Discussion

Age has been considered an important determinant in the adoption of new technology as different age groups have different reactions to new technology. The results of this study show similar adoption behavior of the Taqat web portal in all age groups. However, half of the '15-60 years old' age group participants disagreed with adopting this web portal. The PU factor appears significant for adopting the web portal among the '18-30 years old' age group participants. The '31-40 years old' age group participants are significantly affected by PU, SI, and TOG factors, and the '41-50 years old' age group participants are significantly affected by the SI factor. While the '51-60 years old' age group participants are significantly affected by the TOG factor. These findings are aligned with many research studies in the literature that found that age is a significant determinant of e-government adoption [163]. Also, another research found that age significantly influenced the voters' preferences to adopt the e-voting system [272]. Bélanger and Carter [250] also explored the digital divide in adopting e-government. Age showed a significant influence on the intention to adopt e-government services.

In addition, Abu-Shanab [273] explored the critical factors affecting Jordanian citizens in adopting e-government services. The adopted factors in the proposed framework were mod-

erated by the age factor. The results showed that age significantly influenced the PU factor to adopt e-government services. As mentioned by Venkatesh et al. [126], the effect of the PU factor on the intention to adopt technology was stronger for younger people while the effect of the SI factor was more silent for older people. Moreover, another study showed that younger consumers are more likely to take risks and adopt the m-payment technology if it is beneficial and outweighs its risks while older consumers are less tolerant and do not agree to adopt m-payment technology due to its risk and trust issues [263].

Another research study investigated the factors affecting the acceptance of the webinar system in blended learning courses by students. The results showed that younger students are more concerned with overall performance while using technology. Hence, the PU factor has a significant influence on the intention to use the webinar system by the young age of participants [274]. Alfalah et al. [275] also investigated the adoption of e-government services among older adults in Saudi Arabia following a quantitative approach. The results revealed that internet adoption tends to decline as age increases, and it also indicated a noteworthy impact of the TOG factor on the intention of older adults to adopt e-government services.

7.5 Disseminating the Reference Implementation

The aim of this dissertation is to propose a comprehensive conceptual framework for evaluating e-government adoption from the citizens' perspective globally. We also developed a reference implementation based on the UCD approach as a practical tool to guide users on how to efficiently evaluate citizens' adoption behaviors:

- The purpose is to inform, promote, and educate the target users about the reliable and accurate guidelines for evaluating citizens' adoption behaviors of e-government.

- Target users are e-government designers, researchers, and practitioners.
- The first step in achieving this goal is to package the whole evaluation process as a reference implementation tool.
- This tool includes a detailed description of the proposed framework, the developed web-based questionnaire, and a comprehensive guide to the data analysis steps documented in this dissertation.
- To make it accessible, the reference implementation is publicly available on our GitHub account: Click here.

7.6 Conclusion

This chapter presents the results of the user study that evaluates the e-government adoption behaviors of the Taqat web portal in Saudi Arabia. The main objective of this study was to promote universal access to adopt this web portal from the perspective of all demographic data, including gender, education level, and age group To achieve this goal, the proposed adoption framework in this thesis was utilized along with the SEM guidelines for data analysis. First, the web-based questionnaire was implemented, and its validity and reliability were evaluated. The results of both tests were provided to ensure that the survey instrument was ready to be used in this study.

During the validity testing, we followed a set of criteria for expert recruitment to ensure diversity and minimize bias. We sought experts from different countries and backgrounds and ended up with 16 participants from 13 different countries. However, despite our efforts, there was still a gender bias in the demographic data of the recruited experts. To mitigate the gender bias, we recommend future studies to recruit experts from both genders to ensure

a fair representation of the population. This can help to minimize the impact of gender-based bias on the validity results and provide a more accurate assessment of the questionnaire.

After that, we followed the data analysis steps mentioned in chapter 5, and applied all the required assessments to ensure that the data adequately fit the model and it can predict the adoption behavior efficiently. Then, we discussed the final results of the structural model regarding the factors that significantly affect Saudi citizens in adopting the Taqat web portal. Finally, we publicly disseminated the reference implementation tool for evaluating citizens' adoption behaviors of e-government.

