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Mobile government public value model for assessing the public institution's services: Evidence through the context of Jordan

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A B S T R A C T

Having a citizen's opinion is considered the most important method to evaluate a public institution's performance. As a contemporary theory regarding public institutions and private organizations, public value theory provides an alternative approach to evaluating organizations' performance. The current research has provided a new insight to assess the Mobile-government applications (m-gov app) by proposing a new model entitled 'Mobile Government Public Value (MGPV)' to measure the performance of m-gov apps in developing country settings, specifically Jordan. Depending on several theories engaged with information technology, many determinants have been selected to draw the line for evaluating MGPV in Jordan. Measuring the level of m-gov apps' usage was estimated depending on its perceived need, awareness, perceived security, social influence and self-efficacy to gauge the weather of creating or increasing the public value of the m-gov app from a citizen's perspective. In the current research, Structural Equation Model (SEM) was selected to obtain the research objectives. The results have indicated that the m- gov apps perceived need, m- gov apps' awareness, m- gov apps perceived security, and m- gov apps social factors played an essential role in creating public value of m- gov apps through the mediation role of m- gov apps use factor. While m-gov apps' self-efficacy factor did not provide a positive effect on creating the public value of m-government apps.

1. Introduction

Mobile technology forces have encouraged public and private institutions to provide a new approach to presenting their services to consumers. However, Mobile Apps have become the main trend among mobile users in all areas around the world (Salameh et al., 2020). Jordan, which is considered one of the developing nations, serves as an example of a rapidly rising smartphone community (Khaddam et al., 2021). Depending on Jordan's Telecom Regulatory Commission, eight million out of ten million Jordanian residents would be mobile subscribers in 2021. (Digital, 2021). The widespread availability of the Internet and mobile technology has boosted the use of both e-government and m-government apps services (Sami et al., 2018, Li et al., 2017). Jordan's e-government activities are increasingly focusing on smartphone applications, which have the potential to improve public service delivery and citizen participation in government initiatives. According to Jordan's e-government homepage (jordan.gov.jo, 2021), the e-government offers citizens of Jordan 39 mobile apps from several public institutions available on Google Play and Apple Store to help them do their tasks (e.g., Amman Stock Exchange and Jordan Investment Commission apps and Department of Lands and Survey apps). While the features provided by these applications are limited, they are a useful beginning step toward having distinct apps for different purposes.

Within the Jordanian context, m-government apps may not be widely used for two reasons. *First,* these apps are new, and the second is that some residents lack the necessary culture and awareness to utilize their smartphones to access government

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services (Yap et al., 2019). Grounding on this (Alhanatleh et al., 2022; Yap et al., 2019), the needs of residents for government services and their awareness of the availability of variant approaches to contacting and accessing the government services, such as visiting a government office, call centre, and websites and portals of government, have been the subject of much research. Furthermore, Al-Zoubi (2020) has recommended self-efficacy as a considerable factor that could affect the use or adoption of the m-gov app in Jordan by the citizens. In recent years, a handful of researchers (e.g., Ahmad & Khalid, 2017; Liang et al., 2017; Liu et al., 2014; Alqaralleh et al., 2020; Kanaan et al., 2019) have reconnoitre the adoption of m-gov. In sum, many researchers (Lallmahomed et al., 2017; Mensah and Mi, 2019) have ascertained the major factors that influence the adoption and use of m-gov apps services using established technology acceptance theories and models such as the TAM, UTAUT, TRA, and TPB. However, some theories have not been included while measuring the adoption level. Through the current research, some of these theories will be applied with others to determine the factors that influence m-gov apps' use. Moreover, these factors will aim at measuring the public institution's performance from the citizens' perspective in Jordan by linking them with the public value theory.

Many studies have supported the public value theory regarding e-government services are hot topics that should be studied (Alhanatleh et al., 2022; Twizeyimana & Andersson, 2019; Mellouli et al., 2020). Depending on (Al-Rawahi,2019; Karunasena & Deng, 2012), existing implementations, designing, and skills of e-government services used in both electronic and mobile modes are often geared at achieving efficiency and service effectiveness, with public value delivery receiving far less attention. Several studies have discussed the public value theory and e-government services from different perspectives such as empirical evidence and theoretical framework (alhanatleh et al., 2022; Scott et al., 2016; Mellouli et al., 2020). However, to the best of the authors' knowledge and regarding what has been done in the literature review, connecting the m-government apps to the context and public value theory has not been addressed yet. Within digital transformation technology, providing a new theoretical framework regarding m-gov apps could provide a new frame of reference (Chatfield & Reddick, 2018). The current research motivation for investigating the connection between m-gov apps and public value theory is to create a new theoretical framework for assessing the public institutions' performance depending on pubic value theory as a response to the research call (Kankanhalli et al., 2017; Mergel, et al., 2018; Kankanhalli et al., 2019; Twizeyimana & Andersson, 2019). For instance, Twizeyimana & Andersson, 2019 and Kankanhalli et al., 2019 suggested important considerations in the experiential and institutional differences of what constitutes public value creation, particularly in emerging economies that have received little attention. However, the current research will aim at answering the following questions:

Research question 1: Which factors influence m-gov apps in Jordan?

Research question 2: How do various factors influence MGPV?

