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UTAUT and determinant factors for adopting e-government in Jordan using a structural equation modelling approach

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Abstract: This study was guided by the unified theory of acceptance and use of technology (UTAUT) to determine factors that affect citizens' adoption and use of e-government in Jordan. Quantitative exploratory descriptive methodology was adopted. Data was collected using questionnaires targeting Jordanian citizens through non-probability purposive sampling, with the sample comprised of 277 respondents. The data was analysed using SPSS and SEM-AMOS. The results show that the UTAUT factors explained moderate variance in behavioural intentions R^2 scored 55%. Moreover, behavioural intentions and facilitating conditions achieved moderate variance in e-government use $R^2 = 41\%$. Further, education and residence were observed to be significant moderators. Following the results, implications, recommendations and directions for future studies are provided.

Keywords: determinants; UTAUT; e-government; SEM; Jordan.

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1 Introduction

Modern technology has influenced and changed the ways government work. With the advent of the internet, the performance and management of many institutions has changed for the better. Governments have used technology in favour of better service (Abu Shanab et al., 2013; Al-Ammary, 2021; Alsaad, 2022). Indeed, e-government is a

precious source of fame for any public organisation, as the basics of e-government include an available website and the latest electronic communication technologies (Talab and Flayyih, 2019). Thus, e-government is the next step for developing government activities in line with new public administration (Cordella, 2007; Nawafleh, 2021).

E-government has become the most popular governing system around the world. The popularity of e-government is closely related to the great benefits it achieves, both for governments themselves and for citizens and society, by broadening participation and eliminating the distance between governments and their citizens (Akman et al., 2005; Cifuentes-Faura, 2021; Elmansori and Ishak, 2021).

In this context, it should be noted that effective implementation of any information technology or information system (IS) depends on user acceptance (Davis et al., 1989), and governments have shown high interest in exploring the determinants of the adoption and use of e-government (Venkatesh et al., 2016). In this vein, a number of previous studies have confirmed that users' lack of acceptance is a major obstacle to the advancement of new technology (Nickerson, 1981; Gould and Lewis 1985). Moreover, many researchers have analysed the global adoption and success of e-government services and found that many governments still suffer from citizens' lack of acceptance of these services (Belanger and Carter, 2008; Gupta et al., 2008; Kumar et al., 2007; Reddick, 2005; Thomas and Streib, 2003). However, other researchers have studied the application of e-government in developing countries in particular and concluded that the low level of citizens' dependence on these services represents the barrier that has faced most developing countries so far (Schuppan, 2009; Alam and Hassan, 2011).

Considering that user acceptance of new technology is an essential factor in determining the success or failure of implementing any new technology (Venkatesh et al., 2003) is relevant in the case of Jordan. In Jordan, the public sector is using an e-government application to increase the efficiency of its offered services and enhance the quality of provided public services; this is one of the most important goals for change set by the Jordanian Government (Nawafleh, 2018). Due to the national advantage of e-government, it is believed that Jordan has attached great importance to the process of developing their e-government. His Majesty King Abdullah II recognised this phenomenon in 2001, when the Ministry of Digital Economy and Entrepreneurship (MODEE) was charged with the responsibility of implementing it. Since then, e-government in Jordan has been developing and focusing on transferring services to the electronic domain. Several different changes and improvements have been made to different aspects of the initiative, which have led to changes in levels of general electronic-service delivery (Nawafleh et al., 2012; Nawafleh, 2018, 2020).

Despite less than expected response, ranking lower in terms of citizen response can be seen in many developing countries, and Jordan is not different. This justifies the need to investigate the issue (UN e-Government Survey, 2014). Indeed, this issue is highly conspicuous in developing countries in comparison to developed ones due to challenges that range from technological factors to social factors (Schuppan, 2009). Kanaan and Hassan (2016), Alkhwaldi et al. (2017) and Al-Refaie and Ramadna (2020) report that low usage levels in relation to e-services is a critical problem in Jordan, which accordingly requires extensive investigation. Moreover, a large percentage of Jordanian citizens have claimed low willingness and low interest in using e-government (Kanaan and Hassan, 2016). However, the literature indicates that academic research of e-government acceptance is still limited (Alshehri, et al. 2012). Therefore, this research

highlights the importance of understanding e-government services and applications within the public sector in order to facilitate their acceptance and use, as well as the importance of user acceptance in adopting e-government applications as a means of motivation to use electronic services.

For this purpose, various models of technology acceptance have been proposed in the literature, which explore determinants of acceptance by end-users. Unified theory of acceptance and use of technology (UTAUT) makes a significant contribution to the study of technology acceptance and use, accounting for nearly 70% of variance in user intent (Venkatesh et al., 2003). UTAUT is a modern paradigm emerging from the synthesis of many models and theories related to the acceptance of technology. This theory emphasises the importance of user perception of systems as one of the most important determinants of acceptance (Kim and Son, 2009). Therefore, UTAUT has been adopted in this study to investigate the determinant factors for the adoption and use of e-government applications by Jordanian citizens. It should be noted that the authors preferred using UTAUT rather than its extended version UTAUT 2, as the former was seen as more suitable in the e-government area. We believe the extended factors, namely hedonic motivation, price value and habit, are not related to e-government when considering that use of public e-services is compulsory. Therefore, old methods, such as visiting a public department is no longer applicable. Accordingly, such systems provide vital services for citizens without aiming to provide hedonic motivation that may become habit in the long run. Moreover, e-services eliminate the costs associated with visiting public departments to request services. Therefore, these extended factors do not provide any related understanding. Hence, UTAUT is viewed as more suitable for the current study.

The aim of this research is to identify and explore the factors that affect the acceptance and use of e-government applications in the public sector from users' perceptions. This research has adopted UTAUT to theorise the potential factors that may arise and influence the adoption of e-government services (Venkatesh and Zhang, 2010).

This research seeks to build a model that helps government decision-makers to understand the factors that affect citizens' adoption of e-government services in the public sector. The paper contributes to the gap mentioned by Kanaan and Hassan (2016), Alkhwaldi et al. (2017) and Al-Refaie and Ramadna (2020), which requires the investigation of determinant factors in e-government adoption in the context of Jordan. This paper also contributes to the robustness of the UTAUT model by validating it from the context of a developing country. Moreover, in analysing the results, it is evident that UTAUT is subject to extensions, such as including possible mediation variables that can provide better understanding for the process in which the suggested UTAUT factors explain usage, which future studies will need to consider.

The paper is structured as follows: the next section provides a literature review and theoretical framework. Then, methodology is presented, followed by statistical analysis and general findings. Finally, implications, recommendations and directions for future studies are provided.

2 Literature review and theoretical framework

According to Taherdoost et al. (2010) as a result of the various technology-acceptance theories and models that have been applied in a variety of fields in an effort to understand

and predict user behaviour, several researchers have developed theories to analyse user acceptance and have established models to describe this process. These models identify different factors in user acceptance of modern technology. One of the latest models from the field of general technology-acceptance is UTAUT.