The evaluation of the adoption behavior of Saudi citizens towards the Taqat web portal has provided valuable insights into understanding citizens' behavior. The findings of this study have opened doors for potential research to investigate citizens' experiences with e-government services in alignment with the significant factors that influence their behavior. The results regarding the adoption behavior of females were particularly intriguing, as they were the only group negatively affected by one of the factors. The study found that social influence had a negative impact on the adoption behavior of Saudi females. This phenomenon raises several questions, and more in-depth research is needed to understand its underlying causes. It is essential to understand the social factors that significantly impact females and prevent them from using the offered services. Further research can help address these issues and improve the adoption of e-government services among Saudi citizens, especially females.

Chapter 8

Conclusion

The United Nations launched the Sustainable Development Goals (SDGs) plan to achieve a better and more sustainable future for all countries. One of the principles of effective governance for sustainable development is inclusiveness, which implies leaving no one behind. The main idea behind this plan is to promote the sustainability of each country by enhancing the user experience of e-government services and ensuring that everyone has fair access to these services. Moreover, in alignment with Society 5.0 vision, the Keidanren, the Japan Business Federation, proposed a set of measures and targets required to develop the e-government based on a user-oriented design approach. They offer a better understanding of e-government among target users by facilitating access to government services and addressing social barriers to adopting these services.

From this standpoint, governments need to put their citizens at the center of the design of e-government services. They need to understand how citizens use the offered e-services and what issues they confront while using them. The UCD-based approach supports e-governments to deepen citizens' adoption of their services and make them more responsive and efficient. Hence, governments can overcome potential difficulties that citizens might face, and ensure a highly efficient user experience towards e-government. However, numerous research efforts focused on developing e-government adoption frameworks based on the UCD-based approach from the lens of specific government services in an individual country or a specific range of countries. There has been a lack of a global e-government adop-

tion framework that could directly contribute to enhancing citizen experience by providing guidelines to evaluate citizens' adoption of any e-government services in any country.

In this dissertation, we aim to enhance the user experience of e-government services and promote universal access to e-government by ensuring that everyone has fair access to these services. To achieve this objective, the main research question is formulated as follows:

How to promote universal access to e-government services?

To answer this question, we provided a systematic approach for evaluating citizens' adoption behaviors of e-government as a reference for future investigations. We conducted a systematic literature review on user experience towards e-government services and covered all different aspects to better understand target users and enhance their overall experience. From this comprehensive review, we developed the proposed conceptual framework to evaluate citizens' adoption of e-government services by incorporating the most common significant factors that influence their adoption behavior globally. These factors represent the necessary steps for enhancing citizens' experience and increasing their adoption of such services. This framework provides a standard overarching process in the e-government domain by providing an established methodology to evaluate citizens' adoption behaviors of e-government services. It is not dependent on or associated with any particular e-government service or country. Otherwise, it can be used to evaluate citizens' adoption behaviors of e-government services in any country. Hence, there is no need to develop a new conceptual framework to investigate the adoption behavior of every specific e-government service, which saves time and effort. To the best of our knowledge, this is the first application of a comprehensive conceptual framework for evaluating citizens' adoption behaviors of e-government services by developing a global UCD-based reference implementation that brings e-government services to a more successful level. This step contributes to achieving the research goal 1: *" Design the*

Comprehensive Conceptual Framework" by fulfilling the following tasks successfully: *"Task-1: identify the significant factors that affect citizens' adoption behaviors of e-government services"* and *"Task-2: develop the conceptual framework for evaluating the e-government adoption behaviors from citizens' perspectives"*.

To establish the guidelines for evaluating the adoption behavior of e-government services, we adopted the quantitative research methodology. We developed a web-based questionnaire based on the proposed framework as a data collection tool. Then, the questionnaire went through repetitive processes of validity and reliability tests. In the validity test, the questionnaire was revised and improved after receiving the evaluation from 16 experts in government and information adoption by measuring the CVR formula for each questionnaire item. Then, the pilot study was conducted to assess the questionnaire's reliability. At this point, we ensured that the developed web-based questionnaire is valid and reliable, and is ready to be used. After that, we adopted the SEM technique to adequately evaluate the quantitatively collected data and explore the significant factors affecting e-government adoption behavior for a given context. To this end, we achieved the research goal 2: *" Deploy the Developed Conceptual Framework"* by fulfilling the following task successfully: *"Task-3: implement the conceptual framework to evaluate citizens' adoption behaviors of any e-government service"*.