To fill the existing gap in the literature review regarding the public value theory and m-government apps, the connection between m-government apps and public value theory may provide a new insight to measure the performance of public institutions. . *First*, the research contributes to the developing countries' setting by conducting in Jordan, which also provides new findings and information to the policymakers of the public institutions for enhancing their services depending on the m-apps' approach. The primary contribution of the current study is to provide a new model (*MGPV*) for assessing the performance of the m-government app's context in Jordan by linking several theories regarding information technology and public value theory. Investigation of the influence of m-government apps for creating public value is little or even absent in the literature in Western and non-Western countries. A few are provided about the public value theory in the m-government and e-government contexts (Alhanatleh et al., 2022; Scott et al., 2016). The current research supports a piece of empirical evidence for evaluating the performance of public institutions in Jordan grounding on multi-dimensional construct through studying the relationship between different related factors of m-government apps and public value theory.

2. Literature review

2.1. Public value theory

As per Fukumoto and Bozeman, (2018), it has been suggested that public value is a hazy term because academics often provide their own, somewhat varying definitions and interpretations of it. There is no clear understanding of what this concept is. It might be read as a management paradigm, rhetoric, a story, or even a tool for performance management. According to Alford & O'Flynn, (2009), public value is a mechanism for evaluating and managing the performance of government services. Several models advocate for a shift in government action from responsiveness to a collaborative, consultative approach in which citizens are treated as equal participants (Stoker, 2006). The three key sources of public value highlighted by Kelly et al. (2002) are the outcome, trust, and services. These kinds of public value creation lay the groundwork for new ways of thinking about the value that public institutions generate for the public. By investigating the quality of e-government service delivery, Omar et al. (2011) established a conceptual framework for evaluating public value. The public value of e-government service quality is investigated in their framework by looking at aspects including technology factors (quality of service, quality of information, and quality of system). This approach investigates how citizens perceive and evaluate e-government services to assess public institutions' performance from the perspective of citizens (Omar et al., 2011).

Moreover, according to Scott et al. (2016), public value theory should have included three value categories: efficiency, effectiveness, and social value. The effectiveness of this approach is proved by the development of a public value-based

construct to assess IS success from the perspective of citizens in the context of e-Government 2.0 technologies. As empirical support of the prior mention, Alhanatleh et al. (2022) have recently researched the e-government public value context by applying the IS success model. Through this research, it uncovered that the quality factors (system, information, and service) provided empirical support to create a public value of e-government in Jordan from the citizens' perspective grounding on the mediation role of the intended use of e-government and citizen satisfaction. It has been concluded that IS success model considers a qualified model for assessing and evaluating the e-government public value in Jordan's context. Consequently, the public value imitates the idiom of IS net benefits (DeLone & McLean 2003) and is centralized for accomplishing three major purposes of generating the public value: increased effectiveness of the public service from public institutions to citizens, guaranteed long term sustainability of public service efficiency, and enhanced social value (Jorgensen and Bozeman, 2007; Heeks, 2008; Bryson et al. 2014). However, the concept of public value theory in E-government and M-government contexts has embraced the policy-makers of public institutions, specialists, and researchers to provide a theoretical framework and practical link between the public value theory and e-government services (e-government and m-government) leading to identify the benefits from public institutions to their citizens (Scott et al., 2016; Mellouli et al., 2020). In line with the aforementioned, the current study is embarking to generate the public value through increased effectiveness of the m-government apps services to Jordanian citizens, guaranteed long-term sustainability of the m-government apps services efficiency and enhanced social value of Jordan citizens.

2.2. M-government evaluation

M-government has been defined as employing the power of mobile technology, applications, and devices to change government functions and improve government services delivery to the primary stakeholders involved in m-government, which includes both individuals and businesses (Schlæger, 2011). Deep & Sahoo (2011) argue that M-Government can support citizens' mobility by providing customized, real-time, and location-based information and services. It can also be viewed as a new channel for delivering government services of government to individuals in rural and urban zones, as well as a way to reach out to those who just prefer to utilize mobile devices. Moreover, Kaur & Dani (2017) define M-government as the empowerment of mobile devices that have been allowed to use and access the services from the public institutions. Following numerous information technology theories, M-government technology has been explored from several perspectives in developed and developing countries. Table 1 provides an overview of m-government investigations in literature review depending on the high-rank databases such as direct science, MDPI, Taylor and Francis, etc.

