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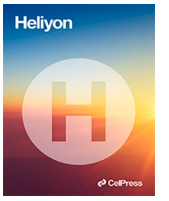

Achieving a successful e-government: Determinants of behavioral intention from Thai citizens' perspective

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ABSTRACT

From the COVID-19 pandemic, e-government is a crucial tool in managing crisis and coping with change through communication and collaboration between the government, private, and civil sectors. The objective of this study was to develop an e-government development success model from the perspective of Thai citizens using integrated multiple concepts and to examine factors affecting the behavioral intention of citizens in e-government. A sample is Thai people in all regions of Thailand (n = 540) and analyzes by Structural Equation Model (SEM). The hypothesis testing found that factors directly influencing behavioral intention were information quality, system quality, service quality, citizen satisfaction, perceived usefulness, computer self-efficacy, and trust in government. Trust in government was the most direct influencing factor and was the mediating variable between perceived privacy and perceived security leading to behavioral intention. The results will benefit governments in developing e-government to drive the digital economy and society further.

1. Introduction

Each country's government has attempted to reform public administration into a new public management (NPM) system [1] by transforming government operations from a complex bureaucratic system with an emphasis on regulations and high costs to a new and modern management style with techniques and processes that are business-like. It emphasizes efficient, effective, cost-effective, and decentralized management to respond to citizens with accountability based on good governance [2–4].

New public management and electronic government (e-government) share similar contexts: citizens are viewed as customers, while government agencies are considered public managers [5]. However, e-government is more advanced than NPM because e-government can immediately lead to good governance by information and communication technology (ICT) and government applications as essential tools to support government administration [6,7]. It delivers public services to citizens with efficiency and thoroughness, reducing access disparities and gaps through transparency. It also allows citizens the chance to inspect. This will facilitate citizen participation and empowerment, reduce corruption, and increase citizen trust in government [8–10].

E-government may enhance the quality of life of citizens, contribute to the growth of the digital society and economy, and play a crucial role in crisis management [7], as evidenced by the COVID-19 pandemic. Through innovation, the government can efficiently deliver public services to citizens, particularly innovations in medicine and public health, especially for delivery to vulnerable populations. Therefore, the development of e-government is an essential objective for many countries. Frequently, the e-government development plan is incorporated into the national master plan.

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The United Nations desires that the development of e-government align with the Sustainable Development Goals (SDGs), particularly SDG16 (Peace, Justice, and Strong institutions). Using the EDGI (E-Government Development Index), the United Nations surveys and ranks the e-government development of 193 member countries every two years based on three dimensions: OSI (Online Service Index), TII (Telecommunication Infrastructure Index), and HCI (Human Capital Index). In 2022, it was determined that Europe had the highest average level of e-government. On a country-by-country basis, Denmark (EDGI = 0.9717), Finland (EDGI = 0.9533), and the Republic of Korea (EDGI = 0.9529) are the top three countries in terms of e-government development [7].

Thailand is among the developing nations that recognize the significance of e-government development. The Ministry of Information and Communication Technology was established in 2002 to serve as the e-government development's central agency. The Thai government made its position clear in 2015 by announcing the Thailand 4.0 policy and advancing the E-government 4.0 policy. Digital technology as a mechanism to drive economic, social, and public administration by adhering to the citizen-centrism approach to improve citizen wellbeing. Additionally, the government announced its readiness to transition to digital government. According to a 2022 UN survey, Thailand ranked 55th out of 193 countries in e-government development (EGDI = 0.7660), ranking among countries with a very high e-government development level (EGDI = 0.75–1.00), a significant improvement from the previous survey in 2020, in which Thailand was ranked 57th (EGDI = 0.7565) [7]. The Thai government desires and strives to be among the top 10 nations by 2037, a goal that has been incorporated into Thailand's national strategy 2018–2037 [11].

The actual success of e-government development is not measured by EGDI rankings, but by the acceptance and willingness of citizens to use e-government services [12]. Thus, the development of e-government is a challenge for the international community, as the government must invest substantial funds in infrastructure development, technology and innovation development, and human resource development. It must also drive and deliver e-government services for actual use by citizens. The research on e-government development will therefore assist the government in identifying the key success factors in e-government development. In the past, however, research on the development of e-government frequently focused primarily on technology. This can be seen from the framework of the stage of e-government development, which present in technology implementation [13,14] or focused on information systems [15–17], or some research focused on user acceptance of technology [18–21]. The actual success of e-government development is more complex than technology acceptance or technology assessment [22]. For e-government development to be a success, it is necessary to consider additional factors as success key, including the national context of each country. In Thailand, there is still a lack of research examining the development of e-government from a variety of perspectives, particularly from the perspective of citizens. Due to the research gap, the following research question has been formulated: "**From the perspective of Thai citizens, what factors influence their use of e-government services?**"

This study developed a new integrated model from various theories by using the Information System (IS) Success Model [23] as the main model (presenting the e-government system quality dimension) and adding some factors from the Technology Acceptance Model (TAM) [24], the Unified Theory of Acceptance and Use of Technology (UTAUAT) [25] (presenting the technology acceptance of citizens dimension), the Social Cognitive Theory (SCT) [26] (presenting computer and digital technology self-efficacy of citizen), other factors that affect the success of e-government service (perceived privacy, perceived security, and trust in government). Consequently, it is proposed the newly developed model covers multiple dimensions that influence e-government service behavioral intention, and then tests the factors that influence e-government service behavioral intention.

The results of this study are derived from the perspective of citizens and contribute to the successful development of e-government based on citizen needs. It will benefit the government sector, system developers, and academics, who can use it to develop e-government technology and innovation. It can also be used to formulate a strategy for the development of the nation's e-government, which will facilitate driving the economy and society in accordance with the concept of sustainable development.

The following is the structure of the article: Beginning with the introduction, section 2 presents the fundamental theories underlying the proposed hypotheses and the conceptual model development; section 3 describes the research methodology; section 4 presents the research results; section 5 presents the discussion and research conclusions; section 6 suggests the implications of the research; and section 7 concludes with a discussion of limitations and future research directions.

2. Theoretical background, hypotheses, and conceptual model

2.1. E-government adoption

E-government is the use of information and communication technology to help government administration be more efficient, faster, and deliver services to citizens, businesses, government agencies, and government employees anywhere, at any time. It has the potential to improve efficiency, transparency, and good governance, as well as the quality of service provided to citizens and the ease with which they can access government services [7,27]. The study of e-government adoption enables governments to better comprehend the needs of their citizens. This will enable the successful delivery of public services [28,29]. Nevertheless, many nations face a lack of citizen acceptance of e-government, preventing governments from fully providing public services and preventing citizens from taking full advantage of e-government.

Prior research on e-government adoption has primarily focused on technology, technology adoption, or both, but there are additional factors to consider. Consequence from the research's implications, behavioral intention is considered as a factor that can be used to quantify acceptance [20,28,30,31].

Table 1 shows the previous researches on e-government adoption. Most of the concepts are taken from the IS success model [23], TAM [24], UTUAT [25] and the related factors to create acceptance of the use of e-government.

Table 1
Previous research in e-government adoption.

Author	Main model	Antecedents	Mediating	Consequence	Context	Sample	Country
Hujran et al. (2023) [18]	UTAUT	Performance expectancy, Effort expectancy, Social influence, Facilitating conditions, Personalization, Convenience	Usage of smart government services, Information transparency, Citizen satisfaction	Citizen engagement	Smart government services	414 smart government clients	United Arab Emirates
Hooda et al. (2022) [19]	UTAUT	Performance expectancy, Effort expectancy, Social influence, Facilitating conditions	Trust in e-government, Intention to use e-government	e-government system use behavior	E-government system	90 articles (Meta-analysis sample)	–
Jermsittiparsert & Wongsurawat (2021) [32]	IS success model	System quality, Information quality, Service quality	Habit, Confirmation	Continued-use	E-government service	345 citizens	Thailand
Xiong et al. (2022) [33]	IS success model/TAM	System quality, Information quality, Service quality, Perceived usefulness, Perceived ease of use, Perceived interactivity, Perceived risk	User satisfaction, Trust	Continuance intention	Mobile government service	335 citizens	China
Khan et al. (2021) [34]	TAM	Information quality, Perceived ease of use, Perceived privacy & security, Structural assurances	Trust, Perceived usefulness	Intention to participation	Social media for government service	615 public and private sector employees	Pakistan
Wang & Teo (2020) [16]	IS success model	Information quality, System quality, Online service quality	Citizen satisfaction	Perceived value	Mobile government service	288 citizens	China
Mensah et al. (2020) [35]	UTAUT	Performance expectancy, Effort expectancy, Social influence, Facilitating conditions, Perceived risk, Perceived service quality, Trust in government	Attitude, Behavioral intention to use,	Intention to recommend	E-government service	289 citizens	China
Alruwaie et al. (2020) [36]	Social Cognitive Theory (SCT)/Expectation Confirmation Theory (ECT)/ IS success model	Prior experience, Social influence, Information quality, Service quality	Personal outcome expectations, Self-efficacy, Satisfaction	Continuance intention	E– government service	471 citizens	United Kingdom
Lallmahomed et al. (2017) [28]	UTAUT2, e-Government adoption model (GAM),	Performance expectancy, Effort expectancy, Social influence, Facilitating conditions, Perceived price value, Perceived awareness, Computer self-efficacy, Trust of the government	Resistance to change	Behavioral intention	E-government service	247 citizens	Mauritius
Kurfalı et al. (2017) [20]	UTAUT	Trust of government, Trust of internet	Performance Expectancy, Effort Expectancy, Social influence, Facilitating conditions	Behavioral intention	E-government service	529 citizens	Turkey
Bhuasiri et al. (2016) [37]	UTAUT, Self-Determination Theory (SDT)	Facilitating conditions, Social influence, Perceived autonomy, Perceived competence, Perceived risk, Perceived credibility	Performance expectancy, Effort expectancy	Behavioral intention to use	E-tax filing and payment systems	372 citizens	Thailand
Stefanovic et al. (2016) [17]	IS success model	Information Quality, System quality, Service quality, User satisfaction, Demographic conditions	Intention to use/Use	Net benefits	E-government system's employees	154 employees	Serbia
Seo & Bernsen (2016) [38]	–	Perceived ease of use, Geographical closeness, Perceived necessary Knowledge, Perceived risk, Trust in e-government, Subjective norm, Resistance to change, Perceived facilitating conditions	Perceived behavioral control, Perceived usefulness	Intention to adoption/use	E-government service	337 citizens	Netherland

(*continued on next page*)

Table 1 (*continued*)

Author	Main model	Antecedents	Mediating	Consequence	Context	Sample	Country
Chen et al. (2015) [39]	IS success model/Trust theory	Trust in government, Trust in technology, Experience on offline government services	Information quality, System quality, Service quality, Perceived usefulness, User satisfaction	Perceived net benefits	Online tax filing system	234 citizens	Philippine
Rana et al. (2014) [40]	IS success model/TAM	System quality, Information quality, Service quality, Perceived risk	Perceived usefulness, Perceived ease of use	perceived satisfaction, Behavioral intention	Online public system	419 citizens	India
Wang (2014) [21]	TAM	Perceived ease of use, Perceived usefulness, Mobility, Perceived security	Perceived value	Satisfaction, Trust in technology, Trust in agent, Trust in government	Mobile government service	326 citizens	China
Ayyash et al. (2013) [41]	IS success model/TAM	Perceived information quality, Perceived system quality, Perceived service quality, Perceived usefulness, Perceived ease of use, Perceived security & privacy	Trust in government	Intention to use	E-government in public sector	364 employees	Palestine
Wang & Lo (2012) [42]	TAM/TPB	Trust in government, Trust in internet, Self-efficacy, Perceived usefulness, Perceived ease of use, Subjective norm, Facilitating conditions	Attitude	Intention to use	Government website	200 citizens	Taiwan
Shareef et al. (2012) [12]	Transaction cost analysis (TCA), TPB, TRA	Perceived awareness, Computer-self efficacy, Availability of resources, Perceived ability to use, Perceived compatibility, Perceived functional benefit, Perceived image, Perceived information quality, Perceived service response, Multilingual option, Perceived uncertainty, Perceived security, Perceived privacy	Perceived trust	Adoption of e-Government	E-Government website	239 citizens	Canada

2.2. IS success model

In 1992, when information technology was used to improve and increase work efficiency, DeLone & McLean proposed the concept and developed the IS Success Model [43]. There are two dimensions to quality assessment factors: information quality and system quality influencing use and user satisfaction, which in turn affects individual impact and organization impact. Later, DeLone & McLean developed a model to assess the success of information systems by adding one more dimension of quality, namely service quality [23], that uses the SERVQUAL principle of Parasuraman and Berry [44] to increase the efficiency of public services [45]. E-government necessitates the development of information systems and innovations as tools to provide timely, location-independent delivery of public services to citizens. In this study, the IS Success model served as the main model for examining the quality dimension of government information systems. The quality measurement of the e-government system according to the IS success model can be measured in three dimensions [23].