We then conducted a user study to evaluate citizens' adoption behavior of the Taqat web portal, a job seeking web portal, in Saudi Arabia. We adopted the conceptual framework proposed in this dissertation by using the developed web-based questionnaire and following the data analysis guidelines to evaluate Saudi citizens' adoption behavior of this web portal. We recruited 1110 Saudi participants to provide their evaluation of each questionnaire item which ranges from strongly agree (5) to strongly disagree (1). As this dissertation promotes universal access by all target users, we evaluated the adoption behavior from the lens of all demographic data i.e. gender, age group, and education level. The outcomes of this study

effectively support government practitioners in the planning, design, and implementation of Saudi e-government services by efficiently evaluating citizens' adoption behaviors and understanding citizens' needs which would affect their willingness to adopt these services. This user study contributes to achieving the research goal 2: *" Deploy the Developed Conceptual Framework"* by fulfilling the following task successfully: *"Task-4: use the framework in a specific context to evaluate the e-government adoption behavior from citizens' perspectives"*.

The main contribution of this dissertation is to inform government designers and practitioners of the established guidelines to accurately evaluate citizens' adoption behavior of a given e-government service. It promotes fair access by all target users by evaluating their adoption behaviors. This dissertation contributes to the existing literature on the e-government domain by (a) conducting a systematic literature review that investigates the user experience of e-government, (b) developing a conceptual framework that incorporates the most common significant factors affecting citizens' adoption behaviors globally, (c) developing a valid and reliable web-based questionnaire based on the proposed framework, and (d) implementing a UCD-based reference implementation that incorporates the systematic approach to evaluate citizens' adoption behavior of a given e-government service. It also contributes to the practical implications of evaluating e-government adoption in Saudi Arabia. Therefore, we conducted a user study to evaluate Saudi citizens' adoption behaviors of the Taqat web portal from the lens of gender, age group, and education level. The findings of this study help to better understand and improve the adoption of the Taqat web portal by exploring the significant factors affecting the e-government adoption behavior from citizens' perspectives.

Some limitations of this dissertation could be addressed in future research. The analysis in this dissertation was limited to only the top five factors that have a significant impact on e-government adoption at a global level. It is our belief that the conceptual framework would benefit from further expansion to include additional adoption factors, thus allowing for a

more comprehensive understanding of e-government adoption. Also, this dissertation utilized a quantitative research methodology to assess the adoption behavior of e-government. However, additional research methodologies may be necessary to provide a more comprehensive understanding of the findings. While this dissertation offers a structured approach to evaluate citizens' e-government adoption using the proposed conceptual framework and UCD-based reference implementation, further research is required to investigate why specific factors are influential in affecting citizens' adoption behaviors, while others are not. In addition, given that this dissertation focuses solely on citizens' perspectives regarding the factors influencing e-government adoption, its findings may have limited generalizability and validity for enhancing e-government adoption and improving user experience as a whole. Other stakeholders, such as government employees, who may have different perspectives on e-government adoption, have been overlooked. They may have unique thoughts and needs regarding e-government adoption that have not been explored. Therefore, to expand the breadth of this research and gain a more comprehensive understanding of the user experience of e-government, future studies could investigate the perceptions of government employees towards e-government adoption.

Finally, the conducted research has led to the following publications:

- **Asma Aldrees and Denis Gračanin**. Cultural Usability of E-Government Portals: A Comparative Analysis of Job Seeking Web Portals Between Saudi Arabia and the United States. In Proceedings of the 23rd International Conference on Human-Computer Interaction - HCII'21.