Table 1
M-government investigations in developed and developing countries

Authors	Theme	Findings
Althunibat et al., 2021	Study the factors affecting the sustainability of smart application in the government services context through three stages (the static, interaction, and transaction stages) in Jordan's setting	- Each of these three stages has distinct requirements in terms of system compatibility, security, information quality, awareness, perceived functional benefit, self-efficacy, perceived image, perceived uncertainty, resource availability, and perceived trust. - The requirements and perceptions of users toward the adoption and use of smart-government services vary considerably throughout the three stages.
Hou et al., 2020	Study the determinants affecting the mobile application's acceptance in the smart city from citizens' point of view in the United States' setting	- The factors (Performance and effort expectations, social influence, and trust in the local government's competence) were provided with a positive influence on the intention to use an app
Alqaralleh et al., 2020	determine the factors that influence the m-government use in Jordan	- As citizens' trust levels in internet services and available technologies for accessing m-government apps improved, their intention to use m-government apps improved as well. - According to the original dimensions of TAM, there was little impact on m-government's intentions to use mediation to increase citizen satisfaction with m-government.
Al-Zoubi, 2020	Study the factors that influence the intention to use m-government from the citizens' perspective in Jordan's setting	- Personal initiatives and perceived value dimensions had a primary and direct effect on adopting m-government. - Ease of use and accessibility dimensions provided a low-level role for the adoption of m-government.
Yap et al., 2019	Study the factors that influence the use of m-gov apps depending on CIC theory in the country of Malaysia	- Perceived need, awareness, and security had a positive significance on m-gov apps' use.
Sharma et al., 2018	Research on the factors that influence the m-gov apps that rely on the UTAUT model in Oman's setting	- Several factors provided a positive impact (Perceived usefulness, social influence, trust and cost) on m-gov apps usage
Almarashdeh & Alsmadi, 2017	Investigate the factors that influence the use of m-gov apps that rely on TAM and UTAUT	- Depending on the empirical results of the study, the m-gov app's perceived trust, cost of service, perceived ease of use, social influence and perceived usefulness supported the use of the m-gov apps
Abu-Shanab & Haider (2015)	Develop a conceptual proposed model for understanding and evaluating the determinants influencing the Jordanian m-gov apps depending on TAM.	- Social influence of m-government apps, perceived usefulness of m-government apps (PU), perceived ease of use of m-government apps (PEOU), perceived compatibility of m-government apps, perceived cost of m-government apps and perceived responsiveness of m-government apps, which have supported empirical evidence with Jordanian citizens' intention to use the m-government apps.
Althunibat et al., 2014	Study the impact role of the major determinants of TAM (perceived usefulness and perceived ease of use) in Jordan	- Perceived usefulness and perceived ease of use could evaluate the citizens' acceptance of Jordanian m-government apps.
Liu et al., 2014	Study factors affecting the adoption of m-gov apps in China using a developed model based on several theories	- The adoption of m-gov apps in China was influenced by several factors, including perceived ease of use, social influence, near-term usefulness, and long-term usefulness.

In accordance with Table 1, it can be concluded that most of the prior investigations have discussed the m-government from different angles. Some of the investigations focused on citizens' acceptance of m-government apps. Others focused on the intention to use m-government and the citizens' behavior toward m-government apps. Other investigations, moreover, were conducted on continuous usage behavior. However, the MGPV does not have a theoretical framework or empirical evidence in the literature.

2.1. The m-gov apps of Jordan

M-government provides contributions in several sectors, involving finance, education, transport, health, and security. Different public institutions of Jordan launched their services depending on mobile apps. Depending on the formal website of the e-government of Jordan (jordan.gov.jo, 2021), the recent article provides the most important m-government apps for public institutions of Jordan, as can be seen in Table 2.

Table 2
M-apps of public intuitions in Jordan

M-apps name	Task
Amman Stock Exchange and Jordan Investment Commission	provide assistance to investors to perform their everyday work
Department of Lands and Survey	Provide different services at any time to citizens relate to their own lands
Energy and Minerals Regulatory Commission	Provide assistance to citizens to calculate their electricity bills
Jordan Health Map	Provide assistance to citizens to find the nearby hospital
Royal Jordanian Airlines	Facilitate the passengers' tasks by providing the information and services
MOENV	Assist in protecting the Jordan environment
Sanad	Assist in protecting the Jordanian from the COVID-19 pandemic
Aman	Assist in protecting the Jordanian from the COVID-19 pandemic

2.2. Research Theoretical Background

To explain people's acceptance of new technology and information systems, numerous information system frameworks have been established and empirically evaluated such as the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1977), diffusion of innovations theory (DOI) (Rogers, 1975; Rogers, 2010), Theory of planned behavior (TPB) (Azjen, 1980; Ajzen, 1991), Technology acceptance model, 2 and 3 (Davis, 1989, Davis, Bagozzi, & Warshaw, 1989; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008), UTAUT (Venkatesh 2003; Dwivedi et al., 2020), IS model (DeLone & McLean 2003), and Citizen-Initiated Contacts theory (CIC) (Jones et al., 1977).

In terms of adopting the determinants influencing the m-government public value in the current study, Sharp (1982) proposes an equivalent model (CIC) for contracting with the government depending on the perceived need and awareness of determinants. In the current study, the m-government perceived need factor was selected from the theory of CIC and the m-government awareness factor was selected from DOI theory. Grounding on (Reddick & Anthopoulos, 2014; Reddick & Zheng, 2017), the m-government apps' perceived need and awareness must be at the highest scale of the parabolic curve for a resident to commence the highest level of contact with the government. Furthermore, there is an additional antecedent to the adoption of M-government in the current study, which is m- perceived security that describes the degree to which a resident feels that performing a transaction on the m-government is safe in a way harmonious with the citizen's confident suppositions (Hartono et al., 2014). In the majority of prior studies, m- self-efficacy has been found to be a significant positive predictor of users' behavioral intentions. M- self-efficacy was taken from the Theory of SCT (Bandura, 1982). Furthermore, the social influence (subjective norm) construct has been selected based on the Theory of TPB and UTAUT. Throughout the current study, m-social influence was discovered to have a considerable impact on citizens' behavior toward m-government usage. Lastly, (Scott et al., 2016) proposed an approach for measuring the public value of e-government based on the IS model (DeLone & McLean 2003). According to that, M-government use/intention has a link to the public value of M-government.