2.2.1 Information quality is the degree to which the information that appears or is obtained from processing by information systems is of good quality. Information quality is an important factor in deciding whether to use a system. Quality information must have the following characteristics: accuracy, personalization, completeness, relevance, understandability, and security [23]. Rana et al. found that online service systems that provide services to the public deliver quality information that is up-to-date, reliable, complete, and timely [40]. While Chatterjee et al. found that government public services using the Internet of Things with high information quality make users in the public sector satisfied with their use [46], it also causes citizens to engage in behavioral intention. It is in accordance with Stefanovic et al. who found that information quality influences behavioral intention [29]. It can formulate hypotheses as follows.

Hypothesis 1a. Information quality has a significant effect on citizen satisfaction.

Hypothesis 1b. Information quality has a significant effect on behavioral intention.

2.2.2 System quality is the quality of the system that occurs when there is an interaction between the system and the user until the purpose is fulfilled, or it responds to user requirements. System quality is a very important factor influencing user satisfaction. Higher system quality also leads to higher user satisfaction [23]. It can be measured by reliability, availability, response times, usability, and adaptability [23,43] Xiong et al. [33] and Wang & Teo [16] found that the quality of the mobile government service made the users satisfied and willing to use the system. While Veeramootoo et al. found that system quality affects e-filling users satisfaction and intent to use the system [47]. It can formulate hypotheses as follows.

Hypothesis 2a. System quality has a significant effect on citizen satisfaction.

Hypothesis 2b. System quality has a significant effect on behavioral intention.

2.2.3 Service quality is a comparison of expectations and perceptions received from the service. When the service is online, the customer perceives the service quality from the interaction received [48]. Parasuraman et al. developed the SERVQUAL model as a tool to assess service quality [44]. It is widespread to measure service quality and is used to develop the service of the organization to be successful. It consists of five dimensions to measure service quality: tangibility, reliability, responsiveness, assurance, and empathy. DeLone & McLean stated that service quality is very important for running a digital business [23]. Because the service users are not users in the organization but are outside the organization, if the service delivery is not good, it will eventually lose customers and lose revenue. In the context of e-government, service users are citizens. If they suffer or receive poor quality service, they will never return to using the service again and will decide whether e-government is worthless or useless to them. Wang & Teo have developed the M-government success model and found that the quality of online services influences citizen's satisfaction [16]. While Hariguna et al. found that service quality is a factor that influences citizen's intention to participate in e-government services [49]. It can formulate hypotheses as follows.

Hypothesis 3a. Service quality has a significant effect on citizen satisfaction.

Hypothesis 3b. Service quality has a significant effect on behavioral intention.

Table 2 presents a summary of measurement items for information quality, system quality, and service quality of e-government services from prior research.

From the synthesis of previous research, this study presents the characteristics used to measure the quality of each dimension of e-government service as follows (Fig. 1):

1) Information quality consists of accuracy (e-government services present and process information with accuracy and precision), relevance (e-government services present and process information in accordance with what citizen need), up-to-date (e-government services present current and up-to-date information), and completeness (e-government services present information that is complete, sufficient to meet the needs, and beneficial).
2) System quality consists of user-friendly (e-government services that are convenient to use), easy to use (e-government services that are simple to use and learn), availability (e-government services that are available and respond quickly), and reliability (e-government services that are consistent under variety of conditions).
3) Service quality consists of responsiveness (e-government services responding quickly to citizens' needs), understanding (e-government services identifying and comprehending the needs of citizens), empathy (e-government services solving problems and being concerned and willing to assist), and reliability (e-government services inspiring trust and confidence).

Table 2
Measurement items of quality in each dimension.

Source	Measurement items		
	Information quality	System quality	Service quality
Xiong et al. [33]	Accuracy, Relevance, Information format	Availability, Response time, Reliability	Responsiveness, Understanding, Better service, Meet user need
Wang & Teo [16]	Accuracy, Up-to-date, Reliability, Completeness	User-friendly, Ease of use, Easy to get system, Security	Empathy, Dependable service, Reliability
Li & Shang [50]	Accuracy, Relevance, Up-to-date, Easy to understand, Well organize	User-friendly, Availability, System features	Availability, Differentiate, Completeness
Santa et al. [51]	Accuracy, Timeliness, Reliability, Completeness	User-friendly, Easy to use, Easy to get system, Workflow improvement, Reduction of time	Responsiveness,Understanding, Service afterwards
Veeramootoo et al. [47]	Accuracy, Relevance, Up-to-date, Reliability, Well organize, Easy to understand	User-friendly, Easy to use, Reliability, Helpful instruction, Respond time	Responsiveness, Understanding, Empathy, Quality improvement, Simplifies & standard, Reduction of time, Reliability
Chatterjee et al. [46]	Accuracy, Relevance, Security	Easy to use, Standard, Privacy	Reliability, Service afterwards
Stefanovic et al. [17]	Accuracy, Relevance, Completeness, Reliability	User-friendly, Easy to use, Helpful instruction	Responsiveness, Understanding, Empathy, Privacy and security
Chen et al. [39]	Accuracy, Relevance, Up-to-date, Completeness, Easy to understand	Easy to use, Response time, Accessibility, Helpful instruction, Well organize	Responsiveness, Understanding, Empathy, Dependable service
Rana et al. [40]	Up-to-date, Completeness, Reliability, Timeliness	User-friendly, Easy to use, Easy to get system	Responsiveness, Understanding, Empathy, Dependable service, Availability
Wang & Liao [52]	Accuracy, Up-to-date, Completeness	User-friendly, Easy to use	Understanding, Empathy, Security

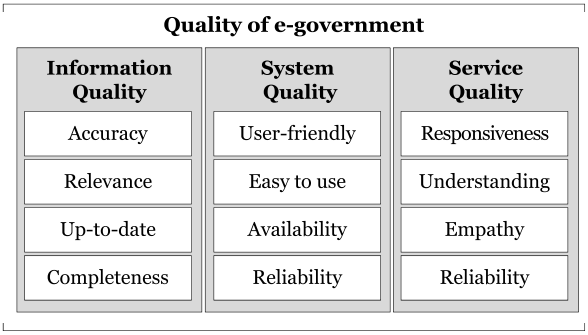


Fig. 1. Summarized characteristics to measure e-government quality.

2.3. Citizen satisfaction

Satisfaction occurs when both physical and psychological requirements are met [53]. The Expectation Confirmation Theory (ECT) is a model of satisfaction which is determined by a comparison of what is expected and what is received [53]. The assessment's outcome is referred to as an attitude. If the assessment results meet expectations, consumers or users will feel satisfied and have a favorable attitude toward the purchase of the product or service, which will result in positive behaviors such as loyalty, future purchase intention, and intention to use technology. If the assessment results are lower than expected, consumers will experience dissatisfaction and will engage in negative behavior.

Customers in the context of e-government are citizens who use e-government services. Citizen satisfaction arises from the positive experience of using the e-government service system. They will assess the overall effectiveness and efficiency of e-government services [54,55]. Satisfaction is the most influential factor in determining whether e-government is accepted, as indicated by intention to use, continuous intention, perceived net benefit, and behavioral intention [39,46,47,50,56].

Veeramootoo et al. studied the acceptance of e-government service in Mauritius and found that the satisfaction of using the e-filling government service system resulted in citizens willingness to continue using the system [47]. While Alruwaie et al. found that UK citizens who are satisfied with their participation in online public services will intend to continue using these services in the future [36]. It can formulate a hypothesis as follows.

Hypothesis 4. Citizen satisfaction has a significant effect on behavioral intention.

2.4. Perceived usefulness

Perceived usefulness refers to the degree to which citizens believe information technology will improve their performance and efficiency [24]. Perceived usefulness is a factor in the technology acceptance model (TAM) [24]. Seddon [57] improves DeLone & McLean's model [43] by including the perceived usefulness factor instead of the use factor. It is obvious that perceived usefulness is an important factor influencing users' intention to use technology [24]. E-government service systems are one type of information system that can improve operational efficiency and citizen quality of life. According to Seo & Bernsen [38], both urban and rural Dutch citizens recognize the benefits of e-government and have committed to using it. Other findings [58,59] found that perceived usefulness influences behavioral intention. It can formulate a hypothesis as follows.

Hypothesis 5. Perceived usefulness has a significant effect on behavioral intention.

2.5. Social influence

Social influence is an environmental factor or influence from a reference group that influences another individual's beliefs, attitudes, conformity, and behavior when using technology. Social influence is one of the variables in the Unified Theory of Acceptance and Use of Technology (UTAUT) [25], which corresponds to the subjective norm in the Theory of Reasoned Action (TRA) [60]. Lamb et al. divided reference groups into two categories: 1) direct reference groups, which are groups in which a person is involved in face-to-face membership, such as family, friends, colleagues, clubs, and religious groups; and 2) indirect reference groups, which are groups in which a person is not currently a member but wishes to be [61]. Individuals are more likely to trust, conform to, and be influenced by their environment (family, friends, and preferred individuals).

The adoption of e-government has been influenced directly by social influence [20,28]. According to Zolotov et al. [62], individuals will use e-participation when they receive positive comments and suggestions from their influencers. This is consistent with the findings of Kurfali et al. [20], Rana & Dwivedi [30], and Bhuasiri et al. [37], who found that social influence influences behavioral intention. It can formulate a hypothesis as follows.

Hypothesis 6. Social influence has a significant effect on behavioral intention.

2.6. Facilitating condition

The facilitating condition refers to an individual's belief that the system's technical infrastructure and existing organizations support its use [25]. The facilitating condition is a variable in the UTAUT [25]. If the user is aware of available resources and advocates for the use of technology, this encourages users to have positive behavioral intention when interacting with technology [63]. As the result of the studies about e-governments in Mauritius [28], Turkey [20], and sub-Saharan Africa [31], it was found that citizens in supportive environments, including those with the necessary resources and knowledge to implement e-government services, were more willing to use system. A condition that facilitates to use system may include resources, knowledge, assistance, or advice [31]. It can be concluded that facilitating condition is a factor that affects behavioral intention [31,35,37]. It can formulate a hypothesis as follows.

Hypothesis 7. Facilitating condition has a significant effect on behavioral intention.