- **Asma Aldrees and Denis Gračanin**. Gender Disparity in the Usability of E-government Portals: A Case Study of the Saudi Job Seeking Web Portal. In Proceedings of the 8th International Annual Conference on Electronic Governance and Open

Society - EGOSE'21.

- **Asma Aldrees and Denis Gračanin**. UX in E-government Services for Citizens: A Systematic Literature Review. Journal of User Experience (JUX), 18(3), 2023.

- **Asma Aldrees and Denis Gračanin**. User Experience and E-government Services: Lessons Learned about Developing a Benchmarking Survey. In Proceedings of the 14th International Conference on Applied Human Factors and Ergonomics - AHFE'23.

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Appendices

Appendix A

The SLR Primary Studies

Table A.1: SLR primary studies for the e-government adoption.

Study reference	Year	Model/ Theory	Critical factors of e-government adoption	Sample size	Country
[107]	2003	TAM TPB Exogenous factor	Perceived ease of use Perceived usefulness Self-efficacy Perceived credibility	260	Taiwan
[102]	2005	TAM Exogenous factor	Perceived ease of use Perceived usefulness Perceived Internet safety	99	Singapore
[144]	2006	TAM DOI Trust model TPB	Perceived ease of use Perceived usefulness Compatibility Perceived risk Self-efficacy Facilitating conditions	27,208	Taiwan
[86]	2007	TAM Trust model TPB Exogenous factor	Perceived usefulness Perceived risk Subjective norms Perceived behavioral control Personal experience	238	Netherlands

Table A.1: SLR primary studies for the e-government adoption (continued).

Study reference	Year	Model/ Theory	Critical factors of e-government adoption	Sample size	Country
[97]	2008	Trust model	Trust Trust of government Trust of the Internet Perceived risk	214	USA
[145]	2009	TAM DOI Trust model Exogenous factors	Perceived usefulness Complexity Relative advantage Trust Cultural factor Image	150	Malaysia
[146]	2009	TAM DOI Exogenous factors Trust model	Perceived usefulness Complexity Beliefs / accessibility Trust of government Trust of the Internet	400	Jordan
[111]	2009	TAM DOI Exogenous factor TPB	Perceived ease of use Perceived usefulness Compatibility Training Subjective norms Self-efficacy Facilitating conditions	186	Taiwan
[147]	2010	TAM TPB Trust model	Perceived ease of use Perceived usefulness Facilitating conditions Trust of government	200	Taiwan

Table A.1: SLR primary studies for the e-government adoption (continued).

Study reference	Year	Model/ Theory	Critical factors of e-government adoption	Sample size	Country
[164]	2010	Trust model Exogenous factor	Trust of government Trust of the Internet Online experience	152 302	USA Mexico
[124]	2010	UTAUT	Effort expectancy Social Influence	1179	Qatar
[89]	2010	UTAUT Trust model Exogenous factor	Performance expectancy Social influence Trust of e-government Perceived risk Optimism bias	260	USA
[98]	2010	Exogenous factors	Perceived risk Perceived trust Positive expectations Reading privacy statement	223	Netherlands
[148]	2011	TAM DOI Exogenous factor	Perceived ease of use Compatibility / observability Using experience	305	China
[163]	2011	DOI TPB IS Success model Trust model Exogenous factors	Compatibility Self-efficacy Information quality Perceived trust Perceived awareness Availability of resources Perceived ability to use Multilingual option Perceived image Perceived service response	239	Canada

Table A.1: SLR primary studies for the e-government adoption (continued).

Study reference	**Year**	**Model/ Theory**	**Critical factors of e-government adoption**	**Sample size**	**Country**
[149]	2011	TAM Exogenous factor	Perceived ease of use Perceived usefulness Perceived enjoyment Perceived learning value	307	Taiwan
[150]	2011	TAM TPB Trust model	Perceived ease of use Perceived usefulness Self-efficacy Facilitating conditions Trust of government Trust of the Internet	216	Turkey
[151]	2013	TAM DOI TPB Trust model	Perceived ease of use Perceived usefulness Compatibility Subjective norms Perceived trust	776	Egypt
[152]	2013	TAM Trust model IS Success model DOI Exogenous factor	Perceived ease of use Trust of the Internet Information quality Relative advantage Compatibility Image	1279	Canada

Table A.1: SLR primary studies for the e-government adoption (continued).