In accordance with the aforementioned discussion, the current article employed various theories (CIC, SCT, DOI, TPB, UTAUT, IS model) to identify the antecedents of M-government apps' use and their role in creating or increasing the public value of M-government. M-government apps perceived need, M-government apps awareness, M-government apps security, M-government apps' self-efficacy, and social factors will be major determinants of the evolution of the citizens' use of M-government apps. As a novelty of the current research, the major consideration of the M-government context is how m-government apps may create value for citizens. Therefore, we argue that the use of m-government apps has a link to generating the MGPV.

3. The model and hypotheses of MGPV

Different theories have been employed for discussing the admission, embracing or the use of technology such as TAM, CIC, SCT, DOI, TPB, UTAUT and IS model (Alqahtani & Kavakli-Thorne, 2020, Alhanatleh & Akkaya, 2020; Alhanatleh, 2020; Yap et al., 2019; Moh'd Al-Dwairi et al., 2018; AL-Nawafleh et al; 2019; Nofal et al., 2021; Alnawafleh et al.,2018).

However, the proposed model of the current study is differentiated from the prior theories due to many matters. *First*, the current study comes up with a new conceptual framework of m-government apps with public value theory for measuring the performance of public institutions from citizens' perspectives and determinants. The linkage between m-government apps and

public value has not been addressed yet. Thus, the original findings of the current study are considered a second contribution. Digital transformation represented by m-apps has increased usage in public and private institutions. Guaranteeing the sustainability of the use of m-apps requires providing a new conceptual framework. Accordingly, the MGPV model of the current research provides a critical contribution to government administration by improving the performance of m-gov use. In addition, the proposed model also contributes to existing theories by composing the m-gov apps and its public value theory.

Throughout the current research, the determinants of MGPV have been carefully nominated grounding on a comprehensive view in the literature. Fig. 1 provides the new conceptual framework of MGPV.

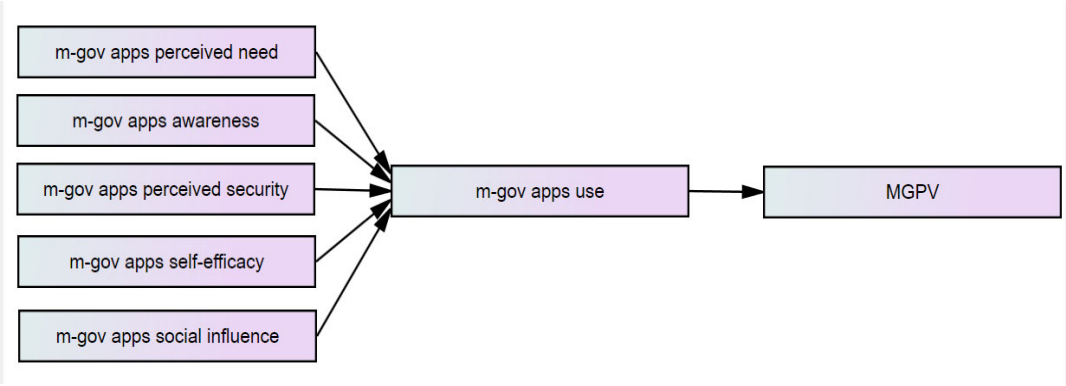


Fig. 1. MGPV model**.**

The proposed model of the recent study provided in Fig. 1 provides a novel perspective related to the MGPV. The following sub-sections will provide an inclusive explanation of the study hypotheses with robust justification in prior investigations in literature.

3.1 M-government apps perceived need

M-government apps' perceived need theorizes as a primary antecedent to determine the citizen level of m-government apps usage. Jones et al. (1977) propose that the level of interaction a person has with the government is determined by their needs for government services, based on traditional connections with the government. Citizens who have a greater need for government services are more likely to contact the government to obtain those services. M-government apps' perceived need is utilized to evaluate the success of m-government use (Yap et al., 2019; Reddick and Zheng, 2017; Reddick and Anthopoulos, 2014). Depending on previous empirical investigations, it can be hypothesized that:

H1: The perceived need for M-government apps will have a positive and direct impact on citizen use of M-government in Jordan.

3.2 M-government apps awareness

M-government apps' awareness is considered a major antecedent for citizens to decide to download the m-government apps on their devices and use these apps (Kamarudin et al., 2021; Shah et al., 2020). In the context of m-government and mobile apps, several studies supported that awareness provides a positive attitude toward m-government app use (Yap et al., 2019) and mobile app use (Hammouri et al., 2021; Al-Gasawneh & Al-Adamat, 2020; Saprikis et al., 2021). Depending on previous empirical investigations, it can be hypothesized that:

H2: The public's awareness of M-government apps will have a constructive and direct impact on the use of M-government in Jordan.