2.7. Computer self-efficacy

Self-efficacy is rooted in the Social Cognitive Theory (SCT). The ability of a person to perform any action successfully and effectively is not only dependent on their abilities; it is also dependent on their self-efficacy [26]. Thus, computer self-efficacy can be defined as self-confidence in one's ability to complete computer-related tasks successfully, based on the concept of self-efficacy [64]. A lack of competence and experience with computers, the Internet, and information communication technology (ICT) is one of the barriers to adoption [65], which leads to a lack of belief in the benefits of e-government [12]. Sharma et al. discovered that the primary challenge to delivering e-government services in rural areas is the support and development of computer and digital technology skills for the citizens [66]. According to the UN report [7], the development of e-government will necessitate not only the creation of online services and infrastructure, but also an increase in digital literacy among citizens. Digital literacy encompasses the use of computers and the Internet, understanding technology and digital content, creating digital content, and accessing technology. Computer self-efficacy can be classified as digital literacy. Consequently, computer self-efficacy is a crucial factor in determining whether citizens accept e-government and have confidence in utilizing new systems or technologies [67,68].

It also affects the behavioral intention of using e-government services [12,67]. It can formulate a hypothesis as follows.

Hypothesis 8. Computer self-efficacy has a significant effect on behavioral intention.

2.8. Perceived privacy

The citizen has four roles: customer, client, citizen, and subject. In the subject role, they must gather individual privacy protection [69]. In the context of e-government, when citizens use services and conduct online transactions, there is a perceived risk of privacy violations. This may lead to a tendency for people to lose their trust [70] and raise concerns about the handling of personal data from

the process of storing, collecting, disclosing, and utilizing information, including identity theft [71,72]. Hence, privacy concerns are the main reason for the inhibition of e-government development because people may not accept or oppose the use of services or stop using e-government services [73].

Zaidi & Qteishat developed the e-GSQA Framework [74] by joining the E-S-Qual [75] and the e-GovQual [76], which included privacy in the framework. E-government service privacy means the e-government has protection against access to personal information, not sharing or disclosing personal information to other systems or other agencies, and not using personal information for other purposes without permission [33,77,78]. E-government therefore needs to proactively protect personal data, sensitive data, and privacy for citizens [7].

As government agencies collect many citizens' personal information from birth to death, protection of citizens' personal information is a challenging issue that the government must ensure for the public. Thailand has announced the Personal Data Protection Act or PDPA Thailand in 2019 to protect personal data and provide legal rights to the data subject. Organizations, particularly government agencies, are preparing to comply with the law, which be enforced in 2022. In e-government research, perceived privacy is an antecedent of perceived trust [79]. If there is effective oversight of privacy and data controls, it can build trust in governments. Then, if there is a high level of privacy, it will cause high trust in the government [13,37]. It can formulate a hypothesis as follows.

Hypothesis 9. Perceived privacy has a significant effect on trust in government.

2.9. Perceived security

The first factor that users consider before using the information system is security [80]. Perceived security is how citizens feel when using an e-government service. A security feature is required to protect data from unauthorized access by third parties so that the system can resolve any threats from system hacking, malware, or viruses, as well as not be controlled by abusive or irrelevant groups [12,34,77]. According to United Nations [7], it emphasizes the security of using e-government services, causing each country to attempt to enforce cybersecurity laws by assigning responsibilities to agencies to provide preventative measures, manage, and respond to cyber threats and other related incidents to create a perceived security for the citizens.

The Thailand National CERT has reported cyber threat statistics for the year 2022 in Thailand. It was discovered that hacked websites of government agencies are the most common cyberthreats, particularly education and public health agencies, of which there are many in Thailand. Cybercriminals in Thailand use a variety of phishing and social engineering techniques to impersonate government website pages with domains similar to their actual domains in order to trick users into downloading files containing malware to deceive personal information for illegal use [81], causing Thai citizens to be concerned of using e-government services.

Research on the development of e-government has revealed that if citizens feel insecure about e-government services, they will reject their use and distrust the government. In the development of e-government, security plays a crucial role. Zaidi & Qteishat created the e-GSQA Framework [74] by combining the E-S-Qual [75] and the e-GovQual [76] and incorporating security into the framework. Perceived security is therefore an important factor influencing trust in government [12,41,82,83]. It can be proposed as a hypothesis as follows.

Hypothesis 10. Perceived security has a significant effect on trust in government.

2.10. Trust in government

Trust is essential for all economic activities, but it is particularly crucial for online business operations, as customers or service users are more vulnerable to risks online than face-to-face. As a result, businesses, including government agencies, strive to earn the trust of service recipients. Because a lack of trust in the service recipient results in disapproval and a discontinuation of service use [84].

Trust in government is a citizen's belief that their government will act to their best benefit [85,86]. Trust can occur based on ability, integrity, and benevolence to serve citizens [87,88], including not abusing e-government services to harm citizens [20,28,31,62]. Trust in government is a crucial factor for citizen acceptance in e-government. There is rarely research conducted in the field of trust in e-government [78,89].

Even though trust is an intangible concept, citizens have always been aware of its existence through communication, particularly online communication, which enables citizens to share and express their opinions rapidly and widely. Thailand is a country that permits the unrestricted use of online media. When an event cast doubt on government administration, it will inevitably erode the public's confidence. Because, from the perspective of the citizen, government agencies should serve the public and be dependent on the citizenry [90], the government sector must increase trust by increasing work efficiency and effectiveness and by establishing a credible image.

Building trust in government requires government to conduct its operations with good governance [2,3], that is, administration guided by the rule of law, moral principles, principles of transparency, principles of participation, and a sense of responsibility, all of which contribute to the country's progress. Trust in government is critical for driving and developing e-government. It may also be a factor affecting citizen acceptance of e-government services [8,14,33,39,46,55] and increasing intention to use government innovation or application [91]. It can be proposed as a hypothesis as follows.

Hypothesis 11. Trust in government has a significant effect on behavioral intention.

Fig. 2 presents the research model integration, which includes the IS Success Model [23], TAM [24], UTAUT [25], SCT [26], and extends the model by adding an e-government acceptance factor, namely perceived privacy, perceived security, and trust in government. It can propose 14 hypotheses.

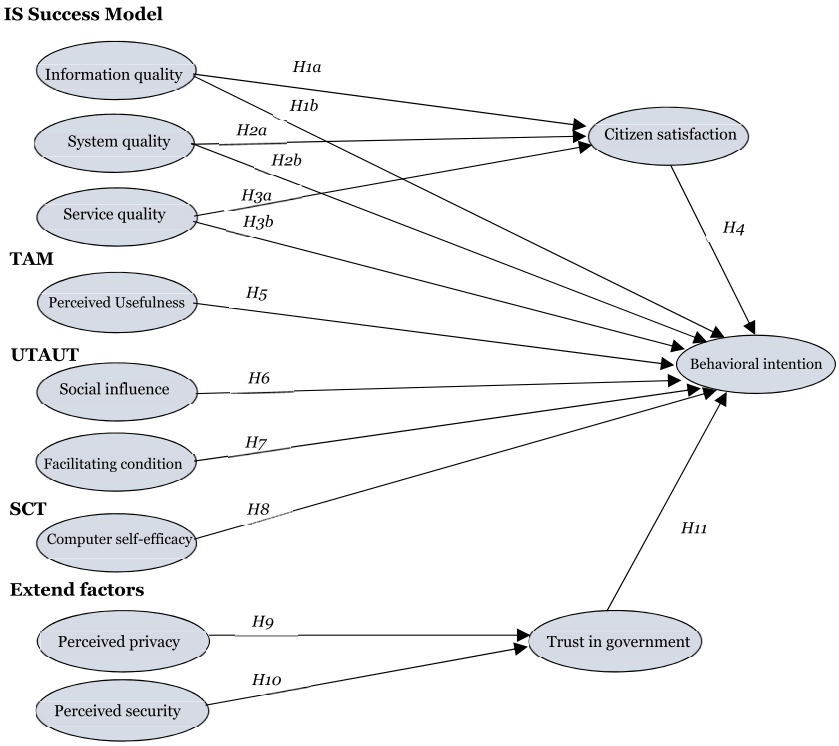


Fig. 2. The conceptual model.

3. Research methodology

3.1. Study design

This research is quantitative which using a causal relationship research technique to explain the cause-and-effect relationship of the dependent variable to answer the research objective, namely factors influencing the success of e-government development from the perspective of citizens. This research is a survey study and uses a questionnaire as a research tool.

3.2. Samples

The research sample consisted of 540 Thai citizens with experience or intention to use e-government services, residing in major cities in six regions of Thailand. It was determined the sample size by considering the suitability of analyzing with a structural equation model that the sample size should be at least 200 samples and considering the rule of thumb that the sample size should be 5–15 times per observed variable. Therefore, the sample size of this study should be 225–675 [92]. The researcher set the sample size at 12 times each of the 45 observed variables, resulting in a sample group of 540 samples, which is sufficient and suitable for analyzing by the structural equation model at a very good level [93].

3.3. Research instrument

This research used a questionnaire as a research tool. It has developed the questions by studying and synthesizing the review of relevant literature, which consists of two parts: Part 1 is a general information inquiry; 11 questions about the respondents are closed-end questions which are multiple choice (check list). Part 2 consisted of 45 questions about opinions about factors influencing the acceptance of using e-government services. The question type is a rating scale of 5 levels, according to Likert's Scale, which determines levels 5 (mostly agree) to 1 (least agree).

The questions developed from literature reviews and prior research. To examine factors influencing the development of e-government, 12 variables consisted of 9 exogenous variables as follows: Information quality (IFQ), system quality (SYQ), service quality (SEQ), perceived usefulness (PU), social influence (SI), facilitating condition (FC), computer self-efficacy (CSE), perceived privacy (PP), and perceived security (PS), there are two mediation variables, namely citizen satisfaction (CS) and trust in government (TG), and one endogenous latent variable, behavioral intention (BI). There are also three endogenous latent variables, which are citizen satisfaction (CS), trust in government (TG), and behavioral intention (BI), with citizen satisfaction (CS) and trust in government (TG) as mediator variables. Constructs and measurement items are shown in Table 3.

Table 3
Constructs and measurement items.

Construct	items	measurement
Information quality (IFQ)	IFQ1	The information provided by the e-government service system is accurate.
Source [16,33,49,51]:	IFQ2	The e-government service system provides information that meet my needs.
	IFQ3	The information provided by e-government service system is up to date.
	IFQ4	The e-government service system provides sufficient information.
System quality (SYQ)	SYQ1	The e-government service system is user-friendly.
Source [16,17,33,40,47]:	SYQ2	The e-government service is easy to use.
	SYQ3	I can use the e-government service system at any time.
	SYQ4	The e-government service system is reliable.
Service quality (SEQ)	SEQ1	The e-government service system provides responds quickly to my needs.
Source [16,33,39,47]:	SEQ2	The e-government service system understands my needs.
	SEQ3	The e-government service system provides empathy to my problem or my needs.
	SEQ4	The e-government service system provides empathy service.
Citizen satisfaction (CS)	CS1	I am satisfied with the e-government service system that I am using now.
Source [16,33,36,47,51]:	CS2	Overall, I am satisfied with using the e-government service system.
	CS3	I think it is a good decision to use the e-government service system.
Perceived usefulness (PU)	PU1	Using the e-government service system improves my performance.
Source [33,34,39,40]:	PU2	Using the e-government service system enables me to accomplish tasks more quickly.
	PU3	Using the e-government service system can reduce costs.
	PU4	Overall, using the e-government service system is advantageous for me.
Social influence (SI)	SI1	People who are important to me think that I should use e-government services.
Source: [20,31,94,95]	SI2	People who influence me think that I should use e-government services.
	SI3	I would use e-government services if my friends used them.
	SI4	I must use e-government services because my family thinks I should use it.
Facilitating condition (FC)	FC1	I have the necessary facilities for use e-government services.
Source [31,38,47,62]:	FC2	I have the necessary knowledge to use e-government services.
	FC3	I can get help from others whenever I have problem using e-government service.
	FC4	I can consult the government service center whenever I have problem using e-government service.
Computer self-efficacy (CSE) Source:	CSE1	I am confident in my ability to use the e-government services.
[12,31,95]	CSE2	I have the necessary skills to use the e-government services.
	CSE3	I am qualified to operate and utilize a computer and the internet.
Perceived privacy (PP)	PP1	The e-government service system prevents any unauthorized access to my personal information.
Source [12,34]:	PP2	The e-government service system does not share my personal information with other systems.
	PP3	My personal information is not used for other purposes without my authorization.
	PP4	My personal information is not shared with another government organization with whom I do not want to provide information.
Perceived security (PS)	PS1	The e-government service system has security features to protect citizens' data from unauthorized access by third parties.
Source [12,20,30,38]:	PS2	The e-government service system has the ability to solve problems arising from security threats.
	PS3	I believe that the information I provide to the e-government service system will not be manipulated by inappropriate or irrelevant groups.
	PS4	I would feel secure in using the e-government service system.
Trust in government (TG)	TG1	I believe that the government agency is truthful, honest, and genuine in its dealings.
Source: [31,34,96]	TG2	I believe that the government agency acts in the citizen's best interest.
	TG3	I believe that the government agency is competent and effective.
	TG4	I believe that using the e-government service system will not act in a way that harms me.
Behavioral intention (BI)	BI1	I intend to use the e-government service system in the future.
Source [30,31,33,36,50,62]:	BI2	I intend to continue using and intend to increase the use of the e-government service system in the future.
	BI3	I will recommend others to use the e-government service system.