Study reference	Year	Model/ Theory	Critical factors of e-government adoption	Sample size	Country
[153]	2013	TAM TPB DOI Trust model Exogenous factors	Perceived ease of use Facilitating conditions Self-efficacy Compatibility Perceived risk Perceived cost perceived convenience	589	Indonesia
[154]	2013	TAM Trust model TPB Exogenous factor	Perceived ease of use Perceived usefulness Trust Subjective norms Self-efficacy Facilitating conditions Interactivity	331	Taiwan
[103]	2015	TAM TPB UTAUT Trust model Exogenous factor	Perceived usefulness Self-efficacy social influence Trust of e-government perceived risk Internet experience	304	Greek
[36]	2015	TAM Trust model Exogenous factors	Perceived ease of use Trust Cultural factors Perceived public value	413	Jordan

Table A.1: SLR primary studies for the e-government adoption (continued).

Study reference	**Year**	**Model/ Theory**	**Critical factors of e-government adoption**	**Sample size**	**Country**
[161]	2015	TPB Trust model Exogenous factor	Subjective norms Trust of the Internet Trust of government Social trust	770	Saudi Arabia
[162]	2015	Trust model UTAUT	Trust Social influence	40	Indonesia
[155]	2015	UTAUT Trust model	Effort expectancy Social influence Trust of e-government Perceived risk	251	Taiwan
[76]	2016	Exogenous factors	E-Informing E-Consulting E-Involving E-Collaborating E-Empowering services	247	Jordan
[90]	2016	TAM Trust model	Perceived ease of use Perceived usefulness Perceived trust Perceived risk Trust of the Internet	105 140	USA UK
[100]	2016	UTAUT Trust model	Performance expectancy Effort expectancy Trust of government Trust of the Internet	608	Hungary

Table A.1: SLR primary studies for the e-government adoption (continued).

Study reference	Year	Model/ Theory	Critical factors of e-government adoption	Sample size	Country
[156]	2017	TPB Trust model UTAUT	Self-efficacy Trust Effort expectancy Performance expectancy Facilitating conditions	249	Mauritius
[112]	2017	TAM	Perceived ease of use Perceived usefulness	156	Indonesia
[276]	2018	Exogenous factors	Perceived benefits Motivations	10	Saudi Arabia
[160]	2018	TPB UTAUT Trust model	Self-efficacy Performance expectancy Social influence Facilitating conditions Trust of government Trust of the Internet Perceived risk	282	Africa
[158]	2019	TAM IS Success model Exogenous factors Trust model	Perceived ease of use Perceived usefulness Information quality Social media competency Perceived security Perceived risk Trust of government Perceived trust	700	Korea
[101]	2020	UTAUT	Performance expectancy Effort expectancy Facilitating conditions	216	Uzbekistan

Table A.1: SLR primary studies for the e-government adoption (continued).

Study reference	**Year**	**Model/ Theory**	**Critical factors of e-government adoption**	**Sample size**	**Country**
[157]	2020	TAM	Perceived ease of use	289	Pakistan
			Perceived usefulness		
		Trust model	Trust of government		
			Decision transparency		
		IS Success model	Information quality		
			System quality		
			Service quality		
		Exogenous factors	services collaboration		
			Service transparency		
			Service effectiveness		
			Public engagement		
[159]	2022	TAM	Performance expectancy	396	Pakistan
			Effort expectancy		
		TPB	Attitude		
			Subjective norms		
			Perceived behaviour control		
			Self-efficacy		
		Trust model	Trust		
		Exogenous factors	Mass media influence		
			Family influence		
			Economic bonds		
			Structural bonds		
			Social bonds		

Appendix B

Research Methodology Concepts

Herein, the key research paradigms and approaches are reviewed to pave the way to select the appropriate research approach.