3.3 M-government apps perceived security

Perception of security in m-government apps is a major determinant of its use. It describes whether a resident feels that accomplishing a transaction on an m-government app is secure in a manner that is harmonious with his or her confidence in doing so (Hartono et al., 2014). Studies indicate that perceived security is an important antecedent for accepting and using new technologies, such as e-banking services (Liao & Cheung, 2002), e-government services (Munyoka & Maharaj, 2019), and mobile government apps. (Yap et al., 2019; Wirtz et al., 2019; Fox et al., 2021). Depending on previous empirical investigations, it can be hypothesized that:

H3: The perceived security of M-government apps will have a positive and immediate impact on citizen adoption of M-government in Jordan.

3.4 M-government apps self-efficacy

Grounding on (Rogers, 1975, M-government apps' self-efficacy is one of the critical factors suggested in SCT. M-government apps' self-efficacy indicates a citizen's perception that they can accomplish functions using mobile Apps of public institutions (Hammouri et al., 2021). It has been demonstrated in many empirical studies that mobile apps self-efficacy increases app usage in a wide variety of technology domains (Hammouri et al., 2021, Sala-González et al., 2021). Depending on previous empirical investigations, It can be hypothesized that:

H4: The self-efficacy of M-government apps will have a favourable and direct impact on citizen use of M-government in Jordan.

3.5 M-government apps' social influence

M-government apps' social influence considers a major key to defining the level of m-government apps usage. It is critical to understand the contributions of internal and external environments such as friends, people, and significant stakeholders for deciding the use of technology. Previous findings supported that social influence enhances the level of use of m-government apps and e-government use (Abu-Shanab & Haider, 2015; Susanto & Aljoza, 2015). Depending on previous empirical investigations, It can be hypothesized that:

H5: The social influence of M-government apps will have a direct and beneficial impact on citizen use of M-government in Jordan.

3.6 M-government apps' use

M-government apps use dimension defined as a major construct in its IS model to evaluate the net benefit of any technology (DeLone & McLean 2003). M-government apps' determinant evaluates the behaviour of M-government apps users and their belief in counting on M-government apps, recurrence of m-government apps use, and the inclination of m-government system usability in the future (Petter et al., 2013). Scott et al., (2016) found a connection between the e-government user dimension and the public value in the IS model by replacing the net benefit construct and substituting the e-government public value construct. Following this way, the current research suggested that there is a link between the M-government apps' use and the MGPV construct. Previous findings supported that e-government use provides a favourable attitude toward e-government public value (Alhanatleh et al., 2022; Suh et al., 2017; Agbabiaka, 2018). Depending on previous empirical investigations, It can be hypothesized that:

H6: From a citizen perspective, M-government app users will have a positive and direct effect on M-government public value in Jordan.

4. Methodology

The research methodology used in this study consists of three stages. During the first stage, a comprehensive review of m-government and public value literature was established. During the second stage, data were collected using a quantitative technique for determining the level of creating a public value of m-government from the citizens' perspective of Jordan depending on suggested factors as presented in the current research model. During the third stage, the collected data from citizens of Jordan were analyzed by harnessing the SPSS AMOS software version. 22.

The M-government public value model's instrument included seven constructs: m-government apps' perceived need, awareness, perceived security, self-efficacy, social influence, use, and M-government public value. The constructs of the m-government public value model were adapted with 46 items. The items of each construct were developed and adapted grounding on related studies of the current study domain as illustrated in Table 3. The response of Jordanian citizens to the creation of MGPV was measured using a 5-Likert scale ranging from "Strongly disagree" to "Strongly Agree," with "Strongly disagree" representing the lowest value level of creating public value of m-government and "Strongly agree" representing the highest value of the same.

Grounded on a developed questionnaire to serve the current research objectives, a quantitative approach was employed to collect and analyze the data. The above-said approach was placed for establishing a baseline of assistance for specialists in the domain of the current research to identify the level of m-government apps for generating the public value of Jordanian citizens. Dodge (2020) reported that when researchers prepare and design their study, they must confirm that the work will minutely provide a representation of the study population. According to the most retrieved data from the government of Jordan - Department of statics (dosweb.dos.gov.jo, 2021), the size of the population was 11,017,752. Consequently, the authors select a sample size of 550 respondents to provide answers with a high-quality accuracy. Throughout this research, a survey approach depending on a questionnaire was executed, with 550 Jordanian citizens to present an inclusive opinion, the level of m-government apps usage, and the creation level of m-government public value. Before starting data collection, the survey items were translated into the Arabic language through careful translation processes. Three experts in the translation field were invited to participate in generating the Arabic survey version to present the final Arabic version without syntax and denotation mistakes. Later, the pilot study was executed with 30 citizens. The result of the pilot study was provided in the final form of

the Arabic version survey. 550 questionnaires were distributed to acquire the data from the selected sample. The completed answered questionnaires were only 429 with a 78% rate of response. The data collection process from the citizens of Jordan got started in September 2021 and ended in November 2021.

Table 3
Developed constructs items

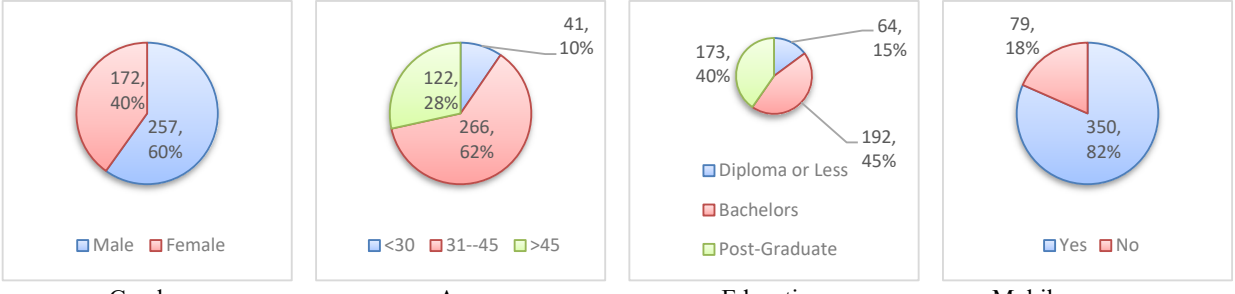
Factor	No of items	References
M-government apps' perceived need	4	Mukred et al., 2020; Yap et al., 2019
M-government apps' awareness	4	Althunibat et al., 2021; Shareef et al., 2014
M-government apps' perceived security	3	Althunibat et al., 2021; Shareef et al., 2014
M-government apps' self-efficacy	4	Althunibat et al., 2021; Shareef et al., 2014
M-government apps' social influence	4	Winarno et al., 2021
M-government apps' use	4	Alhanatleh et al., 2022; Wang & Liao (2008)
M-government public value	21	Alhanatleh et al., 2022; Scott et al. (2016)

5. Results

For obtaining the findings of the current research purpose, several approaches and techniques were employed grounding on AMOS V. 22 and SPSS package due to their capability to produce accurate findings in the current research field (Byrne, 2013; Ringle et al., 2018). According to (Bagozzi & Yi, 1988; Hair et al., 2007; Rex B. Kline, 2011), estimating the hypotheses findings of the MGPV model was conducted depending on several sequence processes. Firstly, SPSS software was appointed for preparing the data using different techniques such as encoding data, manipulating unengaged respondents' values, discovering the missing values of respondents, conducting the Skewness and conducting the outliers of respondents. Secondly, Confirmatory Factor Analysis (CFA) was executed to assess the measurements of the m-government public value model. Finally, SEM was implemented for retrieving the hypotheses results of the MGPV model.

5.1 Characterization of Demographic variables

The gender feature of Jordanian citizens participating in the current research is distributed between males at 59.9% and females at 40.1%. Moreover, three categories were selected for describing the age feature of Jordanian citizens participating in the current research; 9.6% of respondents' age were <30, 62% is in the range of 31 to 45 and 28.4% were > 46. Furthermore, three categories were selected for describing the education feature of Jordanian citizens participating in the current research: 14.9% of respondents were the holders of a diploma or less certification, 44.8% of respondents were the holders of bachelor's certification, and 40.3% of respondents were the holders of a post-graduate certification. Finally, the current research provided that 81.6% of Jordanian citizens used the m-government apps services and 18.4% have not used the m-government apps services. The results are supported in Fig. 2.



Gender Age Education Mobile apps usage

Fig. 2. Personal characteristics of the participants (N=429)

5.2. Measurement of m-government public value Model

For providing a fit indication of the m-government public value model, CFA was evaluated to obtain results of several fit indicators. Grounding on (Hair, 2007; Rex, 2011), the retrieved fit indicators of the current model were provided with strong evidence for continuing the analysis as can be seen in Table 4.

Table 4
Measurements of m-government public value model

construct	x^2/df	IFI	TLI	CFI	GFI	AGFI	RMSEA
First round	2.423	0.924	0.915	0.923	.765	0.812	0.058
Second round	2.252	0.937	0.926	0.936	0.858	0.825	0.054
Criteria values	x^2/df<3	IFI>.9	TLI>.9	CFI>.9	GFI>.9	AGFI>.9	RMSEA<.8

The reliability and validity of the m-government public value constructs were computed for each construct. However, the internal consistency of the public value m-government constructs was produced through retrieving (α) values for all model constructs; the retrieved values provided high-reliable results and acceptable values (>=0.7) depending on (Sekaran and Bougie, 2019). Thus, the convergent validity of the m-government public value constructs was accomplished (Hair et al., 2017). Grounding on (Hair et al., 2021), the composite reliability (CR) and average variance extracted (AVE) results were provided with an acceptable value (>=0.70) and (>=0.50) respectively; the obtained CR and AVE results ranged from (0.872 to 0.947) and from (0.501 to 0.695) respectively. However, several items of the m-government public value constructs were omitted due to issues of factor loading process (one item from m-government apps social influence construct, one item from m-government apps awareness construct, one item from m-government apps self-efficacy construct, and three items from M-government public value). As evident in Table 5, the internal consistency and the discriminant validity of the m-government public value constructs were supported and accomplished.

Table 5
Reliability and validity evaluation

Construct	α	Mean	Std. Deviation	CR	AVE
M-gov apps perceived need	0.889	3.285	0.840	0.872	0.631
M-gov apps awareness	0.819	2.999	0.758	0.779	0.541
M-gov apps perceived security	0.859	3.577	0.858	0.845	0.645
M-gov apps self-efficacy	0.861	3.676	0.977	0.872	0.695
M-gov apps social influence	0.788	3.387	0.738	0.773	0.531
M-gov apps use	0.823	3.869	0.762	0.815	0.526
MGPV	0.959	3.410	0.678	0.947	0.501

The Pearson correlation test was estimated for determining the degree of the relationship between MGPV constructs. As provided findings in Table 6, m-government apps perceived security, m-government apps social influence, m-government apps self-efficacy, m-government apps awareness constructs are strongly connected to m-government apps use construct (r= .778, p <.01), (r= . 902, p <.01), (r= . 627, p <.01) and (r= . 762, p <.01) respectively. The findings also provided that m-government apps' use construct is strongly connected to M-government public value construct (r= .860, p <.01). Therefore, the m-government public value constructs of current research are positively and strongly related.

Table 6
Person correlation estimating

	1	2	3	4	5	6	7
M-gov apps perceived security	1						
M-gov apps use	.778**	1					
M-gov apps social influence	.693**	.902**	1				
M-gov apps self-efficacy	.612**	.627**	.554**	1			
MGPV	.699**	.860**	.721**	.470**	1		
M-government apps awareness	.691**	.762**	.701**	.703**	.462**	1	
M-gov apps perceived need	.665**	.896**	.719**	.570**	.621**	.727**	1

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

5.3 SEM of m-government public value hypotheses

After verifying the discriminant validity of m-government public value constructs through calculating the square root of AVE and after estimating the model fit, the assessment of the MGPV was elucidated through executing SEM. As Fig. 3 and Table 7 provide that **H1**, **H2**, **H3, H5**, and **H6** had empirical evidence; where **H4** did not have empirical support. In more detail, M-government apps' self-efficacy did not have an impact on M-government use; where each m-government app's perceived need, m-government apps awareness, m-government apps' perceived security, and m-government apps' social influence directly, significantly, and positively affected the M-government use. Consequently, all these dimensions expounded 92% (0.92) of the variance in M-government app use. Moreover, M-government apps use directly, significantly, and positively affected M-government public value expounded 72% (0.72) of the variance in MGPV.

Table 8
The estimation of m-government public value hypotheses

Independent Variable	dependent Variable	Estimate	S.E.	C.R.	P
m-gov apps perceived need	m- gov apps use	0.471	0.007	70.446	***
m- gov apps awareness	m- gov apps use	0.182	0.003	57.033	***
m- gov apps perceived security	m- gov apps use	-0.028	0.002	-17.635	***
m- gov apps self-efficacy	m- gov apps use	-0.001	0.001	-0.687	0.492
m- gov apps social influence	m- gov apps use	0.397	0.006	68.823	***
m- gov apps use	MGPV	0.636	0.024	26.805	***

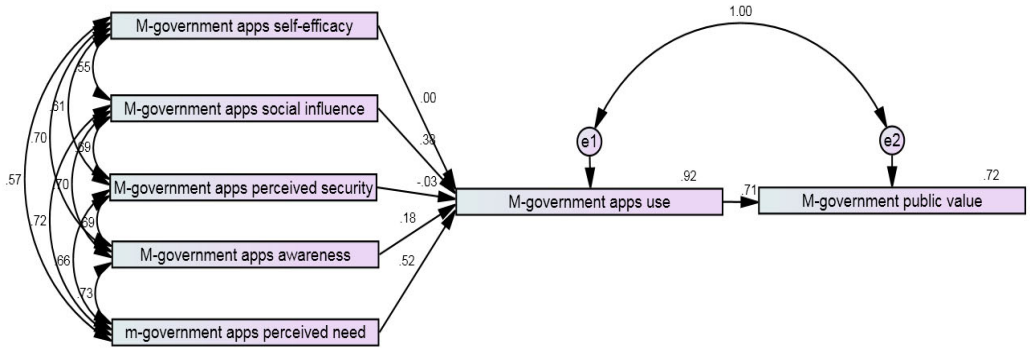


Fig. 3. SEM of research

6. Results Discussion

The recent article has targeted to provide a new conceptual model that connects the m-government apps' technology and public value theory grounding on multiple related theories. From citizens' views, the study has practically examined the probable variables affecting m-government app project utilization and also about establishing the public value of m-government in Jordan. However, the current article's findings article has aimed to confirm the first research question as mentioned in the introduction section. In addition to that, the current article findings have responded to and confirmed the second research question as mentioned in the introduction section.

Through their impact on m-government app use, both the perceived need for m-government apps and the social influence of m-government apps indicate the high impact scale of MGPV value. In line with prior investigations (Yap et al., 2019; Reddick and Zheng, 2017), m-gov apps' perceived need is considered a primary dimension for increasing the m-gov apps' use. This means that citizens have enhanced their use of m-government apps dramatically when these apps started fitting their demands and criteria. As a result, citizens are evaluating m-gov use based on their expectations of an increased number of m-gov apps that will make their daily interactions with Jordan's government easier. Only high citizen expectations of m-gov applications can lead to increased m-gov app usage and, as a result, public value for the apps will be enhanced. According to previous research (Abu-Shanab & Haider, 2015; Susanto & Aljoza, 2015), social influence on mobile government apps is a vital dimension that has a major impact on their use. This study indicates that citizens' m-gov app usage is progressively increased based on their relationships with others. As a result, residents are becoming increasingly hesitant to utilize m-gov apps, even though the number of people utilizing these apps is increasing. Similar to previous studies on mobile government app awareness (Yap et al., 2019; Hammouri et al., 2021), mobile government app awareness has a beneficial impact on its use. This study indicates that citizens' knowledge, abilities, and information regarding the characteristics of m-gov apps considerably enhance citizens' use of m-gov applications. Consequently, citizens are increasingly reluctant to use m- gov apps grounding on raising their realization and understanding of the benefits of m- gov apps. Following prior investigations (Yap et al., 2019; Wirtz et al., 2019; Fox et al., 2021), m- gov apps perceived security is provided with an affirmative and significant impact on m-government apps use. The denoting of this result is that citizens are significantly augmented m- gov apps usage counting on the confidence of processing their transactions through m- gov apps system and protecting their information on the system. Consequently, citizens are increasingly reluctant to use m- gov apps grounded on their trust in the security platform to accomplish the transactions through m-government apps. In contrast to prior investigations (Hammouri et al., 2021, Sala-González et al., 2021), m- gov apps self-efficacy is not provided with an affirmative and significant on m- gov apps use. The potential interpretation of this result is that citizens are not provided with guidance to use the m- gov apps from the government of Jordan. Another elucidation is that there are no sufficient ways to increase the skills and qualifications of citizens for using m- gov apps.

In accordance with prior investigations (Alhanatleh et al., 2022; Suh et al., 2017; Agbabiaka, 2018), M- gov apps use is provided with an affirmative and significant impact on MGPV. The denoting of this result is that citizens are gradually creating an MGPV depending on their trends to continuously use the m-gov apps in future. Consequently, MGPV is generated through achieving several benefits from using m-gov apps such as keeping citizens' effort and cost, increasing the effectiveness of m-gov apps, raising the efficiency of m-gov apps, and boosting the social value of the citizens.

7. Practical and Managerial Implications of Research

The MGPV model's conclusions have a wide range of practical and administrative applications. The perceived necessity for m-gov apps is regarded as a critical factor that determines their utilisation as well as the development of MGPV apps in Jordan. This finding encourages Jordanian policymakers to increase the number of apps available in the m-gov environment

to meet citizens' needs. Furthermore, policymakers in Jordan might focus on generating value from the given m-gov apps by addressing citizens' demands and expectations. Furthermore, as our analysis showed, the m-gov social influence plays an essential role in raising the level of m-gov app usage. Thus, public institutions in Jordan could pay attention to the social influence for determining and increasing the m-gov apps to create the public value of using m-gov apps. In addition, m-gov apps awareness and m-gov apps perceived security dimensions consider the primary key that influences the usage of the m-gov app. Thus, the related policymakers and public institutions in Jordan could make serious decisions to increase the awareness of citizens and improve the security issues of m-gov apps. Furthermore, m-gov apps use and its significant antecedents consider optimal dimensions influencing MGPV in Jordan. Thus, creating a public value of using m-government apps in Jordan requires the public institutions of Jordan to increase the effectiveness and efficiency of m-gov apps.

Depending on what have done in the prior studies engaged with m-gov apps and e-gov services, especially in Jordan's context, just one article discussed the classification of e-government services; the study classified the e-government services into three categorizations: mandatory services, optional services, and tangible–optional services (Alabdallat, 2020). Thus, analyzing and categorizing the m- gov apps in Jordan could determine the level of important services for citizens. In this way, the policymakers and public institutions of Jordan will have a sufficient overview of the presented m-gov apps services and planning for future trends of m-gov apps services for citizens. MGPV could be generated as a result of this, with the goal of improving the efficiency of m-gov applications services, increasing their effectiveness, and raising citizens' social worth. Investing in a cloud m-gov platform could give numerous advantages for citizens, businesses, and public institutions, according to a recent article that searched, analysed, and discussed the literature review of m-gov technology related to developing countries. According to Mustafa & Shabani (2018), the cloud m-gov platform could help increase availability, guarantee immutability, reduce response time to residents and employees' government, develop new m-apps based on open data government and crowdsourcing methods, and increase the efficiency, effectiveness, and social value of citizens. As a result, these implications may help Jordan develop MGPV.

8. Recommendations

The current article discusses numerous future developments that can be used to assess the context of m-gov app services and provide public value for citizens. No study has attempted to analyze citizens' needs for m-gov apps. As a result, there is a greater need to devote more resources to analyzing and categorizing citizens' needs for m-gov apps. Jordan's government is experiencing financial hardships, which may have an impact on spending and the development of e-government services and mobile government apps. As a result, it is predicted that the following trends will identify economic limits and their function in growing m-gov app usage and establishing MGPV. Furthermore, various elements such as electronic word of mouth, citizen involvement, citizen participation, and others were not considered in this study when measuring the level of MGPV. As a result, including these elements in our model will be beneficial in the future. Furthermore, offering detailed insight into the creation of MGPV could bolster the study's current findings. As a result, the next step could be to undertake long-term research to get a full picture of the MGPV model. In addition, making citizens' transactions through m-gov apps could increase the matter of their security issues. As a result, future trends could focus on the adoption of mobile-blockchain technology as an alternative solution. Finally, the current study's sample size was insufficient to produce credible results. As a result, future studies could expand the sample size by including additional parameters impacting the public value of m-government apps in Jordan, allowing the current findings to be generalized.

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