UTAUT theory is similar to previous acceptance models in terms of its definition for user intention – to use ISs and increase usage behaviour. This theory employs a framework based on the philosophical and methodological consistencies of eight influential frameworks historically used in the field of ISs to predict the acceptance of technology in regulatory environments (Venkatesh et al., 2003). Through a review of the literature on acceptance of technology, many theories and models have been found, ranging from human behaviour to computer science; they include TRA (Fishbein and Ajzen, 1980), the theory of planned behaviour (TPB) (Ajzen, 1985), SCT (Bandura, 1986), TAM (Davis, 1989), MPCU (Thompson et al., 1991), MM (Davis et al., 1992), TAM2 (Venkatesh and Davis, 2000) and DOI (Rogers, 2003).

The UTAUT effectively integrates eight models already used in the IS domain. Venkatesh et al. (2003) developed this composite model in 2003 to present an integrated picture of the acceptance process. The UTAUT proposes four main combinations, each of which plays an important role as a direct determinant of user acceptance and use behaviour. Guided by Venkatesh et al. (2003); in the UTAUT model, performance expectancy (PE) is guided by perceived usefulness, external motivation, relative advantage, job fit and outcome expectations, hence, PE is what the user believes or expects they will gain from using the system in terms of functionality. Direct association between PE and intentions is formulated as follows:

H1 PE has a direct impact on BIs of e-government application use.

Effort expectancy (EE) captures ideas of ease and complexity of use; indeed, EE is what the user thinks about how easy it is to use the system. EE and intentions association is formulated in the following hypothesis:

H2 EE has a direct impact on BIs of e-government application use.

Meanwhile, social influence (SI) can be defined through social factors, subjective norms and image, SI happen when the user believes it is important to others that he or she should use the new system. SI and intentions link is formulated in H3:

H3 SI has a direct impact on BIs of e-government application use.

Facilitating conditions (FC) can be defined by determining concepts of perceived controlling behaviour and consensus. It is the degree to which the user believes that there is a supportive organisational and technical infrastructure when using the system. FC has a direct association with intention and action/use:

H4 FC has a direct impact on BIs of e-government application use.

H5 FCs have a direct impact on e-government application use.

UTAUT proposes intention as a predictor of action/use, which is formulated as follows:

H6 BIs have a direct impact on e-government application use.

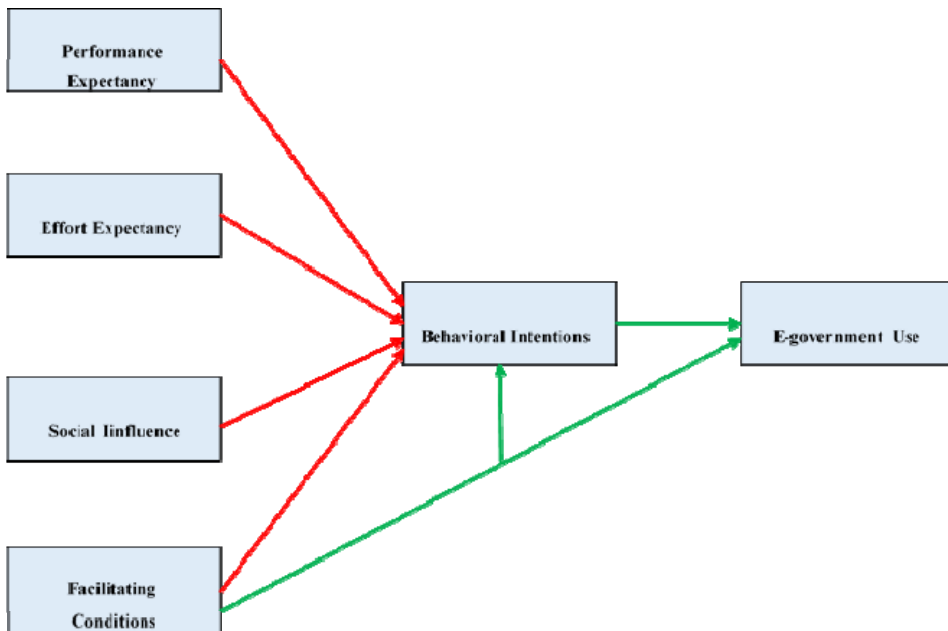
Finally, demographic variables have been integrated into the UTAUT model as taking a moderating role, as such younger users, highly educated and those who reside in urban

areas is suggested to have an intermediate impact on the action/use in comparison to the older users, lower educated and those who reside in rural areas. These suggestions are formulated as follows:

- Ha Younger users, rather than older users, have an intermediate impact on e-government application use.
- Hb Highly educated users, rather than uneducated users, have an intermediate impact on e-government application use.
- Hc Urban populations, rather than rural populations, have an intermediate impact on e-government application use.

Figure 1 depicts the model of study.

Figure 1 The research model (see online version for colours)



UTAUT has been broadly used in different countries to study the adoption of e-government and was utilised as a conceptualisation model with results determining the factors affecting the adoption of e-government. Previous models showed factors that verify user acceptance of any technology, and the capability of UTAUT to determine factors that affect user acceptance of any new technology (Wachama et al., 2014) has also been acknowledged. Weerakkody et al.'s (2013) study on facilitating e-government adoption by examining the influences of intermediaries pointed out that, due to UTAUT's ability to provide prediction and clarification of users' behaviours, it is considered the most predictive model in technology acceptance. Moreover, most of the previous literature mentions UTAUT as increasing usage behaviour and the use IS alongside explanations of user intentions towards the acceptance of e-government. Therefore, the acceptance process becomes more real than in previous models (Alshehri et al., 2012; Taiwo et al., 2012).

Most importantly, the validity and reliability of UTAUT has been proven in many technology-adoption studies in different fields that have evaluated the success of information-system implementation. Additionally, contributions to the interpretation and understanding of determinants of user acceptance that target users through programme design and explanations of variance in usage intentions, it is considered the most-preferred comprehensive statistical model among any of the previous models, which confirms the effortlessness and the strength of UTAUT as the most logical method among other models. For this reason, it has developed as one of the foremost encompassing theories of IT adoption (Al Shafi and Weerakkody, 2010; Rodrigues et al., 2016; Wachama et al., 2014; Wang et al., 2006).

2.1 Prior studies on UTAUT and e-government

Kurfali et al. (2017) examined determinants and factors that affected the e-government adoption process in Turkey. The object of their study was to discover Turkish citizens' needs and expectations from e-government services and provide a guide for the Turkish government, so they could develop the appropriate e-government services. Their methodology involved the use of UTAUT to examine citizens' trust in the internet and trust in the government. An online survey was conducted with a total of 1,170 people; however, only 529 responses were regarded as legitimate, and the responses were evaluated by the SEM technique. Lastly, the results indicated PE, FCs, SI and trust in the Internet were determinant for Turkish citizens in deciding to use e-government services. Moreover, both trust in the internet and trust in the government positively influenced the PE of e-government services.