B.1 Research Paradigms

Research paradigm is known as "a set of linked assumptions about the world which is shared by a community of scientists investigating that world" [277, p. 101]. It elaborates on how the current system functions, how to obtain knowledge from the system, identifies what research questions should be provided, and specifies what research methodologies should be followed to answer the research questions [278]. When the research paradigm is successfully identified, the research findings can efficiently answer the research questions and improve the system's state by narrowing down the emerged gaps [252, 279].

The research paradigm encompasses three main principles, including ontology, epistemology, and methodology [5, 280, 281]. Ontology indicates the nature of reality and asks, 'what is reality?'. It concerns the nature of the social phenomena as entities to be accepted into the knowledge system. While epistemology refers to the nature of the knowledge. It focuses on what we know and how we know in the current system. It clarifies what adequate and acceptable information to obtain knowledge in the given system. Finally, the methodology represents the research techniques adopted to investigate a specific topic in a given context.

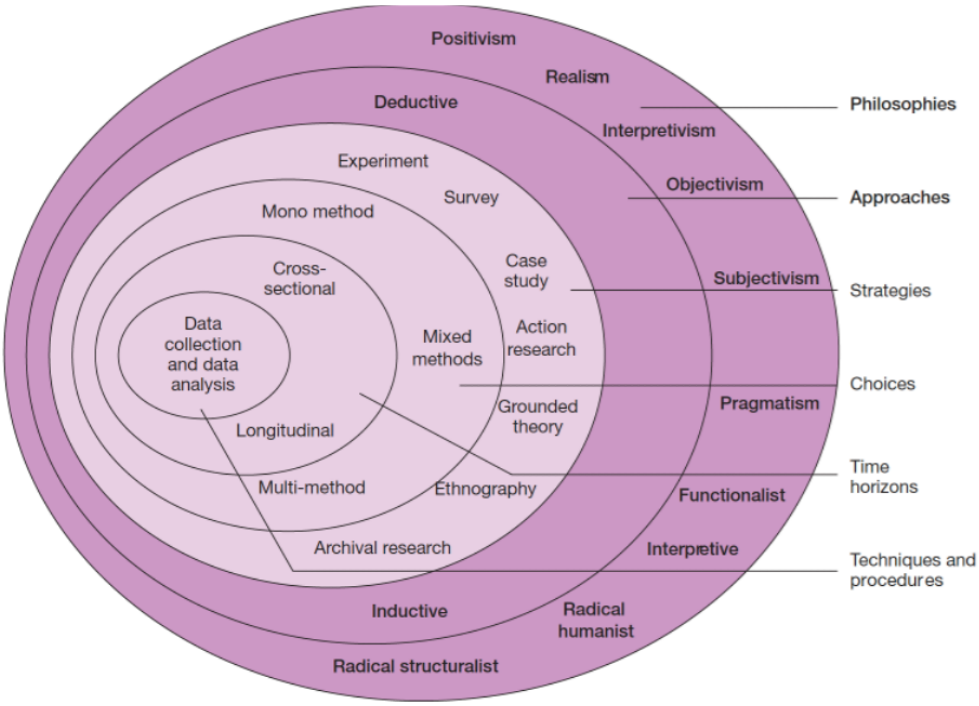

Figure B.1: The research onion [5, p. 102].

These techniques help interpret the principles of ontology and epistemology to perform research procedures. The outermost layer of the 'research onion' represents the research paradigms, which provide a summary of the basic research philosophies as shown in Figure B.1. These principles guide and articulate how researchers perceive the current system. They also help identify the importance of the research outcomes Hence, selecting a research paradigm depends on the researchers' perceptions of the research principles [5, 185, 279].

In the IS research, in which the current research is located, two distinctive schools of thought propose positions on research philosophy, which are positivism and interpretivism [5, 185]. These two approaches are considered the dominant philosophical approaches applied in the IS field [5, 279, 281]. The positivism approach is based on exploring what changes happened to the system by following the deductive approach to investigate the causal relationship between existing constructs [185, 187]. Positivism posits that reality exists and it is independent of the researcher and what is being studied so that the phenomena remain consistent among differ-

ent subjects. Thus, researchers who follow the positivist approach assume that reality exists objectively and can be measured through empirical data. For instance, in the e-government domain, the e-government adoption factor remains consistent in all survey questions pertaining to it. Therefore, responses to these questions can be measured to give a statistical result. The positivism approach consists of using a quantitative methodology to utilize the proposed models/frameworks, developing the research hypotheses regarding the relationships among the selected factors, and value-free analysis of the gathered responses [279, 280, 281].