3.4. Data collection

Data collection was conducted both face-to-face and online using a convenient sampling between December 2022 and February 2023. Quota sampling was used to determine the number of data collection sites by determining the area of data collection by selecting the provinces with the highest population in each region to represent a total of 6 provinces, namely Bangkok (representing the central region), which had 217 samples (40.11%), Nakhon Ratchasima Province (representing the northeast region), which had 104 samples (19.21%), Chiang Mai province (representing the north region) equals 64 samples (11.90%), Nakhon Si Thammarat Province (representing the south region) equals 61 samples (11.31%), Chonburi Province (representing the eastern region) equals 61 samples (11.31%), and Ratchaburi Province (representing the western region) equals 33 samples (6.16%). In addition, an additional 5% (27 samples) of data was collected in case of missing data [92]. The study has been approved by Mahidol University Central Instructional Review Board (MU-CIRB), Certificate of Approval COA No. MU-CIRB 2022/285.2510, date of approval November 28, 2022. Informed consent was obtained from all individual participants included in the study. Data collection is implemented based on research ethical principles, namely respect for persons, beneficence, and justice.

3.5. Validity and pilot-test

Before taking the questionnaire to collect the real sample, the validity was tested by the Index of Item-Objective Congruence by nine experts to check content consistency (2 academicians, 2 government officials, 2 information system developers, and 3 Thai citizens). The index of item-objective congruence passes the acceptance criteria [86] (range 0.78–1.00, >0.5). Conducting pilot-tests to determine reliability with the trial group of 45 samples using the internal consistency method, it was found that Cronbach's Alpha Coefficient with high confidence (0.789–0.878, >0.70) [92] (Table 4).

3.6. Data analysis

Data analysis was conducted in three steps as follows. 1) It was analyzed the preliminary data of the respondents with descriptive statistics, including frequency, percentage, mean, and standard deviation, and analyze the respondent's background affecting the behavior of using e-Government service with one-way ANOVA by SPSS v.18, 2) The validity and reliability of the measurement models were tested using Confirmatory Factor Analysis (CFA) with Maximum Likelihood Estimation (MLE), assessed by factor loading, Composite Reliability (CR), Average Variance Extracted (AVE), and Cronbach's alpha. It tested the congruence of measurement models with model fit indices (CMIN/DF, GFI, AGFI, RMR, NFI, RMSEA) and analyzing their correlation and discriminant validity of construct by program SPSS AMOS v.22. , and 3) The congruence of the structural model was evaluated using the model fit indices (CMIN/DF, GFI, AGFI, RMR, NFI, RMSEA), and path analysis was used to evaluate the research hypothesis using SPSS AMOS v.22.

4. Results

4.1. Respondents' demographic profile

The analysis of the demographics and behavior of 540 survey respondents found that most of them are female (n = 287, 53.1%), aged between 20 and 29 years old. (n = 208, 38.5%), graduated with a bachelor's degree (n = 312, 57.8%), was an employee in the private sector (n = 263, 48.7%), earned between 25,001 and 40,000 THB per month (n = 189, 35.0%), lived in an urban area (n = 267, 49.5%), had computer and digital technology skills at a medium level (n = 240, 44.4%), used the Internet 5–8 h per day (n = 209, 38.7%), used e-government service in medical and health (n = 493, 91.3%), and had frequency in e-government service usage 1–3 times per week (n = 255, 47.2%) (Table 5).

In addition, respondents' backgrounds that influence their intention to use e-government services were considered by comparing the mean differences of two or more independent groups with 95% confidence using one-way ANOVA. When classified by education, it was found that the samples' behavioral intention to use the e-government service were significantly different at the.001 level (F = 11.830, p = 0.000); when classified by residents, it was found that the samples' behavioral intention to use the e-government service was significantly different at the.001 level (F = 17.391, p = 0.000); and, when classified by computer and digital technology skill level, it was found that the samples' behavioral intention to use the e-government service were significantly different at the.001 level (F = 7.001, p = 0.000). The sample group with no difference in behavioral intention in using e-government services were citizens with graduate and postgraduate education levels, citizens living in urban and sub-urban areas, and citizens with computer and digital technology skills at a medium and high level (Table 6.).

4.2. Measurement model

Validity and reliability of the measurement model were assessed by Confirmatory Factor Analysis (CFA) with maximum likelihood estimation (MLE). It was found that Factor Loading, Composite Reliability (CR), Average Variance Extracted (AVE), and Cronbach's Alpha pass accepted criteria [92]. Factor Loading is greater than 0.50; composite reliability is between 0.799 and 0.884 (>0.60); Average Variance Extracted is between 0.517 and 0.659 (>0.50); and Cronbach's Alpha is between 0.793 and 0.878 (>0.70). (Table 7.).

Table 4
Results of reliability analysis.

Construct	Items	Number of items	Cronbach's alpha Coefficient
Information quality	IFQ1 - IFQ4	4	0.849
System quality	SYQ1 - SYQ4	4	0.878
Service quality	SEQ1 - SEQ4	4	0.858
Perceived usefulness	PU1 – PU4	4	0.789
Social influence	SI1 – SI4	4	0.824
Facilitating condition	FC1 – FC4	4	0.812
Computer self-efficacy	CSE1 - CSE3	3	0.798
Perceived privacy	PP1 – PP4	4	0.859
Perceived security	PS1 – PS4	4	0.798
Trust in government	TG1 - TG4	4	0.868
Citizen satisfaction	CS1 – CS3	3	0.858
Behavioral intention	BI1 – BI3	3	0.829

Table 5
Demographics of survey respondents. (n = 540).

Measure	Items	Frequency	Percentage (%)
Gender	Female	287	53.1
	Male	253	46.9
Age (years)	<20	48	8.9
	20–29	208	38.5
	30–39	178	33.0
	40–49	63	11.7
	50–59	31	5.7
	≥60	12	2.2
Education	Undergraduate	165	30.5
	Graduate	312	57.8
	Postgraduate	63	11.7
Occupation	Employee - public sector	263	48.7
	Self-employed	81	15.0
	Freelance	75	13.9
	Employee - private sector	63	11.7
	Student	53	9.8
	Unemployed	5	0.9
Income (monthly)	<10,000 THB	41	7.6
	10,000–25,000 THB	178	32.9
	25,001–40,000 THB	189	35.0
	40,001–55,000 THB	57	10.6
	55,001–70,000 THB	43	8.0
	>70,000 THB	32	5.9
Residential place	Urban	267	49.5
	Sub-urban	186	34.4
	Rural	87	16.1
Computer & digital technology skill level	High	198	36.7
	Medium	240	44.4
	Low	102	18.9
Daily internet usage	<1 h	54	10.0
	1–4 h	176	32.6
	5–8 h	209	38.7
	>8 h	101	18.7
Type of e-Gov service usage	Medical and health	493	91.3
	Finance and tax	435	80.6
	Domestic utilities	386	71.5
	Welfare and social security	303	56.1
	Weather	273	50.6
	Education	235	43.5
	Transport services	228	42.2
	Law	195	36.1
e-Gov service usage (week)	1–3	255	47.2
	4–6	234	43.3
	7–9	36	6.7
	>9	15	2.8

Table 6
The comparison of behavioral intention to use e-government services among the sample separated by education, resident, and computer and digital technology skill level.

Variable	x	S.D.	Test of Homogeneity of Variance		F	P	Multiple comparison
			Levene	p			
Education							
1. Undergraduate	4.25	0.54	0.657	0.519	11.830	0.000	1 < 2
2. Graduate	4.46	0.48					1 < 3
3. Postgraduate	4.50	0.42					2 and 3 not difference
Resident							
1. Urban	4.45	0.45	1.797	0.167	17.391	0.000	1 and 2 not difference
2. Sub-urban	4.46	0.48					1 > 3
3. Rural	4.12	0.59					2 > 3
Computer & digital technology skill level							
1. High	4.40	0.48	0.515	0.598	7.011	0.001	1 and 2 not difference
2. Medium	4.47	0.49					1 > 3
3. Low	4.25	0.55					2 > 3

Table 7
Reliability and convergent validity.

Construct	Items	Mean	S.D.	Factor Loading	CR	AVE	Cronbach's Alpha
Information quality	IFQ1	4.126	0.425	0.718	0.884	0.659	0.878
	IFQ2	4.083	0.416	0.728			
	IFQ3	3.888	0.620	0.904			
	IFQ4	3.811	0.637	0.880			
System quality	SYQ1	4.233	0.473	0.714	0.811	0.517	0.808
	SYQ2	4.328	0.504	0.688			
	SYQ3	4.113	0.513	0.712			
	SYQ4	4.087	0.441	0.761			
Service quality	SEQ1	3.872	0.739	0.767	0.874	0.634	0.871
	SEQ2	3.922	0.631	0.743			
	SEQ3	3.754	0.681	0.844			
	SEQ4	3.657	0.599	0.827			
Perceived usefulness	PU1	4.203	0.502	0.750	0.825	0.542	0.823
	PU2	4.333	0.575	0.737			
	PU3	4.350	0.550	0.728			
	PU4	4.242	0.608	0.729			
Social influence	SI1	4.069	0.552	0.729	0.865	0.617	0.865
	SI2	3.850	0.595	0.761			
	SI3	3.722	0.613	0.835			
	SI4	3.676	0.645	0.813			
Facilitating condition	FC1	4.111	0.490	0.735	0.856	0.599	0.851
	FC2	3.761	0.654	0.829			
	FC3	3.681	0.661	0.814			
	FC4	3.581	0.669	0.712			
Computer self-efficacy	CSE1	4.161	0.533	0.806	0.800	0.571	0.796
	CSE2	4.019	0.513	0.735			
	CSE3	4.222	0.592	0.724			
Perceived privacy	PP1	3.770	0.530	0.772	0.832	0.553	0.829
	PP2	4.028	0.604	0.714			
	PP3	4.107	0.506	0.729			
	PP4	4.076	0.520	0.758			
Perceived security	PS1	4.185	0.459	0.697	0.831	0.552	0.829
	PS2	3.963	0.497	0.748			
	PS3	4.226	0.453	0.759			
	PS4	3.915	0.531	0.764			
Trust in government	TG1	4.248	0.485	0.752	0.832	0.554	0.829
	TG2	4.107	0.430	0.749			
	TG3	3.972	0.432	0.750			
	TG4	4.317	0.536	0.726			
Citizen satisfaction	CS1	4.278	0.642	0.712	0.799	0.571	0.793
	CS2	4.148	0.531	0.735			
	CS3	4.324	0.562	0.817			
Behavioral intention	BI1	4.409	0.591	0.730	0.842	0.641	0.838
	BI2	4.363	0.582	0.851			
	BI3	4.430	0.559	0.816			

The relationship between constructs was tested by discriminant validity. The square roots of AVE for all constructs are higher than the inter-construct correlation coefficients (Table 8). It can confirm the validity and reliability of the data and model.

To test the fit of measurement model, Maximum Likelihood Estimation (MLE) by AMOS v.22 was employed to assess goodness of fit indices consisting of the Chi square adjusted for degree of freedom (CMIN/DF), the Goodness of Fit Index (GFI), the Adjusted Goodness of Fit Index (AGFI), the Root Mean Square Residual (RMR), the Normed Fit Index (NFI), the Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA). It was found that all indices passed the accepted criteria [92]. (CMIN/DF = 1.150, GFI = 0.920, AGFI = 0.902, RMR = 0.011, NFI = 0.903, CFI = 0.969, RMSEA = 0.028). (Table 9.).

4.3. Structural model

Causal relationship testing for model consistency and research hypothesis testing are executed with the AMOS v.22 program.

4.3.1. Structural model fit

After validity testing by confirmatory factor analysis, the next stage is to test the goodness of fit of the structural model. It was found that all indices passed the accepted criteria [92] (X^2 = 1207.818 (sig. = 0.000), CMIN/DF = 1.350, GFI = 0.918, AGFI = 0.901, RMR = 0.013, NFI = 0.905, CFI = 0.969, RMSEA = 0.028) (Table 9.). Therefore, the proposed model is compatible with research data.

Table 8
Correlations construct and discriminant validity.

	IFQ	SYQ	SEQ	PU	SI	FC	CSE	PP	PS	TG	CS	BI
IFQ	0.812											
SYQ	0.061	**0.719**										
SEQ	0.074	0.130	**0.796**									
PU	0.072	0.065	0.138	**0.736**								
SI	−0.053	0.045	0.032	0.002	**0.785**							
FC	−0.033	0.001	−0.011	−0.017	0.000	**0.774**						
CSE	0.063	0.089	0.115	0.098	0.068	−0.088	**0.756**					
PP	−0.031	0.020	−0.010	−0.003	−0.045	0.000	0.013	**0.744**				
PS	−0.028	0.034	0.038	−0.030	0.015	0.013	0.014	−0.035	**0.743**			
TG	0.081	0.063	0.146	0.138	0.015	−0.040	0.030	0.242	0.255	**0.744**		
CS	0.226	0.223	0.268	0.130	0.074	0.090	0.008	−0.019	−0.058	0.061	**0.756**	
BI	0.276	0.290	0.289	0.278	0.051	−0.012	0.220	0.058	0.038	0.300	0.265	**0.801**

Table 9
Goodness of fit of measurement model and structural model.

Fit indices	X^2 test			Absolute fit			Comparative fit		
	Chi-square	Degree of freedom	CMIN/DF	GFI	AGFI	RMR	NFI	CFI	RMSEA
Acceptable fit			<5	≥ .90	≥ .90	<0.05	≥ .90	≥ .90	<0.05
Measurement model	954.617	830	1.150	0.920	0.902	0.011	0.903	0.969	0.028
Structural model	1207.818	895	1.350	0.918	0.901	0.013	0.905	0.969	0.028

4.3.2. Hypothesis testing

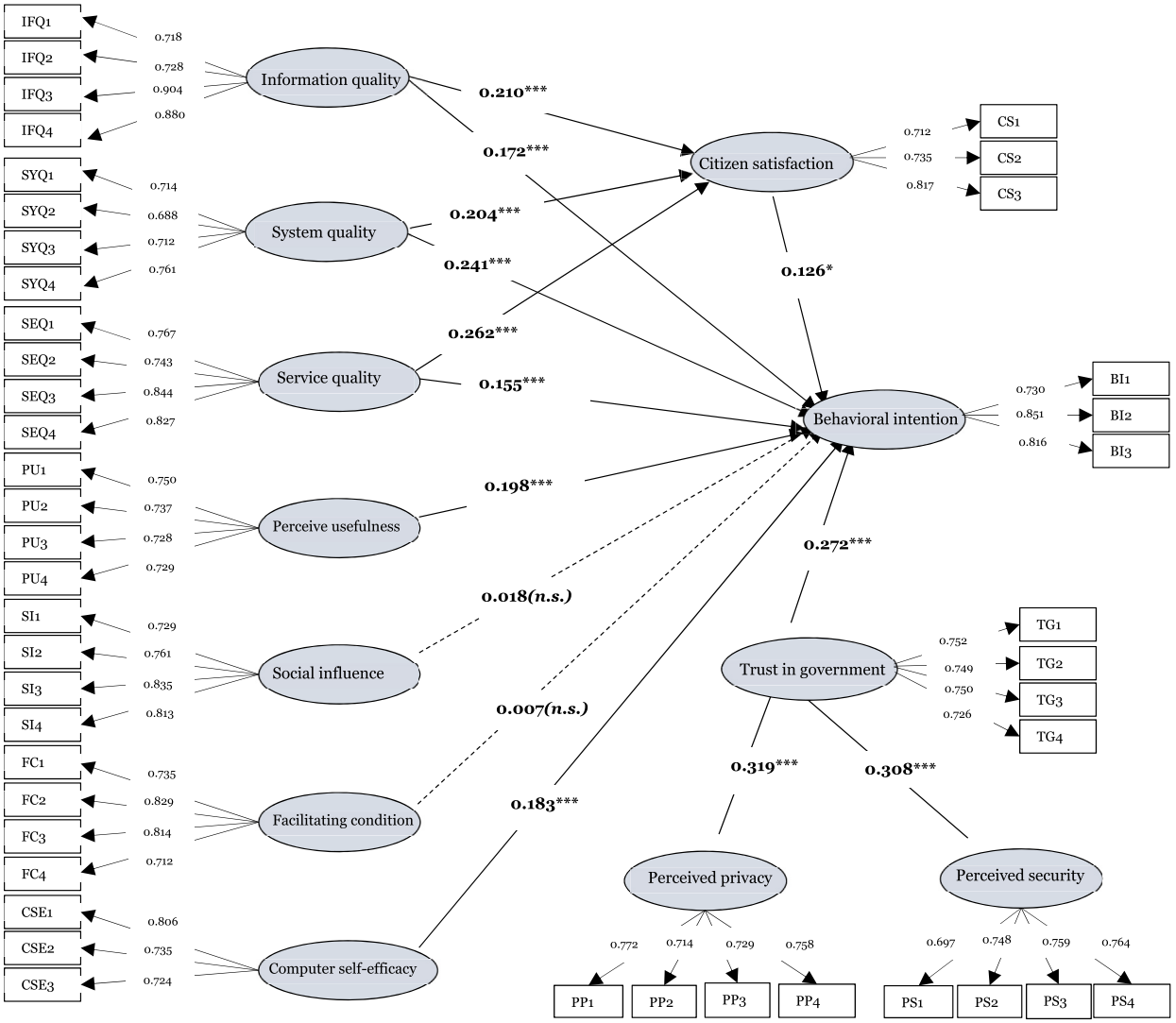
After testing the goodness of fit of structural model, the hypotheses were tested. Table 10 And Fig. 3 show standardized coefficient, critical ratios (C.R.), and hypotheses testing results. The test was found that twelve hypotheses is not rejected (at least at level of $p < 0.05$) consisting of H1a (Information quality - > Citizen satisfaction, $\beta = 0.210$; $p < 0.001$), H1b (Information quality - > Behavioral intention, $\beta = 0.172$; $p < 0.001$), H2a (System quality - > Citizen satisfaction, $\beta = 0.204$; $p < 0.001$), H2b (System quality - > Behavioral intention, $\beta = 0.241$; $p < 0.001$), H3a (Service quality - > Citizen satisfaction, $\beta = 0.262$; $p < 0.001$), H3b (Service quality - > Behavioral intention, $\beta = 0.155$; $p < 0.001$), H4 (Citizen satisfaction - > Behavioral intention, $\beta = 0.126$; $p < 0.05$), H5 (Perceived usefulness - > Behavioral intention, $\beta = 0.198$; $p < 0.001$), H8 (Computer self-efficacy - > Behavioral intention, $\beta = 0.183$; $p < 0.001$), H9 (Perceived privacy - > Trust in government, $\beta = 0.319$; $p < 0.001$), H10 (Perceived security - > Trust in government, $\beta = 0.308$; $p < 0.001$), H11 (Trust in government - > Behavioral intention, $\beta = 0.272$; $p < 0.001$). While two hypotheses are rejected consisting of H6 (Social influence - > Behavioral intention, $\beta = 0.018$; n. s.) and H7 (Facilitating condition - > Behavioral intention, $\beta = 0.007$; n. s.)

In Table 11 shows the direct effect, indirect effect, and total effect of mediating variables. It was found that System quality - > Citizen satisfaction - > Behavioral intention has the highest total effect (0.267), of which the direct effect is 0.241 and the indirect effect is 0.026.

Table 10
Hypotheses and results.

Hypothesis	Standardized Coefficient	C.R.	Results
H1a: Information quality - > Citizen satisfaction	0.210	4.330***	Supported
H1b: Information quality - > Behavioral intention	0.172	3.875***	Supported
H2a: System quality - > Citizen satisfaction	0.204	3.947***	Supported
H2b: System quality - > Behavioral intention	0.241	4.986***	Supported
H3a: Service quality - > Citizen satisfaction	0.262	5.154***	Supported
H3b: Service quality - > Behavioral intention	0.155	3.304***	Supported
H4: Citizen satisfaction - > Behavioral intention	0.126	2.371*	Supported
H5: Perceived usefulness - > Behavioral intention	0.198	4.315***	Supported
H6: Social influence - > Behavioral intention	0.018	0.424	Not supported
H7: Facilitating condition - > Behavioral intention	0.007	0.170	Not supported
H8: Computer self-efficacy - > Behavioral intention	0.183	3.936***	Supported
H9: Perceived privacy - > Trust in government	0.319	6.213***	Supported
H10: Perceived security - > Trust in government	0.308	6.022***	Supported
H11: Trust in government - > Behavioral intention	0.272	5.966***	Supported

*p < 0.05, **p < 0.01, ***p < 0.001.



*p < 0.05, ** p < 0.01, *** p < 0.001
Structural model fit indices: X^2 = 1207.818 (sig.= 0.000), = CMIN/DF = 1.350, GFI = 0.918, AGFI = 0.901, SRMR = 0.013, NFI = 0.905, CFI = 0.969, RMSEA = 0.028)

Fig. 3. Structural model results.

Table 11
Effects of mediating variables.

Hypothesis	Direct Effect	Indirect Effect	Total Effect
Information quality - > Citizen satisfaction - > Behavioral intention	0.172	0.026	0.198
System quality - > Citizen satisfaction - > Behavioral intention	0.241	0.026	0.267
Service quality - > Citizen satisfaction - > Behavioral intention	0.155	0.033	0.188

5. Discussion and conclusion

This study investigates factors influencing behavioral intention in using e-government service from the perspective of citizens, which is the key to successful e-government development, through the integration of the IS Success model [23], TAM [24], UTAUT [25], and SCT [26], and has extended factors that are important to create e-government acceptance, namely perceived privacy, perceived security, and trust in government. It was found that most of the hypotheses were accepted (H1a, H1b, H2a, H2b, H3a, H3b, H4, H5, H8, H9, H10, and H11), and only two hypotheses were rejected (H6 and H7). The results showed that behavioral intention in

using e-government services was caused by the quality of e-government services in three dimensions, namely information quality, system quality, and service quality, according to the IS Success Model [23] (H1b, H2b, H3b). These results are consistent with the findings of Xiong et al. [33], Wang & Teo [16], Santa et al. [51], and Chatterjee et al. [46]. The study found that system quality most influenced behavioral intention (H2b). If citizens perceive the system quality, it will lead them to use e-government services [16,17, 47]. Citizens will perceive system quality when the system is user-friendly, easy to use, available, and reliable.

Citizen satisfaction also arises from the dimensions of information quality, system quality, and service quality (H1a, H2a, and H3a), consistent with the findings of Wang and Teo [16], Alruwaie et al. [36], Santa et al. [51], and Veeramootoo et al. [47]. Service quality has a strong influence on citizen satisfaction (H3a), where service quality occurs when citizens receive rapid responses, empathy, understanding, and reliability, which is consistent with the SERVQUAL model [44], including Stefanovic et al. [17] and Chen et al. [39]. In addition, the findings show that information quality is an antecedent for satisfaction and behavioral intention (H1a, H1b), which is consistent with studies by Xiong et al. [33], Wang & Teo [16], Santa et al. [51], and Chatterjee et al. [46] that found that high information quality resulted in higher citizen satisfaction and higher behavioral intention. Citizens are aware of the information quality when an e-government service provides information that is accurate, up-to-date, sufficient, and relevant to their needs. In addition, Citizen satisfaction influences behavioral intention (H4), consistent with the findings of Alruwaie et al. [36], which found that UK citizens' satisfaction with e-government services causes their intention to use them. This is similar to Veeramootoo et al. [47], which found that citizens in Mauritius are satisfied with using the e-filling government service system, resulting in more usage behaviors, and also in line with Li & Shang [50], Veeramootoo et al. [47], Chatterjee et al. [46], Alzahrani et al. [56], Chen et al. [39]. Moreover, perceived usefulness is significant for behavioral intention (H5), which is consistent with Seo & Bernsen [38], which found that citizens of both urban and rural Dutch residents recognize the benefits e-government services can offer in reducing costs, reducing time, and increasing transaction efficiency. Hence, the adoption of technology and behavioral intention occurred in accordance with the TAM. It is also consistent with Hamid et al. [97] and Horst et al. [98].

Computer self-efficacy has an influence on behavioral intention because citizens who are confident in their computer self-efficacy will show positive behavior; they are willing to use and will attempt to successfully use e-government, in line with Chatzoglou et al. [67] and Shareef et al. [12], which are based on SCT [26,64].

Trust in government influence on behavioral intention to use e-government service (H11), which is accordance with Morote et al. [8], Verkijika & Wet [31], Lallmahomed et al. [28], Alzahrani et al. [56], Chen et al. [39], and Chatzoglou [67]. Because e-government is a new form of public management that can immediately lead to good governance emphasizing equity, transparency, participation, accountability, efficiency, and effectiveness [2]. It is also a response to the SDGs concept, which can reduce inequality by ensuring all citizens have equal access to government services based on the Leave No One Behind (LNOB) concept [7]. In addition, trust in government arises from perceived privacy (H9) and perceived security (H10), in line with Ejdys et al. [83], Ayyash et al. [47], Shareef et al. [12]. The results found that perceived privacy and perceived security influence trust in government at a high level. Beside considering the information quality, system quality, and service quality in the development of e-government services, perceived privacy and perceived security should also be taken into account, that is, personal data must be protected, especially sensitive data, by preventing access, not sharing, and not disclosing citizen's personal data to other systems or other agencies, including not disclosing for other purposes without permission from the data subject [34,77,78]. Protecting access to personal data can be done by creating a security system for the e-government service by requiring security features to prevent vulnerabilities and cyber threat protection to prevent unauthorized access to information [12,34,77]. This gives citizens perceived security in the online environment [99].

On the other hand, social influence had no effect on behavioral intention toward e-government service (H6). As a result, citizens perceive the benefits of e-government service clearly and concretely, causing them to choose to use e-government service independently rather than conforming to social influence. This is consistent with Lallmahomed et al. [28] who discovered that citizens would accept e-government services with personal motivation. In addition, the majority of this study's respondents are between the ages of 20 and 39, so they are classified as Generation Y and Generation Z individuals who grew up with technology and the Internet. They live in a friendly environment, are familiar with and proficient with technology, and possess high self-esteem. Therefore, social influence is not a deciding factor for the use of e-government services, which is consistent with Chang et al. [100], who found that if individuals have skills and expertise in using technology as well as high self-confidence, they are immune to social influences or pressure from others to use various technologies. Moreover, the majority of respondents live in urban areas with a fast-paced lifestyle and rarely congregate; consequently, they are not significantly influenced by society. This is consistent with Zolotov et al. [62] who discovered that social influence has no effect on the intention of urban citizens to use e-government services.

In addition, the facilitating condition had no effect on behavioral intention regarding e-government services (H7). Since the majority of respondents have bachelor's degrees and reside in urban areas, they are knowledgeable in the usage of technology and infrastructure and are familiar with their use. As this group of citizens recognizes the benefits and value of e-government services, they strive to learn and develop their digital skills so that they can take advantage of the full potential of e-government services without viewing the facilitating condition as an obstacle to using the e-government services. This is consistent with Zolotov et al. [62] found that facilitation conditions are not a key factor in inhibiting the use of e-government services. On the other hand, citizens will pay attention to and be aware of the benefits of e-government services, rather than facilitating conditions. It is also consistent with Seo & Bernsen [38], who discovered that facilitating conditions had no positive effect on the e-government service behavior of urban residents.

Even though the results indicate that social influence and facilitating conditions do not have a positive effect on behavioral intention when using e-government services, it is still an interesting factor that is deserving of further research, especially given that the study was conducted on citizens over 40 (Gen X, Gen B) and rural citizens, as urban and rural areas continue to have inequalities in income and internet connectivity.

6. Implications

6.1. Theoretical implications

This study reveals that the development of e-government necessitates multiple dimensions, such as the quality of government information systems, citizen acceptance of technology, citizen computer and digital technology skills, as well as the establishment of trust in government. The proposed model is integrated from many theories in accordance with previous research by taking the IS Success model [23], adding some factors in TAM [24], UTAUT [25], SCT [26] and expanding the model with factors affecting behavioral intention, namely perceived privacy, perceived security, and trust in government. Few prior studies have investigated as many dimensions as this one.

The research results support that IS success model is a model to measure the success of e-government from three aspects: information quality, system quality and service quality. All three aspects of quality have a direct effect on behavioral intention, especially system quality that has the highest standardized coefficient (0.241). In addition, these three qualities indirectly affect behavioral intention through citizen satisfaction. Citizens' acceptance of technology is influenced by perceived usefulness, while their computer and digital technology skills are influenced by computer self-efficacy. Moreover, perceived usefulness and computer self-efficacy influence behavioral intention. Trust in government is a crucial factor. It directly influences behavioral intention (Standardized Coefficient = 0.272), with perceived privacy and perceived security serving as antecedents of trust in government. It can be concluded that information quality, system quality, service quality, perceived usefulness, computer self-efficacy, and trust in government directly influenced behavioral intention. Academics and researchers will be able to use this study's model and research results as a guide for future research and development to obtain a different model.

6.2. Practical implications

From Thai citizens' perspective, it was found that citizen satisfaction, trust in the government, perceived usefulness, and computer self-efficacy influence behavioral intention. Therefore, there are practical suggestions for government agencies, government application developers, including related agencies, as follows: first, the result showed that citizen satisfaction is a mediating variable that affects the behavioral intention of using e-government services. Citizen satisfaction arises from the quality of e-government services in three dimensions: information quality, system quality, and service quality. In terms of information quality, government agencies must provide information that is up-to-date, reliable, complete, and timely. Therefore, government officials acting as back offices must screen and consider information to have such characteristics before it is presented as part of the e-government service to the citizens. As for the system quality, it must have the following characteristics: user-friendliness, ease of use, availability, and reliability. Therefore, when developing an e-government service, stakeholders, whether government executives or system developers, including the public sector, should participate in requirements, design, and system testing. While maintaining service quality, government agencies and system developers should develop e-government services with Artificial Intelligence (AI), blockchain, chatbots, big data, Internet of Things (IoT), Virtual reality (VR), and Augmented Reality (AR) technology to effectively address citizens' problems or needs and respond promptly to citizens' requests.

Second, when considering trust in the government, it was found that perceived privacy and perceived security have a very high influence on trust in the government. Thus, government agencies and system developers must be aware of the importance of privacy and security. Therefore, the analysis and design of the e-government service must have protection for the personal data of the data subject, for example, by having a feature to request consent from the data subject, clearly declare the purpose of storage, and store only as needed. Government agencies must have standardized measures for collection, use, disclosure, and destruction. It should hire personnel who act as Data Protection Officers (DPO) and have expertise in General Data Protection Regulation (GDPR) laws to advise and ensure that the organization is following the principles. As for security issues, the system should be developed to have security features to close vulnerabilities and prevent cyber threats that may invade to destroy the system or steal data. Government agencies should encourage citizens to recognize the importance of protecting personal data and create cyber security, such as by creating public relations materials for citizens to know through online and offline channels or using celebrities and influential people as communicators. The government should also strictly enforce cybersecurity laws.

Next, the study found that perceived usefulness affects behavioral intention to use an e-government service. Therefore, government agencies or relevant agencies should make citizens aware of the benefits of e-government services by promoting them through online channels (e.g., social media on various platforms) and offline channels (such as television or infographics displayed in crowded locations). In addition, government agencies should create marketing campaigns for citizens that, for example, can reduce costs or increase benefits from using e-government services.

Finally, the study found that computer self-efficacy influences behavioral intention to use e-government service. Therefore, government agencies should promote, or education agencies should create short courses to promote and develop computer and digital skills for citizens. This may be done through online platforms such as Massive Open Online Courses (MOOCs) for citizens to equally access. It should also operate offline for citizens in vulnerable groups such as the elderly, the disabled, the sick, the poor, and the less educated to achieve good learning. This will enable citizens to transform into digital citizens to support the development of digital government.

7. Limitations and future research directions

This study had four main limitations. First, this was a Thailand-specific study, where the availability of technology infrastructure, including human capital, may differ from other countries. Second, this study pointed at e-government services. Future studies could reduce the scope of research by defining e-government in other areas such as medical and health, domestic utilities, or transport services, or study the adoption of e-government in technologies that are in trend, such as artificial intelligence. Third, this research was studied from an individual citizen perspective, but e-government has other contexts: G2B (government-to-business), G2E (government-to-employee), and G2B (government-to-business). The next study may be studied from the perspective of other groups, such as government, employees, and business. Fourth, this study is quantitative research that was conducted by survey. Data collection by questionnaires may yield consistent numerical results according to the measure level. Therefore, the next study may conduct mixed-methods research to obtain research results from qualitative research. This may be done with focus group discussion, the Delphi technique, or grounded theory to obtain comprehensive research results that are deeper and clearer.

Ethics statement

The Mahidol University Central Institutional Review Board (MU-CIRB 2022/285.2510).

Author contribution statement

All authors listed have significantly contributed to the investigation, development and writing of this article.

Data availability statement

Data included in article/supp. Material/referenced in article.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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References

[1] P. Dunleavy, C. Hood, From old public administration to new public management, Publ. Money Manag. 14 (3) (1994) 9–16, https://doi.org/10.1080/09540969409387823.
[2] M. Fredriksson, J. Pallas, New Public Management, The International Encyclopedia of Strategic Communication, 2018, https://doi.org/10.1002/9781119010722.iesc0119.
[3] C. Hood, A public management for all seasons? Publ. Adm. 69 (1) (1991) 3–19, https://doi.org/10.1111/j.1467-9299.1991.tb00779.x.
[4] J. Boston, The Theoretical Underpinning of Public Restructuring in New Zealand, Reshaping the State, Oxford University, Auckland, 1991, pp. 1–26.
[5] D. Osborne, T. Gaebler, Reinventing Government: How the Entrepreneurial Spirit Is Transforming the Public Sector, Addison-Wesley, Reading, 1992.
[6] United nations, E-Government survey 2020 Digital government in the decade of action for sustainable development [Online] Available from: https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020. (Accessed 10 January 2023).
[7] United nations, E-Government survey 2022 The future of digital government [Online] Available from: https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2022. (Accessed 10 January 2023).
[8] R.P. Morote, C.P. Rosa, M.N. Chicharro, The effects of e-government evaluation, trust and the digital divide in the levels of e-government use in European countries, Technol. Forecast. Soc. Change 154 (2020), https://doi.org/10.1016/j.techfore.2020.119973.
[9] P.L. Sun, C.Y. Ku, D.H. Shih, An implementation framework for e-Government 2.0, Telematics Inf. 32 (3) (2015) 504–520, https://doi.org/10.1016/j.tele.2014.12.003.
[10] M. Yildiz, E-government research: reviewing the literature, limitations, and ways forward, Govern. Inf. Q. 24 (1) (2007) 646–665, https://doi.org/10.1016/j.giq.2007.01.002.
[11] National Strategy 2018-2037 [Online] Available from:, Office of the National Economic and Social Development Board, 2018 https://alro.go.th/uploads/org/admin_sys/download/article/article_20181029101644.pdf. (Accessed 29 June 2023).
[12] M.A. Shareef, V. Kumar, U. Kumar, Y.K. Dwivedi, E-government adoption model (GAM): differing service maturity levels, Govern. Inf. Q. 28 (2011) 17–35, https://doi.org/10.1016/j.giq.2010.05.006.

[13] K. Layne, J. Lee, Developing fully functional e-government: a four stage model, Govern. Inf. Q. 18 (2) (2001) 122–136, https://doi.org/10.1016/S0740–624X(01)00066-1.
[14] J. Lee, 10 years retrospect on stage models of e-government: a qualitative meta-synthesis, Govern. Inf. Q. 27 (3) (2010) 220–230, https://doi.org/10.1016/j.giq.2009.12.009.
[15] K. Jermsittiparsert, K. Wongsurawat, Confirmation and habit of using e-government mediate between quality dimensions and continuance usage of e-government: an empirical study in Thailand, Humanities and Social Science Research Promotion Network Journal 4 (2) (2021) 116–136.
[16] C. Wang, T.S.H. Teo, Online service quality and perceived value in mobile government success: an empirical study of mobile police in China, Int. J. Inf. Manag. 52 (2020), https://doi.org/10.1016/j.ijinfomgt.2020.102076.
[17] D. Stefanovic, U. Marjanovic, M. Delic, D. Culibrk, B. Lalic, Assessing the success of e-government systems: an employee perspective, Inf. Manag. 53 (6) (2016) 717–726, https://doi.org/10.1016/j.im.2016.02.007.
[18] O. Hujran, M.M. Al-Debei, A.S. Al-Adwan, A. Alarabiat, N. Altarawneh, Examing the antecedents and outcomes of smart government usage: an integrated model, Govern. Inf. Q. 40 (2) (2023) 1–22, https://doi.org/10.1016/j.giq.2022.101783.
[19] A. Hooda, P. Gupta, A. Jeyaraj, M. Giannakis, Y.K. Dwivedi, The effects of trust on behavioral intention and use behavior within e-government contexts, Int. J. Inf. Manag. 67 (December 2022) (2022) 1–13, https://doi.org/10.1016/j.ijinfomgt.2022.102553.
[20] M. Kurfali, A. Arifoglu, G. Tokdemir, Y. Pacin, Adoption of e-government services in Turkey, Comput. Hum. Behav. 66 (2017) 168–178, https://doi.org/10.1016/j.chb.2016.09.041.
[21] C. Wang, Antecedents and consequences of perceived value in mobile government continuance use: an empirical research in China, Comput. Hum. Behav. 34 (2014) 140–147, https://doi.org/10.1016/j.chb.2014.01.034.
[22] Z. Irani, Y.K. Dwivedi, M.D. Williams, Understanding consumer adoption of broadband: an extension of the technology acceptance model, J. Oper. Res. Soc. 60 (10) (2009) 1322–1334, https://doi.org/10.1057/jors.2008.100.
[23] W.H. DeLone, E.R. McLean, The DeLone and McLean model of information systems success: a ten-year update, J. Manag. Inf. Syst. 19 (4) (2003) 9–30, https://doi.org/10.1080/07421222.2003.11045748.
[24] F.D. Davis, Perceived usefulness, perceived ease of use, and user acceptance of information technology, MIS Q. 13 (3) (1989) 319–339, https://doi.org/10.2307/249008.
[25] V. Venkatesh, M.G. Morris, G.B. Davis, F.D. Davis, User acceptance of information technology: toward a unified view, MIS Guarterly 27 (3) (2003) 425–478, https://doi.org/10.2307/30036540.
[26] A. Bandura, Social Foundations of Thought and Action: A Social Cognitive Theory, Prentice Hall, Englewood Cliffs, NJ, 1986.
[27] R. Silcock, What is e-Government, Parliam. Aff. 54 (2001) 88–101.
[28] M.Z.I. Lallmahomed, N. Lallmahome, G.M. Lallmahomed, Factors influencing the adoption of e-government services in Mauritius, Telematics Inf. 34 (4) (2017) 57–72, https://doi.org/10.1016/j.tele.2017.01.003.
[29] S. Ozkan, I.E. Kanat, E-Government adoption model based on theory of planned behavior: empirical validation, Govern. Inf. Q. 28 (4) (2011) 503–513, https://doi.org/10.1016/j.giq.2010.10.007.
[30] N.P. Rana, Y.K. Dwivedi, Citizen's adoption of an e-government system: validating extended social cognitive theory (SCT), Govern. Inf. Q. 32 (2) (2015) 172–181, https://doi.org/10.1016/j.giq.2015.02.002.
[31] S.F. Verkijika, L.D. Wet, E-Government adoption in sub-saharan Africa, electronic commerce, Research and Applications 30 (2018) 83–93, https://doi.org/10.1016/j.elerap.2018.05.012.
[32] K. Jermsittiparsert, K. Wongsurawat, Confirmation and habit of using e-government mediate between quality dimensions and continuance usage of e-government: an empirical study in Thailand, Humanities and Social Science Research Promotion Network Journal 4 (2) (2021) 116–136.
[33] L. Xiong, H. Wang, C. Wang, Predicting mobile government service continuance: a two-stage structural equation modeling-artificial neural network approach, Govern. Inf. Q. 39 (1) (2022), https://doi.org/10.1016/j.giq.2021.101654.
[34] S. Khan, R. Umer, S. Umer, S. Naqvi, Antecedents of trust in using social media for E-government services: an empirical study in Pakistan, Technol. Soc. 64 (2021), https://doi.org/10.1016/j.techsoc.2020.101400.
[35] I.K. Mensah, G. Zeng, C. Luo, E-government Services Adoption: an Extension of the Unified Model of Electronic Government Adoption, SAGE Open, 2020, pp. 1–17, https://doi.org/10.1177/2158244020933593. April-June.
[36] M. Alruwaie, R.E. Haddadeh, V. Weerakkody, Citizens' continuous use of eGovernment services: the role of self-efficacy, outcome expectations and satisfaction, Govern. Inf. Q. 37 (3) (2020), https://doi.org/10.1016/j.giq.2020.101485.
[37] W. Bhuasiria, H. Zob, H. Leec, A.P. Ciganek, User acceptance of e-government services: examining an e-tax filing and payment system in Thailand, Inf. Technol. Dev. 22 (4) (2016) 672–695, https://doi.org/10.1080/02681102.2016.1173001.
[38] D. Seo, M. Bernsen, Comparing attitudes toward e-government of non-users versus users in a rural and urban municipality, Govern. Inf. Q. 33 (2) (2016) 270–282, https://doi.org/10.1016/j.giq.2016.02.002.
[39] J.V. Chen, R.J.M. Jubilado, E.P. Capistrano, D.C. Yen, Factors affecting online tax filing-An application of the IS Success Model and trust theory, Comput. Hum. Behav. 43 (2015) 251–262, https://doi.org/10.1016/j.chb.2014.11.017.
[40] N.P. Rana, Y.K. Dwivedi, M.D. Williams, V. Weerakkody, Investigating Success of an E-Government Initiative: Validation of an Integrated IS Success Model, Information Systems Frontiers, 2014, https://doi.org/10.1007/s10796-014-9504-7.
[41] M.M. Ayyash, K. Ahmad, D. Singh, Investigating the effect of information systems factors on trust in e-Government initiative adoption in Palestinian public sector, Res. J. Appl. Sci. Eng. Technol. 5 (15) (2013) 3865–3875, https://doi.org/10.19026/rjaset.5.4447.
[42] H.J. Wang, J. Lo, Determinants of citizens' intention to use government websites in Taiwan, Inf. Dev. 29 (2) (2012) 123–137, https://doi.org/10.1177/0266666912453835.
[43] W.H. DeLone, E.R. McLean, Information systems success: the quest for the dependent variable, Inf. Syst. Res. 3 (1992) 60–95, https://doi.org/10.1287/isre.3.1.60.
[44] A. Parasuraman, V.A. Zeithaml, L. L Berry, A conceptual model of service quality and its implications for future research, J. Market. 49 (1985) 41–50, https://doi.org/10.2307/1251430.
[45] L. Raymond, S. Uwizeyemungu, F. Bergeron, Motivations to implement ERP in e-government: an analysis from success stories, Electronic Government an International journal 3 (3) (2006) 225–240, https://doi.org/10.1504/EG.2006.009597.
[46] S. Chatterjee, A.K. Kar, M.P. Gupta, Success of IoT in smart cities of India: an empirical analysis, Govern. Inf. Q. 35 (3) (2018) 349–361, https://doi.org/10.1016/j.giq.2018.05.002.
[47] N. Veeramootoo, R. Nunkoo, Y.K. Dwivedi, What determines success of an e-government service? Validation of an integrative model of e-filing continuance usage, Govern. Inf. Q. 35 (2) (2018) 161–174, https://doi.org/10.1016/j.giq.2018.03.004.
[48] A. Parasuraman, V.A. Zeithaml, L. L Berry, Servqual, A multiple-item scale for measuring consumer perceptions of service quality, J. Retailing 64 (1) (1988) 12–40.
[49] T. Hariguna, U. Rahardja, Q. Aini, Nurfaizah, Effect of social media activities to determinants public participate intention of e-government, Proc. Comput. Sci. 161 (2019) 233–241, https://doi.org/10.1016/j.procs.2019.11.119.
[50] Y. Li, H. Shang, Service quality, perceived value, and citizens' continuous-use intention regarding e-government: empirical evidence from China, Inf. Manag. 57 (3) (2020) 1–15, https://doi.org/10.1016/j.im.2019.103197.
[51] R. Santa, J.B. MacDonald, M. Ferrer, The role of trust in e-government effectiveness, operational effectiveness and user satisfaction: lessons from Saudi Arabia in e-G2B, Govern. Inf. Q. 36 (1) (2019) 39–50, https://doi.org/10.1016/j.giq.2018.10.007.
[52] Y.S. Wang, Y.W. Liao, Assessing eGovernment systems success: a validation of the DeLone and McLean model of information systems success, Govern. Inf. Q. 25 (2008) 717–733, https://doi.org/10.1016/j.giq.2007.06.002.

[53] R.L. Oliver, A cognitive model of the antecedents and consequences of satisfaction decision, J. Market. Res. 17 (4) (1980) 460–469, https://doi.org/10.2307/3150499.
[54] R.E. Anderson, S.S. Srinivasan, E-satisfaction, E-Loyalty, A Contingency framework, Psychol. Market. 20 (2) (2003) 123–138, https://doi.org/10.1002/mar.10063.
[55] A. Gustafsson, M. Johnson, I. Roos, The effects of customer satisfaction, relationship commitment dimensions, and triggers on customer retention, J. Market. 69 (4) (2005) 210–218, https://doi.org/10.1509/jmkg.2005.69.4.210.
[56] L. Alzahrani, W. Al-Karaghouli, V. Weerakkody, Analysing the critical factors influencing trust in e-government adoption from citizens' perspective: a systematic review and a conceptual framework, Int. Bus. Rev. 26 (1) (2017) 164–175, https://doi.org/10.1016/j.ibusrev.2016.06.004.
[57] P.B. Seddon, A respecification and extension of the DeLone and McLeanmodel of IS success, Inf. Syst. Res. 8 (3) (1997) 240–253, https://doi.org/10.1287/isre.8.3.240.
[58] H. Rafique, A.O. Almagrabi, A. Shamim, F. Anwar, A.K. Bashir, Investigating the acceptance of mobile library applications with an extended technology acceptance Model (TAM), Comput. Educ. 145 (2020), https://doi.org/10.1016/j.compedu.2019.103732.
[59] N. Singh, N. Sinha, F.J. Liebana-Cabanillas, Determining factors in the adoption and recommendation of mobile wallet services in India: analysis of the effect of innovativeness, stress to use and social influence, Int. J. Inf. Manag. 50 (2020) 191–205, https://doi.org/10.1016/j.ijinfomgt.2019.05.022.
[60] I. Ajzen, M. Fishbein, Understanding Attitudes and Predicting Social Behavior, Prentice-Hall, New Jersey, 1980.
[61] C.W. Lamb, J.F. Hair, C. McDaniel, Marketing, tenth ed., Cengage Learning, Mason, 2008.
[62] N.M. Zolotov, T. Oliveira, S. Casteleyn, Z. Irani, Continuous usage of e-participation: the role of the sense of virtual community, Govern. Inf. Q. 36 (3) (2019) 536–545, https://doi.org/10.1016/j.giq.2019.05.009.
[63] V. Venkatesh, J.Y.L. Thong, X. Xu, Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology, MIS Q. 36 (1) (2012) 157–178, https://doi.org/10.2307/41410412.
[64] D.R. Compeau, C.A. Higgins, Computer self-Efficacy: development of a measure and initial test, MIS Q. 19 (2) (1995) 189–211, https://doi.org/10.2307/249688.
[65] J. Dijk, O. Peters, W. Ebbers, Explaining the acceptance and use of government Internetservices: a multivariate analysis of 2006 surveydata in The Netherlands, Govern. Inf. Q. 25 (2008) 379–399, https://doi.org/10.1016/j.giq.2007.09.006.
[66] S.K. Sharma, B. Metri, Y.K. Dwivedi, N.P. Rana, Challenges common service centers (CSCs) face in delivering e-government services in rural India, Govern. Inf. Q. 38 (2) (2021) 1–14, https://doi.org/10.1016/j.giq.2021.101573.
[67] P. Chatzoglou, D. Chatzoudes, S. Symeonidis, Factors affecting the intention to use e-Government services, in: Federated Conference on Computer Science and Information Systems, 2015, https://doi.org/10.15439/2015F171.
[68] M.H. Hsu, C.M. Chiu, Internet self-efficacy and electronic service acceptance, Decis. Support Syst. 38 (2004) 369–381, https://doi.org/10.1016/j.dss.2003.08.001.
[69] H. Mintzberg, Managing Government, Governing Management, Harvard business review May-June, 1996, pp. 75–83.
[70] T.P.V. Dyke, V. Midha, H. Nemati, The effect of consumer privacy empowerment on trust and privacy concerns in e-commerce, Electron. Mark. 17 (1) (2007) 68–81, https://doi.org/10.1080/10196780601136997.
[71] S.E. Colesca, Understanding trust in e-government, Economics of engineering decision 3 (63) (2009) 7–14.
[72] E. Lee, C. Nam, C. Song, C.I. Park, Consumer's privacy concerns and willingness to provide marketing related personal information online, Consumer Research 33 (2006) 212–217.
[73] S. Yang, K. Wang, A fairness heuristic analysis of the primacy effect of reputation on perceived of privacy policy and privacy seals, In the 9th international conference on electronic business (2009) 572–581.
[74] S.F. H Zaidi, M.K. Qteishat, Assessing e-government service delivery (government to citizen), International Journal of eBussiness and eGovernment Studies 4 (1) (2012) 45–54.
[75] A. Parasuraman, V.A. Zeithaml, A. Malhotra, E.-S. Qual, A multiple-item scale for assessing electronic service quality, Journal of Service Research — Sage Publications 7 (3) (2005) 213–233, https://doi.org/10.1177/1094670504271156.
[76] X. Papadomichelaki, G. Mentzas, A multiple-item scale for assessing e-government service quality, International Conference on Electronic Government (2009) 163–175, https://doi.org/10.1007/978-3-642-03516-6_14. EGOV.
[77] S.J. Kwon, E. Park, K.J. Kim, What drives successful social networking services? A comparative analysis of user acceptance of Facebook and Twitter, Soc. Sci. J. 51 (4) (2014) 534–544, https://doi.org/10.1016/j.soscij.2014.04.005.
[78] A. Beldad, M. Jong, M. Steehouder, How shall I trust the faceless and the intangible? A literature review on the antecedents of online trust, Comput. Hum. Behav. 26 (5) (2010) 857–869, https://doi.org/10.1016/j.chb.2010.03.013.
[79] M. Parent, C.A. Vandebeek, A.C. Gemino, Building citizen trust through e-government, Govern. Inf. Q. 22 (4) (2005) 720–736, https://doi.org/10.1016/j.giq.2005.10.001.
[80] X.W. Fang, S. Chan, J. Brzezinski, S. Xu, Moderating effects of task type on wireless technology acceptance, J. Manag. Inf. Syst. 22 (3) (2006) 123–157, https://doi.org/10.2753/MIS0742-1222220305.
[81] National Cyber Security Agency-NCSA, Cyber Threat Report 2023 [Online] Available from: https://data.go.th/dataset/gdpublish-ro7irasuk, 2023. (Accessed 29 June 2023).
[82] M. Maqableh, H.Y. Hmoud, M. Jaradat, R. Masa'deh, Integrating an information systems success model with perceived privacy, perceived security, and trust: the moderating role of Facebook addiction, Heliyon 7 (9) (2021), https://doi.org/10.1016/j.heliyon.2021.e07899, 1, 15.
[83] J. Ejdys, R. Ginevicius, Z. Rozsa, K. Janoskova, The role of perceived risk and security level in building trust in e-government solutions, Inf. Manag. 3 (2019) 220–235, https://doi.org/10.15240/tul/001/2019-3-014.
[84] H.F. Lin, An empirical investigation of mobile banking adoption: the effect of innovation attributes and knowledge-based trust, Int. J. Inf. Manag. 31 (3) (2011) 252–260, https://doi.org/10.1016/j.ijinfomgt.2010.07.006.
[85] C.W. Thomas, Maintaining and restoring public trust in government agencies and their employees, Adm. Soc. 30 (2) (1998) 166–193, https://doi.org/10.1177/0095399798302003.
[86] S. Kim, J. Lee, E-participation, transparency, and trust in local government, Publ. Adm. Rev. 72 (6) (2012) 819–828, https://doi.org/10.1111/j.1540-6210.2012.02593.x.
[87] F. Bélanger, L. Carter, Trust and risk in e-government adoption, J. Strat. Inf. Syst. 17 (2) (2008) 165–176, https://doi.org/10.1016/j.jsis.2007.12.002.
[88] R. Larzelere, T. Huston, The dyadic trust scale: toward understanding interpersonal trust in close relationship, J. Marriage Fam. 42 (1980) 595–604, https://doi.org/10.2307/351903.
[89] J. Lee, H.J. Kim, M.J. Ahn, The willingness of e-government service adoption by business users: the role of offline service quality and trust in technologym, Govern. Inf. Q. 28 (2) (2011) 222–230, https://doi.org/10.1016/j.giq.2010.07.007.
[90] D.J. Houston, L.H. Hardin, Public trust in government administrators: explaining citizen perceptions of trustworthiness and competence, Public Integr. 16 (1) (2013) 53–76, https://doi.org/10.2753/PIN1099-9922160103.
[91] J. Lee, S. Kim, Citizens' e-participation on agenda setting in local governance: do individual social capital and e-participation management matter? Publ. Manag. Rev. 20 (6) (2018) 873–895. https://doi.org/10.1080/14719037.2017.1340507.
[92] J.F. Hair, W.C. Black, B.J. Babin, R.E. Anderson, Multivariate Data Analysis, Pearson Higher Ed, New Jersey, 2010.
[93] A.L. Comrey, B.L. Howard, A First Course in Factor Analysis, second ed., Psychology Press, 1992 https://doi.org/10.4324/9781315827506.
[94] M.N. Zolotov, T. Oliveira, S. Casteleyn, E-participation adoption models research in the last 17 years: a weight and meta-analytical review, Comput. Hum. Behav. 81 (2018) 350–365, https://doi.org/10.1016/j.chb.2017.12.031.
[95] H. Zahid, B.H. Din, Determinants of intention to adopt e-government services in Pakistan: an imperative for sustainable development, Resources 8 (128) (2019), https://doi.org/10.3390/resources8030128.

[96] C. Ventriss, J.L. Perry, T. Nabatchi, H.B. Milward, J.M. Johnston, Democracy, public administration, and public values in an era of estrangement, Perspectives on Public Management and Governance 2 (4) (2019) 275–282, https://doi.org/10.1093/ppmgov/gvz013.
[97] A.A. Hamid, F.Z.A. Razak, A.A. Bakar, W.S.W. Abdullah, The effects of perceived usefulness and perceived ease of use on continuance intention to use e-government, Procedia Econ. Finance 35 (2016) 644–649, https://doi.org/10.1016/S2212-5671(16)00079-4.
[98] M. Horst, M. Kuttschreuter, J.M. Gutteling, Perceived usefulness, personal experiences, risk perception and trust as determinants of adoption of e-government services in The Netherlands, Comput. Hum. Behav. 23 (4) (2007) 1838–1852, https://doi.org/10.1016/j.chb.2005.11.003.
[99] N.M. Kassim, T. Ramayah, Trust in internet banking in Malaysia and the moderating influence of perceived effectiveness of biometrics technology on perceived privacy and security, Journal of Management Sciences 4 (1) (2017) 3–26, https://doi.org/10.20547/jms.2014.1704101.
[100] I.C. Chang, H.G. Hwang, W.F. Hung, Y.C. Li, Physicians' acceptance of pharmacokinetics-base clinical decision support systems, Expert Systems with Spplicstions 33 (2) (2007) 296–303, https://doi.org/10.1016/j.eswa.2006.05.001.