There was also work done by Witarsyah et al. (2017) on the adoption of e-government in Indonesia. The main purpose of their study was to find factors that affect the adoption of e-government through the use of a conceptual model of UTAUT. Researchers depended on the bibliometric technique as a base for the comprehensive analysis used. Moreover, the dimensions of satisfaction and trust were added to the proposed model as new dimensions. Their findings showed that trust is a major factor affecting the adoption of e-government. In the future, this proposed model with added variables will be a good reference in the field of e-government adoption.

Lu (2016) studied the intentions of taxpayers in using an e-filing system in Vietnam. The UTAUT model was used with the IS success model to investigate factors that influenced the adoption of the e-filing system, as well as the intentions to improve services provided by the e-government programme. SPSS analysis was used as the main tool to explore these factors. Therefore, a two-part questionnaire was the main instrument for study. The first part inquired about demographic data, and the second part measured independent variables. Accordingly, it was found that all factors included in the model had a strong influence on the intentions to use the e-filing system. Factors included PE, EE, SI, information quality, system quality and service quality. Consequently, all findings supported the validity of the UTAUT model and the IS success model in forecasting the factors that affected use intentions. One of the recommendations suggested that any other researches of this subject take a bigger sample of the population.

Table 1 Summary of the previous studies related to the subject of the research

Study	Country	Aim	Methodology	Results	Dimensions
Kurfali et al. (2017)	Turkey	The aim was to examine the determinants and factors that are affected by the e-government adoption process in Turkey.	The methodology was used based on the UTAUT model through an online survey.	The results indicate that (PE), (FC), (SI) and trust of the internet are determinant of the use e-government services.	<ol style="list-style-type: none"> 1 PI 2 EE 3 SI 4 FC 5 BI 6 Trust of internet 7 Trust of government Moderators <ol style="list-style-type: none"> 1 Gender 2 Age 3 Experience 4 Voluntariness to use
Witarsyah et al. (2017)	Indonesia	This study aimed to find factors that affect the adoption of e-government through the use of (UTAUT).	The methodology was used based on the UTAUT model depended on the bibliometric technic as a base to the comprehensive analysis used.	The findings show that trust is a major factor that affect the adoption of e-government.	<ol style="list-style-type: none"> 1 PE 2 EE 3 SI 4 FC 5 BI 6 Trust 7 System quality 8 Information quality Moderators <ol style="list-style-type: none"> 1 Gender 2 Age 3 Experience 4 Voluntariness to use
Lu (2016)	Vietnam	This research aimed to study that intention of tax payer to use the system of e-filing in Vietnam.	The model of UTAUT was used with the information system success Model and SPSS analysis was used as a main tool to explores these factors.	The findings found that all factors have a strong influence on the intentions to use the e-filing system.	<ol style="list-style-type: none"> 1 PE 2 EE 3 SI 4 BI 5 Information quality 6 System quality 7 Service quality

Table 1 Summary of the previous studies related to the subject of the research (continued)

Study	Country	Aim	Methodology	Results	Dimensions
Younisoti (2013)	Greece	This study aimed to have better understanding of the user's intention to use and adopt the e-government program in Greece.	A quantitative approach with a survey used to validate the research framework in addition to SEM analysis.	The variable 'effort expectancy' that has a direct impact on behavioural intention was strongly influence the adoption of e-government in addition to users' trust, also the security of the websites.	<ol style="list-style-type: none"> 1 PE 2 EE 3 SI 4 FC 5 BI 6 Trust of internet 7 Trust of government 8 Trust of the CSC Moderators <ol style="list-style-type: none"> 1 Gender 2 Age 3 Education 4 Internet experience
Ahmad et al. (2013)	Pakistan	The main question of the research was to investigate the factors affecting e- government services adoption in Pakistan from a citizen perspective.	The model of UTAUT was used with online survey.	Four constructs (performance expectancy, effort expectancy, social influence, and facilitating condition) had influenced users' adoption of e-government services in Pakistan.	<ol style="list-style-type: none"> 1 PE 2 EE 3 SI 4 FC 5 BI
Taiwo et al. (2012)	Malaysia	Explain factors that affect citizens' behavioural intention towards the use of government e-services.	This study employed the UTAUT Model to examine the influential factors of the adoption and use of e-government services with the use of a structured questionnaire.	The research found that citizen's ability to take a risk and trust the government influences their intention to use E-government services also, performance expectations, peer influence, trust belief, and risk took propensity are significant in predicting behavioural intention to adopt e-government services.	<ol style="list-style-type: none"> 1 PE 2 EE 3 SI 4 FC 5 BI 6 Positive attitude 7 Negative attitude 8 Disposition to trust 9 Institution 10 Trust beliefs 11 Risk-taking propensity

Table 1 Summary of the previous studies related to the subject of the research (continued)

<i>Study</i>	<i>Country</i>	<i>Aim</i>	<i>Methodology</i>	<i>Results</i>	<i>Dimensions</i>
Hung et al. (2006)	Taiwan	This paper highlight factors of the acceptance of user based on the (UTAUT) to justifies the citizen adoption of e-government.	A questionnaires used to gather and test user experience the authors use the analysis of SPSS for the collected data.	The results indicate the variable performance expectancy (PE) was strongly affect the intention behaviour of the user.	1 PE 2 EE 3 SI 4 FC
Rabaa'i (2017)	Jordan	This study observe the critical factors influence the e-government program adoption in Jordan, and examined the influence of the national culture on the adoption process.	A questionnaire used to collect data from users of e-services in Jordan's e- government program and analysed with the structural equation model.	The findings showed that the factors of performance expectancy (PE), social influence (SI), facilitating conditions (FC), effort expectancy (EE) and behavioural intention (BI) have a strong influence on the e-government program adoption in Jordan.	1 PE 2 EE 3 SI 4 FC 5 BI Moderators 1 Gender 2 Age 3 Experience
Zawaideh (2016)	Jordan	The aim of this study was to explore the main factors that affect the acceptance of Jordanian citizens toward the use of e-government applications.	Based on the UTAUT model as a tool to measure the factors. Therefore, a questionnaire was used to collect data and distributed on 300 respondents but 266 respondents were valid to measure.	The findings showed that the performance expectancy, social influence, effort expectancy and facilitating conditions strongly influence the intentions of Jordanian citizen's to accept and use the e-government applications.	1 PE 2 EE 3 SI 4 FC 5 BI
Rodrigues et al. (2016)	UAE	The study aimed to increased user adoption of e-government services and residents' expectations and attitudes about user satisfaction and adoption of e- government services.	A quantitative research methodology was used to test these factors in the UAE context. A survey questionnaire was developed.	The main finding was that the study identified confidentiality and users' trust and attitudes toward using technology as key determinants of overall satisfaction and the adoption of e- government services.	1 PE 2 EE 3 SI 4 FC 5 BI 6 Trust and confidentiality Moderators 1 Nationality 2 Internet usage 3 Educational level 4 Gender

Table 1 Summary of the previous studies related to the subject of the research (continued)

Study	Country	Aim	Methodology	Results	Dimensions
Alryalat et al. (2013)	Jordan	The aim of this study was to examine the intention of Jordanian citizens to use e-government program through the use of some of factors that may have an impact on their intentions such as trust, security and two other factors adopted from the UTAUT model which were facilitating conditions and social influence.	A questionnaire was conducted and was performed on the responses received from a total of 538 participants and to that end, Structural equation modelling techniques (SEM) was used to analyse the data.	The results showed that all of the factors that mentioned above of (trust, security, facilitating conditions, and social influence) had an influence on the intentions to use the e-government program. Citizens.	<ol style="list-style-type: none"> 1 Trust 2 Security 3 SI 4 FC 5 BI
Al Imarah et al. (2013)	Kufa (Iraq)	This study aimed to identify the factors influencing the acceptance and use of e-government services, specifically, to explore the important factor in the adoption of e-government services.	A quantitative research in the form of a survey questionnaire was undertaken to meet the aim of the research, used Structural Equation Modeling (SEM) approach to test the data.	The finding showed that effort expectancy (EE), performance expectancy (PE), and facilitating conditions (FC) contribute significantly to the adoption of e-government services and directly affect the user behaviour of e-government services.	<ol style="list-style-type: none"> 1 PE 2 EE 3 SI 4 FC 5 BI 6 UB Moderators <ol style="list-style-type: none"> 1 Gender 2 Age 3 Educational level
Weerakkody et al. (2013)	Saudi Arabia.	The purpose of the study presented the role of intermediaries in facilitating e-government adoption in Saudi Arabia.	The questionnaire was built based on the UTAUT model and the SEM technique was used path analysis.	The results of this study reviewed significant relationships among the factors that influence the intention to use e-government (performance expectancy (PE), effort expectancy (EE), and trust of intermediary. Besides, the findings showed that there was a significant relationship between facilitating conditions (FC) and usage behaviour.	<ol style="list-style-type: none"> 1 PE 2 EE 3 SI 4 FC 5 BI 6 Trust of the internet 7 Trust of intermediary

Table 1 Summary of the previous studies related to the subject of the research (continued)

<i>Study</i>	<i>Country</i>	<i>Aim</i>	<i>Methodology</i>	<i>Results</i>	<i>Dimensions</i>
Al Shafi and Weerakkody (2010)	Qatar	This study presented an initial attempt towards understanding the adoption of the e-government services in Qatar from a citizen's perspective.	A survey questionnaire was utilized to collect data from responses and the SPSS technique was adopted to examine the influence of the factors adapted from the UTAUT on e-government adoption.	The findings reveal that effort expectancy (EE) and social influences (SI) determine citizens' behavioural intentions towards e-government. Additionally, facilitating conditions (FC) and behavioural intention (BI) were found to determine citizens' use of e-government services in Qatar.	1 PE 2 EE 3 SI 4 FC 5 BI Moderators 1 Gender 2 Age 3 Educational level
Al Awadhii and Morris (2009)	Kuwait.	The main idea of this study, to determine factors that influence adoption of e- government services from the perceptions of the citizens of Kuwait.	The research built on previous questionnaire that utilizes the UTAUT model for the understanding of acceptance and adoption on information technology.	The results showed that there were other factors that influence the adoption of e-government services, including usefulness of e-government services, ease of use, reforming bureaucracy, cultural and social influences, technical issues, trust in internet and finally lack of awareness.	1 Usefulness of e-government services (PE) 2 Ease of use(EE) 3 Reforming bureaucracy 4 Cultural and social Influences 5 Technical issues (FC) 6 Trust in internet 7 Lack of awareness

Ahmad et al. (2013) investigated factors affecting the adoption of e-government services in Pakistan from the citizens’ perspective by utilising factors of the UTAUT model. The sample of this study included 115 responses from two distinct groups of citizens: 32 e-government-services adopters and 83 non-adopters. Almost all the respondents proved their internet connection by the use of an online survey. According to the results, by using UTAUT, four constructs (PE, EE, SI and FCs) had influenced users’ adoption of e-government services in Pakistan, and citizens were willing to adopt e-government services when their effectiveness and efficiency increased. It was discovered that citizens’ trust towards the Internet and their social environment is a prerequisite to using e-government services. Table 1 provides a summary of the studies that integrated UTAUT into their e-government research.

3 Methodology

This quantitative exploratory descriptive study aims to explore and investigate the field of study by summarising the literature related to the research subject and analysing it to help gain a better understanding of the research problem, and because there are few studies related to the current research, the exploratory descriptive approach is appropriate. Moreover, this study uses a quantitative approach to test the hypotheses by hypothesising the relationships between the variables and analysing them following the appropriate statistical methods.

3.1 Instrument and scales

A questionnaire was designed using two sections, as follows. The first section includes demographic information. The second section includes questions related to the UTAUT model, which involves six dimensions and statements adopted from the work of Venkatesh et al. (2003). (5) statements measure PE, (6) statements measure EE, (4) statements measure SI, (3) statements measure FC, (3) statements measure BI and (4) statements measure actual use. The questionnaire was developed in the Arabic language. The Likert scale of five-points is used in the instrument to allow respondents to determine their level of agreement with a statement by selecting [strongly agree-(5), agree-(4), moderately agree-(3), disagree-(2) or strongly disagree-(1)]. To interpret mean levels, the scale from Table 2 is used. The scale ranks mean value according to one of three levels (high, moderate or low).

Table 2 Mean, std. values levels

<i>Mean</i>		<i>Std.</i>	
<i>Range</i>	<i>Agreement level</i>	<i>Range</i>	<i>Data</i>
1–2.33	Low	Less than 1	Close to the mean
2.34–3.67	Moderate	More than 1	Spread from the mean
3.68–5	High		

Content validity was maintained after establishing the questionnaire by contacting professors in the field of public administration as well as some fields related to management ISs, computer information sciences and business administration to examine

the survey: 'Does it measure what is required of it? Were valid terms used?' All mentioned notes were taken into account, and the questionnaire was revised.

3.2 Targeted population and unit of analysis

The study targets all Jordanian citizens, age 18 years and above, as they authorise requests for public services, and accordingly, authorise requests to use the applications and websites of e-government. Hence, citizens younger than 18 years old are excluded from the target population. Moreover, the study is concerned with those who are familiar with the e-government concept or have previously obtained services in this way. Therefore, the population of the current study includes Jordanian citizens aged 18 and older, familiar with the e-government concept and/or have previously obtained services via e-government websites. Population also constituted a unit of analysis.

An official estimation of the population provided by the Department of Statistics of Jordan does not provide exact estimations according to age in order to exclude the proportion of youth from its total estimation of the population. Moreover, as the study is concerned with those who are familiar with e-government, or have previously obtained services, the total estimation cannot be used to determine the required sample size, as there are no clear statistics provided by the e-government programme for the estimation for e-government users. Hence, using statistical lists provided by Sekaran and Bougie (2016) for determining a sample size is inappropriate.

The study is designed to collect the maximum possible sample through targeting citizens after explaining the purpose of study. Additionally, due to COVID-19, which made distributing questionnaires impossible, the study makes use of online survey, KOBOTOOLBOX.ORG, as well as social networks and groups to send links of the questionnaire to the maximum number of citizens, focusing on reaching different areas of the north, centre and south of Jordan. Moreover, researchers made good efforts to include respondents from cities and villages from all regions through personal contacts from the desired cities and villages. Data collection started 21 June 2020 and was completed 6 August 2020. The researchers collected a total of 321 questionnaires and conducted a second round to collect data. However, as response to the second round was low, and no more responses were received, accordingly, the researchers used this sample to complete statistical analysis, mentioning the limitation that the response was not very high.

3.3 Sampling and data screening

Total of 321 respondents participated in sample. questionnaire included question asking for nationality of respondent, in order to exclude non-Jordanian from sample, as study concerned with Jordanian citizens' perceptions toward e-government in Jordan, accordingly (7) respondents excluded. And as study targeted those who are familiar with e-government or those who obtained service through e-government, questionnaire also included question asking respondents to determine levels of information having regarding services and applications provided by e-government, as if respondent has no familiarity with e-government system, evaluation for suggested variables such as reducing effort or increasing performance because of using e-government is not expected to be accurate, therefore such respondents should be dropped from sample. level of familiarity with e-government determined by either, very good, good, satisfactory or weak, and those who

answered weak were dropped from the sample, accordingly (22) respondents were also dropped. Hence, sample included (292) respondents.

Considering study included respondents according to specific conditions, this method is identified as non-probability purposive sampling, as it allows for including respondents who satisfy specific conditions (Sekaran and Bougie, 2016). Data coded and screening conducted to exclude any inconsistent responses. standard deviation of responding collected, and responses have std. value equal to (zero) dropped from sample, as such responses have same answer on all statements, (15) responses were identified as having same answer which dropped from sample. Data also checked to detect any pattern, and no evident patterns seen. Finally, outliers checked using both Simple scatter dot diagram and gathering Cook distance, and no major outliers identified, as Cook distance values did not exceed threshold of (1) as suggested by Weinberg and Abramowitz (2008). Final sample comprised (277) respondents which deemed for further analysis.

4 Analysis and general findings

Measurement model tested by application of confirmatory factor analysis (CFA) that requires assessing goodness-of-fit, reliability and validity of model, and this first stage of SEM in accordance with suggestions of Anderson and Gerbing (1988). Second stage analysis of relationships between variables and conducted by application of path analysis. SEM-AMOS chosen for analysis as simultaneously combines factor analysis and regression models for testing models, hence, providing better validation for model and more precise prediction power, and for specific for models that include mediators and moderators at multi-levels (Shook et al., 2004; Martínez-López et al., 2013), therefore this method for analysis seems to fit better with this study.

4.1 Preliminary analysis

Reliability of data examined, starting with missing data, ratio of missing data (0.0060%), evidently far below maximum allowed level (10%) suggested by Cohen et al. (2003). Using regression imputation, missing data replaced by examining median series equation. Normal distribution of data examined by checking values of skewness and kurtosis values that were in recommended range (± 2.2) in accordance with suggestion of Sposito et al. (1983). In looking for values of skewness and kurtosis listed in Table 3, normality of data seen prevailed.

Table 3 Skewness and kurtosis values for study variables (N = 277)

<i>Variable</i>	<i>Skewness</i>	<i>Kurtosis</i>
Performance expectancy	-0.723	1.334
Effort expectancy	-0.223	-0.049
Social influence	-0.650	0.851
Facilitating conditions	-0.524	0.283
Behavioural intensions	-0.643	0.476
E-government use	-0.064	-0.643

Possibility of multicollinearity checked as constructs of independent variable subject to such issue. This done by examining Pearson correlations, tolerance and variance inflation factor (VIF). Table 4 donated no issue of multicollinearity when considering values of VIF far below (10), and tolerance values far above (0.05), and Pearson correlation achieved significant correlations with maximum correlation level ($r = 0.713^{**}$), which in line with suggestions of Neter et al. (1996) and Pallant (2001). This ensures no issue of multicollinearity between constructs of independent variable.

Table 4 Tolerance, VIF and Pearson correlations to check for multicollinearity (N = 277)

Variable	Tolerance	VIF	Pearson correlations			
			1	2	3	4
Performance expectancy	.455	2.200	1			
Effort expectancy	.455	2.245	0.713**	1		
Social influence	.607	1.647	0.574**	0.586**	1	
Facilitating conditions	.802	1.247	0.434**	0.618**	0.328**	1

Note: **Correlation is significant at (0.01) level.

Finally, possible bias among constructs of independent variable examined by using one-factor test. According to Mackenzie and Podsakoff (2012) variance explained by first identified factor should below (50%). test reported that first factor explained (42.791%) of variance which below (50%) confirming no bias issue. By completing these preliminary tests, data proofed its reliability, allowing for proceeding with SEM analysis.

4.2 Sample profile

Using descriptive statistics, sample profile provided, results were as follows: about half of sample males (n = 131) (47.3%) and other half females (n = 146) (52.7%), donating gender diversity. This reflects absence of gender bias in sample. sample included respondents from three different main regions of Jordan as follows: North (n = 176) (63.5%), Centre (n = 65) (23.5%), and South (n = 36) (13%). proportion for regions donated most of sample from north region, and this can be explained because of using on-line survey sent to all possible citizens who can be reached; however, online survey does not guarantee high responding ratio in comparison to paper questionnaire that can be personally handed to respondent.

Most of sample from those who live in cities – urban areas- (n = 189) (68.2%), in comparison to (n = 88) (31.8%) respondents who live in villages – rural areas. As most of sample from those who live in urban areas, this entails another limitation raised because of CORONA crisis that made visiting villages to collect responses impossible. Regarding age of respondents, sample included respondents from all different age categories as follows: (n = 84) (30.3%) aged 19 – less than 29 years, (n = 69) (24.9%) aged 29 – less than 39 years, (n = 66) (23.8%) aged 39 – less than 49 years and (n = 58) (20.9%) aged 49 years or more. This means that there is diversity in age groups and this important because old people are different from young people in evaluating things according to their experience in life.

Sample demonstrated high levels of education as follows: (n = 106) (38.3%) received bachelor certificate, (n = 77) (27.8%) received postgraduates certificate, (n = 56) (20.2%) received diploma certificate and (n = 38) (13.7%) received secondary level or less.

Therefore, the level of education is high due to the fact that technology is commonly used. The sample also have adequate levels of computer skills as follows: (n = 149) (53.8%) reported as have very good skills, (n = 78) (28.2%) reported as having good skills, (n = 35) (12.6%) reported as having moderate skills, (n = 12) (4.3%) reported as have weak skills and only (n = 3) (1.1%) reported as have very weak skills. This is expected because the level of education in the sample was high. The sample demonstrated satisfactory levels of education and computer skills, along with diversity in terms of gender, age, region and residence, donating that the sample can capture the different views of citizens.

To ensure that the sample is aware of the system that their perceptions are being investigated toward, the questionnaire asked respondents to identify their familiarity level with e-government which was as follows: (n = 72) (26%) respondents identified their familiarity as very good, (n = 142) (51.3%) as good, (n = 63) (22.7%) as satisfactory. the questionnaire also asked respondents to identify the extent to which they have obtained a service using e-government and the sample reported as follows: (n = 59) (21.3%) reported often, (n = 137) (49.5%) reported sometimes, (n = 64) (23.1%) reported rarely, and (n = 17) (6.1%) reported never use before. Those who reported never use before was not excluded from the sample as they reported familiarity with e-government in the previous question, as all respondents who reported no familiarity with e-government were dropped from the sample, however, being familiar with e-government do not entail using its service before by necessities. Hence, such a sample has adequate relevance with e-government can provide more precise assessments for the factors that encourage them to use it again or adopt it for the first time. Table 5 provides sample relevance and usage for e-government services.

Table 5 Sample relevance and usage for e-government services (N = 277)

<i>Category</i>	<i>Group/sub-group</i>	<i>n</i>	<i>%</i>
Familiarity with e-government	Very good	72	26%
	Good	142	51.3%
	Satisfactory	63	22.7%
	<i>Total</i>	<i>277</i>	<i>100%</i>
Prior experience with e-government	Often	59	21.3%
	Sometimes	137	49.5%
	Rarely	64	23.1%
	Never use	17	6.1%
	<i>Total</i>	<i>277</i>	<i>100%</i>

4.3 Measurement model testing using CFA

The full measurement model was built comprising all dependent and independent variables together, the values of the suggested fit indices were examined which achieved acceptable fit, therefore, the model was examined to identify possible amendments that can improve the fit. In line with guidelines by Hair et al. (2006), the limit (0.50) was used as a minimum level for factor loading, which was seen to be recorded by all statements, therefore no statements were dropped due to low factor loading. Modification indices and standardised residual covariance were examined and the number of fit indices was seen to

need covariate to reduce the redundancy between the correlated statements. Four covariances were established and the goodness of fit was improved, and a satisfactory fit was achieved. Fit indices reported as follows: CMIN/ DF [2.232], CFI [0.928], SRMR [0.065] and RMSEA [0.067] which are in accordance with (Hu and Bentler, 1999; Hair et al., 2006) suggestions, Table 6 presents goodness-of-fit indices and its values.

Table 6 Goodness-of-fit indices and its values

<i>Indices</i>	<i>Cutoff criteria</i>			<i>Estimate</i>	<i>Interpretation</i>
	<i>Terrible</i>	<i>Acceptable</i>	<i>Excellent</i>		
CMIN	--	--	--	571.422	--
DF	--	--	--	256	--
CMIN/DF	>5	>3	>1	2.232	<i>Excellent</i>
CFI	<0.90	<0.95	>0.95	0.928	<i>Acceptable</i>
SRMR	>0.10	>0.08	<0.08	0.065	<i>Excellent</i>
RMSEA	>0.08	>0.06	<0.06	0.067	<i>Acceptable</i>

Note: -Values of goodness-of-fit indices as recommended by Hu and Bentler (1999).

Cronbach α and composite reliability (CR) are recommended to exceed the threshold of (0.70) to ensure the reliability of the instrument (Sekaran and Bougie, 2016), the presented values in Table 7 donated high reliability by the instrument, which can be seen as appropriate for the current study.

- Cronbach's α values were as follows: PE (0.872), EE (0.876), SI (0.850), FC (0.807), Behavioural intentions (0.884) and e-government use (0.858).
- CR values were as follows: PE (0.862), EE (0.870), SI (0.855), FC (0.808), Behavioural intentions (0.890) and e-government use (0.858).

Table 7 Cronbach's α and CR values

<i>Variable</i>	<i>Cronbach's α</i>	<i>CR</i>
Performance expectancy	0.872	0.862
Effort expectancy	0.876	0.870
Social influence	0.850	0.855
Facilitating conditions	0.807	0.808
Behavioural intentions	0.884	0.890
E-government use	0.858	0.858

Construct validity was confirmed by examining convergent validity. Values of average variance extracted (AVE) is suggested to exceed the threshold of (0.50) for convergent validity purposes, and this was confirmed for all variables as summarised in Table 8 and values were as follows: PE (0.558), EE (0.527), SI (0.596), FC (0.586), Behavioural intentions (0.729) and e-government use (0.601).

Moreover, factor loading is recommended to exceed the threshold of (0.50) to achieve convergent validity, and this was also seen for all statements considering the minimum value of loading (0.50) was confirmed and all statements and were significant. Table 9 presents factor loading and significance for the statements of the measurement model.

Table 8 AVE values

<i>Variable</i>	<i>AVE</i>
Performance expectancy	0.558
Effort expectancy	0.527
Social influence	0.596
Facilitating conditions	0.586
Behavioural intensions	0.729
E-government use	0.601

Table 9 Factor loading and significance for the statements of the measurement model

<i>Variable</i>	<i>Statement</i>	<i>Loading</i>
Performance expectancy	PE_1	0.79***
	PE_2	0.80***
	PE_3	0.81***
	PE_4	0.67***
	PE_5	0.66***
Effort expectancy	EE_1	0.73***
	EE_2	0.74***
	EE_3	0.71***
	EE_4	0.73***
	EE_5	0.70***
	EE_6	0.75***
Social influence	SI_1	0.77***
	SI_2	0.79***
	SI_3	0.84***
	SI_4	0.68***
Facilitating conditions	FC_1	0.68***
	FC_2	0.84***
	FC_3	0.76***
Behavioural intensions	BI_1	0.86***
	BI_2	0.90***
	BI_3	0.79***
E-government use	eGov_Use_1	0.83***
	eGov_Use_2	0.74***
	eGov_Use_3	0.77***
	eGov_Use_4	0.77***

Note: ***Significant at (0.001) level.

Table 10 Descriptive statistics (N = 277)

Construct	Descriptive statistics						Pearson correlations					
	Mean	Std.	Level	Lowest	Highest		1	2	3	4	5	6
PE	3.99	0.65	High	1.40	5.00		1					
EE	3.80	0.62	High	1.67	5.00		0.713**	1				
SI	3.85	0.63	High	1.50	5.00		0.574**	0.586**	1			
FC	4.14	0.64	High	1.67	5.00		0.434**	0.618**	0.328**	1		
Intention	4.02	0.73	High	1.33	5.00		0.650**	0.592**	0.623**	0.468**	1	
Use	3.31	0.80	Moderate	1.50	5.00		0.553**	0.625**	0.546**	0.367**	0.633**	1

Note: **Sig. at (0.01) level (2-tailed).

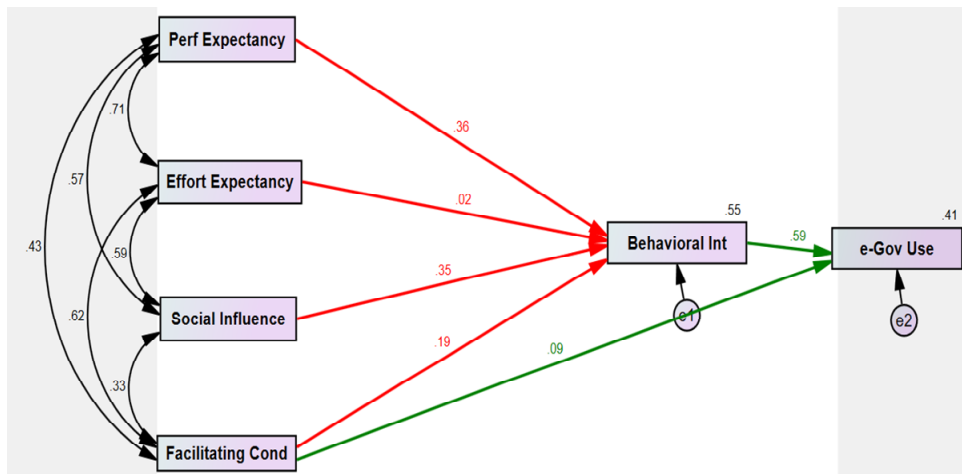
4.4 Descriptive statistics

Descriptive statistics were provided in Table (10) and reported that the sample reported high levels of PE (M = 3.99), EE (M = 3.80), SI (M = 3.85), FC (M = 4.14) and intention (M = 4.02), and moderate level of Use (M = 3.31). The Std. values were not seen to exceed (1) donating that the sample assessments were close to the mean. Pearson correlations reported significant correlations at the 2-tailed, the correlations ranged between (r = 0.328) to (r = 0.713).

4.5 Structural model testing using path analysis

Path analysis was conducted to test the structural model. (R²) coefficient of determination, (β) path coefficient, (P) significance at (0.05) level was collected to provide a decision for hypotheses. The structural model went under testing to test the proposed hypotheses as depicted in Figure 2 and results were as follows:

Figure 2 Structural model testing (see online version for colours)



Results of testing the structural model reported that the four factors achieved moderate variance in behavioural intentions as R² = 55% donating that the four suggested factors explained 55% of the variance in behavioural intentions, moreover, behavioural intentions and FC achieved moderate variance in e-government use R² = 41%. PE achieved moderate influence on behavioural intentions as path coefficient was (β = 0.36) and significant as path significance recorded (P = 0.001) less than the significance level (0.05), hence, H1 was supported.

EE achieved low influence on behavioural intentions as path coefficient was (β = 0.02) and insignificant as path significance recorded (P = 0.762) higher than the significance level (0.05). H2 was not supported. SI achieved moderate influence on behavioural intentions as path coefficient was (β = 0.35) and significant as path significance recorded (P = 0.001) less than the significance level (0.05), hence, H3 was supported. FC achieved low influence on behavioural intentions as path coefficient was

($\beta = 0.19$) and significant as path significance recorded ($P = 0.001$) less than the significance level (0.05), accordingly H4 was supported.

FC achieved low influence on e-government use as path coefficient was ($\beta = 0.09$) and insignificant as path significance recorded ($P = 0.081$) higher than the significance level (0.05). H5 was supported. Behavioural intentions achieved moderate influence on e-government use as path coefficient was ($\beta = 0.59$) and significant as path significance recorded ($P = 0.001$) less than the significance level (0.05), hence H6 was supported. Table 11 presents a summary of path values and decisions for hypotheses.

Table 11 Summary of path values and decision for hypotheses

<i>Hypothesis</i>	<i>Path</i>	β	<i>P</i>	<i>Decision</i>
H1	Performance expectancy → Behavioural intentions	0.36	0.001	<i>Supported</i>
H2	Effort expectancy → Behavioural intentions	0.02	0.762	<i>Not supported</i>
H3	Social influence → Behavioural intentions	0.35	0.001	<i>Supported</i>
H4	Facilitating conditions → Behavioural intentions	0.19	0.001	<i>Supported</i>
H5	Facilitating conditions → e-government use	0.09	0.081	<i>Not supported</i>
H6	Behavioural intentions → e-government use	0.59	0.001	<i>Supported</i>

4.6 Moderator's testing

To test the moderator hypotheses, two groups were being established for age and education, as the residence is only rural and urban. Age categories 19 – less than 29 years and 29 – less than 39 years made the young user group, whereas age categories 39 – less than 49 years and 49 years or more made the old user group. Secondary level or less and diploma made the low educated user group, whereas Bachelor and Postgraduates made the high educated user group. Multigroup analysis (MGA) was used as this analysis examines pre-defined data groups whether it has significant differences in its parameter estimates for a specific group. This analysis establishes two structural models each one tests a group of the pairs.

MGA was executed and the two models for young vs. old users reported nearly the same results with marginal differences, donating no significant differences due to age groups, and this was confirmed by Chi-square test that compares the two models through invariant difference test which reported $X^2 = 5.804$ with a significance ($P = 0.446$) exceeding the threshold of (0.05), indicating that the two models are not significantly different at the model level. Previous results provided no support for age as a moderator. Figure 3 presents MGA testing for young users, whereas Figure 4 presents MGA testing for old users.

Two structural models were established, to test the model of low educated users and high educated users. MGA was executed and the two models for low educated Vs. high educated users reported differences in results as achieved variance in behavioural intentions in the low educated model was 45%, and achieved variance in e-government use was 37%, whereas the achieved variance increased to become 59% in behavioural intentions and 42% in e-government use donating differences between the two groups,

and this was confirmed by chi-square test that compares the two models through invariant difference test which reported $X^2 = 16.380$ with a significance ($P = 0.012$) not exceeding the threshold of (0.05), indicating that the two models are significantly different at the model level. Previous results provided support for education as a moderator.

Figure 3 MGA testing for young users (see online version for colours)

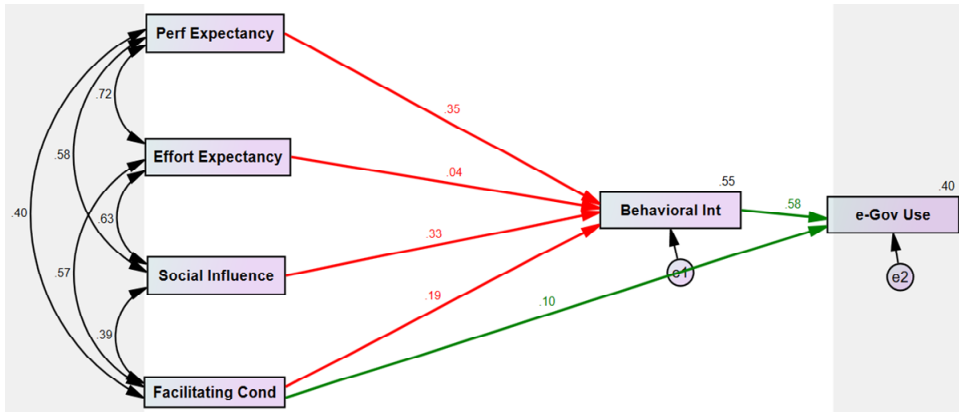
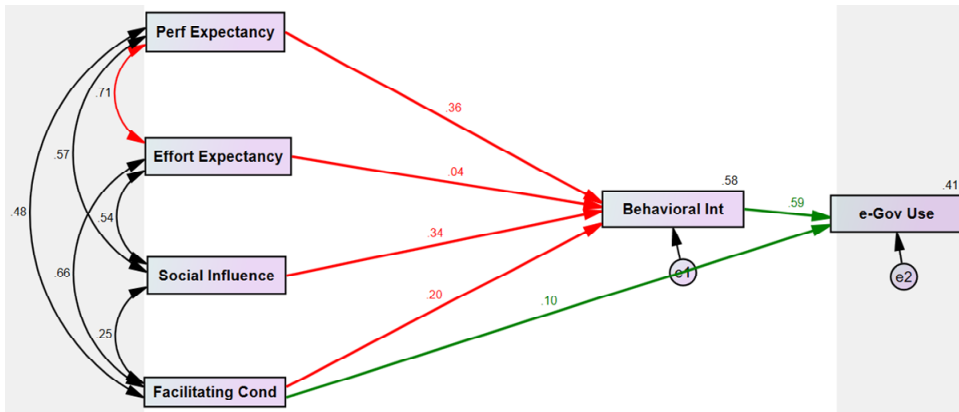


Figure 4 MGA testing for old users (see online version for colours)



Finally, two structural models were established, to test the model of urban users and rural users. MGA was executed and the two models for urban vs. rural users reported differences in results as achieved variance in behavioural intentions in the urban model was 60%, and achieved variance in e-government use was 39%, whereas the achieved variance decreased to become 44% in behavioural intentions and increased to become 45% in e-government use in the rural model, donating differences between the two groups, and this was confirmed by Chi-square test that compares the two models through invariant difference test which reported $X^2 = 12.934$ with a significance ($P = 0.044$) not exceeding the threshold of (0.05), indicating that the two models are significantly different at the model level.

5 Implications, recommendations and directions for future studies

This paper aimed to determine the factors that affect the adoption process of e-government in Jordan and the extent of acceptance and use of citizens for the services provided by e-government applications. The study was guided by UTAUT which suggests four determinants namely PE, EE, SI and FC. A quantitative exploratory descriptive methodology was adopted, data was collected using an online questionnaire targeting Jordanian citizens, through non-probability purposive sampling 277 respondents were surveyed. Data was analysed using SPSS and SEM-AMOS. Results of reported that the four factors achieved moderate variance in behavioural intentions as $R^2 = 55\%$, moreover, behavioural intentions and FC achieved moderate variance in e-government use as $R^2 = 41\%$. Moderator's testing provided no supported for age as a moderator, whereas education level and residence place were seen as a significant moderator for UTAUT.

The gathered results confirm the reliability and robustness of UTAUT in exploring the acceptance of e-government applications in developing country setting, and despite that the factors explained 55% of the variance in intentions, which is less than 70% that is expected to be explained by the model, this do not underestimate the reliability of UTAUT, indeed, this provides an indicator that maybe other factors in Jordan context play a role in determining intentions, and this is in line with the suggestions for extending the theory to explore the different factors that can play direct or indirect role by moderating or mediating the influence. A call can be raised in current study for future studies to provide attempts to extend the model by incorporating possible mediators than can better explain the process in which the suggested factors of UTAUT explain intentions and use.

Following the gathered results, one can conclude that despite high levels of acceptance that surveyed citizens showed on EE and FC but EE was unable to improve behavioural intentions and FC was unable to influence and improve the use of e-government. This means that there are other factors that still play role in determining behavioural intention of e-government use such as trust or quality of services, hence the study recommends conducting further future research to identify other factors that determine usage of e-government applications in Jordan.

According to surveyed citizens, they approved that surrounding people can influence their intentions to use e-government applications and this considered a critical point for e-government programme, this means that e-government officials should promote awareness and gives more attention to the reputation of E-government because they have an impact on each other. Results also heightened that high educated users achieved high variance in behavioural intentions more than low educated users, therefore, the study suggests that directors of e-government programme should conduct training courses, workshops about the use of e-government applications targeting low educated users. Considering that results reported that urban users achieved high variance in behavioural intentions more than rural users, this entails that directors of e-government programme should take into consideration that FC in rural less than urban region; therefore, it is possible to provide labs with PCs for service recipients in the government institutions.

In matching the gathered results with the presented prior studies, our results are in line with the major results that confirmed a set of the suggested factors as significant such as in the work Kurfali et al. (2017), Witätsyah et al. (2017), Taiwo et al. (2012), Hung et al. (2006) and Rodrigues et al. (2016). In the other hand, our results contradicted with

the gathered results when considering the insignificant effect for EE and FC, this was seen in the work of Lu (2016), Voutinioti (2013), Ahmad et al. (2013), Rabaa'i (2017), Zawaideh (2016), Alryalat et al. (2013), Al Imarah et al. (2013) and Weerakkody et al. (2013).

Regarding the limitations of current study, due to CORONA crisis, the on-line survey was used instead of the paper questionnaire, so the online questionnaire was sent to all possible citizens but this online survey does not guarantee a high responding ration in comparison to paper questionnaire. Moreover, due to CORONA crisis visiting villages were impossible and this why the results show that the respondents from urban was higher than respondents from rural regions. The respondent's sample of the research was collected with difficulty because of the inability to guarantee a high responding ratio from all regions of south, north and centre despite the continuous attempts to deploy the questionnaire. Accordingly, future studies are recommended to resolve the identified limitations in future studies, to provide more comprehensive investigation for the topic, indeed, adopting both quantitative and qualitative approaches are recommended to provide better understanding.

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