On the other hand, the interpretivism paradigm supports the thought saying that the reality of the system can be understood by users' opinions [5, 22]. It indicates that the observation of the social phenomenon is produced by an individual interpretation and it cannot be presumed that what is being observed is similarly interpreted. Researchers must understand the difference in users' roles as social actors [5, 187]. The reality in this paradigm is obtained following the inductive approach by interacting with individual subjects from the target population to understand their roles and interpret their subjective opinions and perceptions of the current system. Therefore, it requires a qualitative methodology for generating particular hypotheses for the given context [279]. To summarize, interpretivism is identified by subjective interpretations of the data, the use of qualitative methodology to obtain and analyze the collected data, and engaging researchers with particular social contexts of the given research [185, 187, 188]. An overview of both paradigms is presented in Table B.1.

B.2 Research Methodology

A research methodology is a systematic plan used to answer a specific research question. It focuses on articulating the research question, developing constructs for the conceptual framework, identifying the sample from the target population, collecting the data, using the

Table B.1: IS research paradigms.

Principle	Positivism	Interpretivism
Ontology *What is reality?*	Reality is apprehendable and more realistic as reality can have a single truth	Reality is probabilistically apprehendable and less realistic as there is no single truth.
Epistemology *How do we know reality?*	Reality can be measured using reliable and valid tools	Reality is created by interpreting individuals' perceptions. It is used to obtain the underlying meanings.
Methodology *How do we go about discovering reality?*	• Confirmatory techniques • Deductive approach • Hypotheses testing • Cause and effect relationships • Quantitative data collection • Experimental and survey research • Statistical analysis	• Exploratory techniques • Inductive approach • Theory generation • Heuristic inquiry • Qualitative data collection • phenomenological research • Observation of interpretations
Source: this table is developed from [5, 187, 279]		

suitable statistical approach for analyzing the data, and reporting the research findings [22]. Selecting a suitable research methodology is essential to ensure the effectiveness and accuracy of the research findings by providing precise guidelines for researchers to carry out the research and achieve the research objectives within a reasonable timeframe. Typically, two research methods are employed to conduct research, namely qualitative and quantitative research methods [187]. These methods differ based on the type of data collected and the context of the research domain.

A qualitative methodology is defined as "a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem" [22, p. 380]. It usually emphasizes text mining techniques for deep interpretations rather than quantification of the collected data [22, 187]. A qualitative methodology is associated with the interpretivism

research paradigm and followed the inductive approach to guide the research study. This methodology aims to obtain participants' opinions and perspectives to study the nature of a specific phenomenon. Common strategies of the qualitative methodology are interviews, case studies, ethnography, grounded theory, action research, and archival research [22, 187, 188].

Another research methodology is a quantitative methodology known as "a means for testing objective theories by examining the relationship among variables." [22, p. 380]. The positivism research paradigm is usually followed in this methodology alongside the deductive approach to formulate the research design for a given study. It emphasizes collecting and analyzing numerical data of participants' viewpoints to explore how research hypotheses are supported [5, 22, 185]. It also supports collecting data from large samples and using computer programs for analysis, allowing researchers to generalize their findings to a larger population. This type of research typically employs predetermined and validated instruments for data collection, resulting in the production of statistical data. Common research strategies, such as surveys and experiments, are utilized in this type of research [22, 185, 187].

Appendix C

Survey Instrument

The following document illustrates the final version of the web-based questionnaire after conducting the validity and reliability tests. We have used this questionnaire for investigating the adoption behavior of the Taqat web portal from Saudi citizens' perspectives. We have exchanged the [The name of the e-government service] with the [Taqat web portal].

Title: Exploring the Significant Factors for the Adoption of Taqat Web Portal.

Protocol No.: IRB 22-684.

The questionnaire attempts to investigate the factors affecting the adoption behavior of the Taqat web portal from Saudi citizens' perspectives. Two versions of the questionnaire are created in English and Arabic languages. The questionnaire consists of two main sections:

- [**Section 1**] Demographics Information.
- [**Section 2**] The Critical factors for the Adoption of the Taqat Web Portal.

Exploring the Significant Factors for Adopting [The name of e-government service]

Eligibility Criteria:

If you would like to participate in this survey, you should be:

- A citizen or legal resident,
- Age is greater than or equal to 18,
- You have been using [The name of e-government service] for the past two years.

If you meet all these requirements, and you want to participate in this survey: Click yes to begin or no to exit.

- Yes
- No

Section-1: Demographic Information

For the following questions, please indicate your response:

Which of these age groups are you in?

- 18 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- More than 60

What is your gender?

- Male
- Female
- Other
- I don’t wish to provide

What is your education level?

- No formal school
- High school or less
- Associate degree
- Undergraduate degree
- Graduate degree
- I don’t wish to provide

Section 2: The Significant Factors for Adopting [The name of e-government service]

This section aims to explore the significant factors influencing the adoption of [The name of e-government service]. Please indicate your opinions by rating the given responses.

Statements about the influence of the perceived ease of use on adopting [The name of e-government service]:

	Strongly agree	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
I find [The name of e-government service] easy to use.	❑	❑	❑	❑	❑
[The name of e-government service]is flexible to interact with.	❑	❑	❑	❑	❑
It is easy to complete my transactions using [The name of e-government service].	❑	❑	❑	❑	❑
It is easy to remember how to perform tasks using [The name of e-government service]	❑	❑	❑	❑	❑

Statements about the influence of the perceived usefulness on adopting [The name of e-government service]:

	Strongly agree	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
I find [The name of e-government service] useful.	❑	❑	❑	❑	❑
Using [The name of e-government service] enables me to accomplish my transactions more quickly.	❑	❑	❑	❑	❑
I can be more productive in getting e-government services by using [The name of e-government service].	❑	❑	❑	❑	❑
Using [The name of e-government service] effectively saves time.	❑	❑	❑	❑	❑

Statements about the influence of the social influence on adopting [The name of e-government service]:

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
People who influence my behavior think I should use [The name of e-government service].	❑	❑	❑	❑	❑
I use [The name of e-government service] because my friends use it.	❑	❑	❑	❑	❑
I feel strong social support around me to use [The name of e-government service].	❑	❑	❑	❑	❑
Positive references on social media towards using [The name of e-government service] motivate me to use it.	❑	❑	❑	❑	❑

Statements about the influence of the facilitating conditions on adopting [The name of e-government service]:

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I have the knowledge necessary to use [The name of e-government service].	❑	❑	❑	❑	❑
I have the technical resources necessary to use [The name of e-government service].	❑	❑	❑	❑	❑
Online support is always available to help with technical problems.	❑	❑	❑	❑	❑
I have a person (or group) who is available if I have difficulty using [The name of e-government service].	❑	❑	❑	❑	❑

Statements about the influence of trust on adopting [The name of e-government service]:

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
[The name of e-government service] is trustworthy in carrying out online transactions.	❑	❑	❑	❑	❑
[The name of e-government service] allows users to input their data safely.	❑	❑	❑	❑	❑
[The name of e-government service] keeps my best interests in mind.	❑	❑	❑	❑	❑
[The name of e-government service] protects users' privacy.	❑	❑	❑	❑	❑

Statements about the adoption behavior of [The name of e-government service]:

	Strongly agree	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
I prefer to adopt [The name of e-government service] to perform my government service requests.	❑	❑	❑	❑	❑
I use [The name of e-government service] on a regular basis.	❑	❑	❑	❑	❑
In the future, I will continue to use [The name of e-government service].	❑	❑	❑	❑	❑
I recommend using [The name of e-government service].	❑	❑	❑	❑	❑

Dear participant, if you have any comments related to your experience with [The name of e-government service], please feel free to share your thoughts below:

Dear participant, if you have any comments related to the design of this survey, please feel free to share your thoughts below: