

Toward a Significant E-Voting Adoption Model: The Digital Divide

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ABSTRACT

Technology, through internet use, has changed how citizens interact and communicate with their governments. However, in any society, a proportion of people cannot access this type of interaction due to digital divide issues. Consequently, this study developed a model by investigating the impact of digital divide factors on technological system adoption, that is, e-voting, mainly in Jordan, a developing country. The model proposes that four digital divide factors, namely age, education, income, and internet use, directly influence citizens' intentions to use an e-voting website. A survey study of 267 Jordanian citizens (and internet users) explored whether the digital divide e-voting adoption model was significant. Analysis of the collected data showed the model's significance for exploring the digital divide's impact on citizens' intentions to use an e-voting website. This study, with its focus on parliamentary elections, is one of the few to examine how the digital divide influences e-voting adoption in the Middle East. Future research will focus on municipality elections.

KEYWORDS

Adoption, Developing Country, Digital Divide, E-Democracy, E-Government, E-Voting

INTRODUCTION

The inventions of the internet and the world wide web (www) have changed the nature of citizens' interactions with their governments from traditional (face-to-face) to online interactive-based interaction. Two technological governmental initiatives provide evidence of this change: e-government and e-voting (alomari, 2018; alomari, woods, & sandhu, 2012; carter, weerakkody, phillips, & dwivedi, 2016; mensah & mi, 2018a; nu'man, 2012). E-voting is one technological innovation and e-government application that has drawn governments' attention in both developed and developing countries to the importance of using the internet in political and governance processes (alomari, 2014a; carter & bélanger, 2005; idoughi & abdelhakim, 2018). Alomari (2016a) indicated that the "... government of jordan has viewed this initiative as an approach to enhance the democratic process by ensuring more participation by voters in choosing their representatives and leaders" (p.409). In different definitions

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of e-voting, citizens (voters) have been highlighted as the main stakeholders of the e-voting system. One definition introduced by Alomari (2016b) stated that it is: “[a] mechanism through which voting processes are produced and delivered to citizens utilizing web-based internet applications” (p.527).

An e-voting system introduces advantages that can reduce the possible negative consequences of paper-based elections, such as ballot counting errors and manipulation of elections to suit the needs of particular candidates. These advantages are briefly summarized below:

- An e-voting system automates the election process and therefore would reduce errors and election issues (Alomari, 2014).
- An e-voting system “... not only save[s] time for voters, but also, by elevating the convenience in [the] election, raise[s] the percentage of people voting” (Chung & Zhen–Yu, 2012).

On the one hand, as voters are the main participants in elections, their turnout is considered a key success factor for the life of democracy in countries (Bélanger & Carter, 2010a). On the other hand, voter turnout is regarded as one of the main obstacles facing governments of developed and developing countries (Alomari, 2014; Avgerou, 2013). Alomari (2016a) declared that this particular issue “... has prompted researchers and practitioners to investigate the issue of the digital divide and its effect on the implementation and adoption of e-voting technology” (p.409). Bélanger and Carter (2009) indicated that digital divide refers to “the distinction between the information haves and have-nots; the gap between the computer literate and the computer illiterate” (p.132).

The current research paper therefore has taken a step forward by exploring the impact of digital divide factors on e-voting adoption by proposing a digital divide e-voting adoption model. This model consists of four digital divide factors, namely, age, education, income, and internet use. As the study has explored the significance of the research model based on the perceptions of citizens in a social community in Jordan, these factors have been addressed based on socially-based perspectives. Social community acceptance is considered to be important when implementing e-voting (Alomari, 2016). Researchers have emphasized that when exploring the factors that affect the adoption of e-government and its applications and initiatives, such as e-voting, citizens’ points of view are valuable in both developed countries (Carter et al., 2016) and developing countries (Alomari et al., 2012; Ovais Ahmad, Markkula, & Oivo, 2013).

By addressing the significance of the model, the current research paper would benefit the government of a developing country, in this case, Jordan, to build a relevant plan to ensure high voter turnout at elections and, to be specific, at the parliamentary election. In Jordan, the 130 parliamentary representatives are elected by the public. Based on the statistics reported about Jordan’s most recent parliamentary election in 2016, 4,130,145 potential voters are qualified to vote. However, only 1,492,400 voters voted in that election. This indicates the low level of participation, with only 36.1% of the overall qualified voters voting (Independent Election Committee, 2016).

This study is one of the few to observe which digital divide factors have an impact on the adoption and use of e-voting websites by citizens in the Middle East and Arab countries. The study clearly shows the necessity of having a digital divide model to ensure successful implementation and adoption of e-voting as a new technological initiative in social communities. This study, therefore, could be significant in bridging the gap between the theoretical design of e-voting and the actual deployment of e-voting in the real social world through interaction with voters (citizens) as end-users. In contrast to previous research conducted in developing countries in particular, the current study examined the direct association of constructs, such as ‘internet use,’ with e-voting adoption.

This paper comprises seven sections, the first being the introduction, which is followed in the second section by the presentation of both the digital divide and the factors that assist in predicting the adoption of an e-voting system. The third section introduces the main digital divide e-voting adoption model and the research hypotheses. The fourth section reports on the methodology with details of the questionnaire used as an instrument to collect data and a presentation of the demographic characteristics

of respondents. The fifth section discusses the results, presenting the main analytical techniques followed in this study and main analysis results. Based on the analyzed data, the significant results are discussed. Before concluding the paper, the study's implications and limitations are presented.

E-VOTING ADOPTION AND THE DIGITAL DIVIDE

The current research paper presents the digital divide e-voting adoption model to carry out a study in a developing country. It adapt a model of Bélanger and Carter (2010b) which is tested and confirmed by a study conducted in a developed country. This model integrates constructs derived from the literature with these being age, education, income, and internet use (see Figure 1). It presents the direct association between these constructs (independent variables) and the construct of e-voting adoption (the dependent variable).

Researchers have emphasized that, due to the continuous growth in governments' interest in implementing e-voting technological systems, mainly internet-based systems, the issues related to the digital divide continue to grow (Bélanger & Carter, 2010a). In their study, Goodman, McGregor, Couture, and Breux (2018) found that people on the wrong side of the digital divide can be disenfranchised when paper ballots are eliminated and elections are conducted over the internet. Previous research has therefore indicated the importance of considering citizens who are always on the other side of the digital divide (Alomari, 2016). Successful attempts to identify the digital divide have been made by different researchers: one such definition describes the digital divide as referring "... to the distinction between the information haves and have-nots; the gap between the computer literate and the computer illiterate" (Bélanger & Carter, 2010b).

Prior research has shown that addressing the components of the digital divide has assisted in articulating the digital divide's main issues and obstacles and their influence on the adoption of technological systems including e-voting. The two major components that shape the digital divide are: access to technology and comfort with technology (Bélanger & Carter, 2010b; Soloop, 2001). Avgerou (2013) indicated that these two main components formulate the obstructions that limit the use of internet voting (I-voting). Based on different streams, including that of individuals (voters), researchers have studied the effect of digital divide obstacles on technological systems, including e-voting and e-government, by exploring socio-demographic characteristics and the characteristics of information technology (IT) skills (Al-Jamal & Abu-Shanab, 2015; Bélanger & Carter, 2010b; Niehaves & Plattfaut, 2014). The current study extends prior research by addressing the impact of the digital divide on individuals (voters)' intentions to use e-voting systems. The following paragraphs provide a review of prior research that has investigated the impact of digital divide components on the adoption of e-voting.

The 'access to technology' component of the digital divide has been examined in prior studies by focusing on various demographic factors that would limit the technological system use, in general, and e-voting, in particular, with these factors comprising age, income, and education (Bélanger & Carter, 2010a; 2010b). The 'comfort with technology' component has been explored in terms of the skill divide, that is, the difference in the level of skills required to interact online with technological systems in an effective and efficient manner (Bélanger & Carter, 2010b; Mossenburg, Tolbert, & Stansbury, 2003).

Focusing on the 'access to technology' component, Mensah and Mi (2018a) conducted a study, using the technology acceptance model (TAM) as the theoretical framework, to investigate the impact of demographic factors on the adoption of e-government services. Researchers have used demographic factors (age, gender, and education) as moderating factors to explore this impact. Mensah and Mi (2018a) found that gender was significant in moderating the positive impacts of both perceived usefulness (PU) and perceived ease of use (PEOU) on the adoption of e-government services. However, age and education were not significant in moderating the impact of these two constructs of the technology acceptance model (TAM). Mensah and Mi (2018a) also examined the direct impact

on PU and PEOU of age, gender, and education. In terms of PU, they found that these demographic factors had no direct influence. Education had a direct influence on PEOU but age and gender did not.

The current study was conducted in Jordan, a developing country in the Middle East. Its proposed model provides a different approach as its main focus is on examining the direct impact of demographic factors (specifically, age, education, and income) on the adoption of one e-government service and application, that is, e-voting. In Ghana, a developing country in Africa, Mensah and Mi's (2018b) study confirmed the direct impact of education, age, and gender on e-government services' adoption. Kose (2019) conducted a study in Turkey and found that household income, education level, and frequency of internet use were positively correlated with the probability of e-government use by Turkish citizens. However, age showed a negative relationship with e-government use.

Focusing on both components of the digital divide, namely, access to technology and comfort with technology, Bélanger and Carter (2010b) conducted a study in the United States of America (USA), a developed country, to test the digital divide's effect on I-voting utilization by proposing a digital divide model. Their model consisted of different factors, and contained access components (age, income, and education) and skill divide components (internet use). These four factors had a direct relationship with the dependent variable, I-voting adoption. Through a survey of 372 people from varied backgrounds, the model was tested. The analysis results confirmed that age, income, and internet use had a significant effect on I-voting. The education factor however was not found to be significant. The current study has extended prior research by inspecting the impact of these components of the digital divide (including their factors) on e-voting adoption in a developing country, namely, Jordan. Earlier research has underlined the importance of inspecting these factors in relation to technology adoption, including e-government and e-voting, in both developed and developing countries (Norris, 2001; Helbig, Gil-García, & Ferro, 2009; Evans, 2006). In research developed by Nu'man (2012) in Jordan (as previously stated, a developing country), the author successfully studied the effect of the digital divide on trust in the e-voting system. The author considered the digital divide to be one of the e-voting issues, in addition to others, that related positively to the dependent variable "e-voting trust." Based on the applied analysis, Nu'man found that Jordanian citizens would trust the e-voting system provided no segment of the population was excluded. This indicates that, to ensure a successful e-voting system, different types of citizens should be considered. The current study extends Nu'man's work by specifically exploring the influence of the digital divide on Jordanian citizens' intentions to use an e-voting system.

In a study conducted in another developed country, the United Kingdom (UK), Carter and Weerakkody (2008) compared UK e-government adoption with e-government adoption in the USA by investigating the impact of the digital divide on citizens' intentions to use e-government services. These researchers formulated a model that proposed a direct relationship between two major factors of the digital divide (internet accessibility and internet skills) and intention to use. They found that, although these two factors were significant determinants of e-government adoption in the USA, in the UK, they were not significant (Bélanger & Carter, 2006). This discrepancy in outcomes was attributed to cultural differences between the two countries, the UK and the USA (Carter & Weerakkody, 2008). Consequently, the current study endeavored to discover the impact of the digital divide on e-voting adoption in Jordan, a developing country, which has a different culture to the UK and the USA, with both being developed countries.

In another e-government study conducted in the USA, Sipior, Ward, and Connolly (2011) proposed an e-government model, using the technology acceptance model (TAM) as a theoretical framework (Davis, 1989), to explore the digital divide and transformational government (t-government). This t-government model emphasized the substantial role of information and communications technology (ICT) in improving the relationship between citizens and government services (Sipior et al., 2011). In their model, these researchers tested the indirect relationships between demographic factors (age, education level, employment status, and household income) and the dependent variable, that is, e-government usage. They proposed that these four demographic factors were directly linked to the

'access barriers' construct. This construct, in turn, would have a direct connection with e-government usage (the dependent variable). The 'access barriers' construct was measured by these researchers as "... a belief that the Internet is expensive to use and difficult to access." On the other hand, the impact of internet experience on e-government usage was tested indirectly through PU and PEOU, the two TAM constructs. The construct 'internet experience' was proposed to be in direct relationships with the PU and PEOU constructs. These two constructs were found to have a direct relationship with e-government usage. After testing and analyzing the model, these researchers found that education level, employment status, and household income had a significant impact on e-government usage through access barriers; however, no significant impact was found for age and internet experience.

The current study has explored the direct influence of digital divide factors on e-voting usage by voters. The study also establishes a valuable resource for future research work focused on t-government. E-voting is one e-government initiative that uses ICT to improve the democratic process via the election process by developing better communication between citizens and the government (Alomari, 2016).

Based on the above studies, the current study has proposed the following four hypotheses:

- H1:** Age will have a positive impact on user intention to use an e-voting website.
- H2:** Income will have a positive impact on user intention to use an e-voting website.
- H3:** Education will have a positive impact on user intention to use an e-voting website.
- H4:** Internet use will have a positive impact on user intention to use an e-voting website.

In summary, this section has delineated works in the literature that have identified the main digital divide factors that contribute to predicting e-voting adoption. The current study has focused on the following factors: age, education, income, and internet use. The review of the literature has shown the lack of research specifically conducted in the e-voting field. The review has also shown the necessity of a digital divide e-voting adoption model that could be used to explain the effect of the digital divide on the adoption of e-voting systems by voters, especially in developing countries. The next section introduces the current study's digital divide e-voting adoption model.

THE DIGITAL DIVIDE E-VOTING ADOPTION MODEL AND STUDY HYPOTHESES

The digital divide e-voting adoption model consists of four factors (independent variables), namely, age, education, income, and internet use. These four independent variables are proposed to be in direct relationships with the dependent variable, e-voting adoption (see Figure 1). E-voting adoption has been tested in this study using the construct 'intention to use'. Previous research in e-government and e-voting has also tested adoption in terms of 'intention to use' (Alomari, 2016; Alomari et al., 2012; Carter & Bélanger, 2005; Carter et al., 2016).

Following the presentation of the research model in Figure 1, Table 1 summarizes the hypotheses of the current study.

METHODS

This section introduces the main demographic characteristics of the study sample: it also presents details of the survey utilized to conduct the study.

The Survey

This study used a survey (questionnaire) to test the digital divide factors that influence e-voting adoption. The questionnaire, as an instrument to collect data, is used commonly in e-government and e-voting research (Alomari, 2016; Carter & Bélanger, 2005). Each factor was measured using categorical data from the survey. Age was measured using five categories (< 20 years, 20–29 years,

Figure 1. Digital divide e-voting adoption model

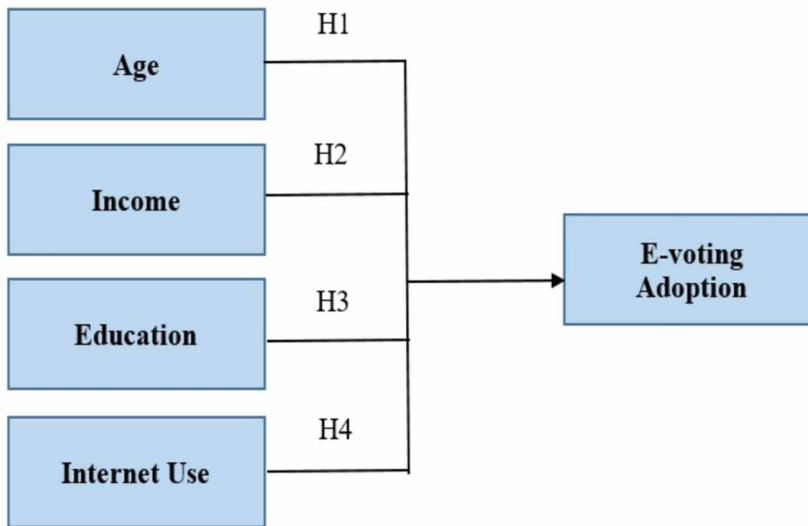


Table 1. Summary of hypotheses

Hypothesis no.	Hypothesis	Construct
H1	Age will have a positive impact on user intention to use an e-voting website.	Age
H2	Income will have a positive impact on user intention to use an e-voting website.	Income
H3	Education will have a positive impact on user intention to use an e- voting website.	Education
H4	Internet use will have a positive impact on user intention to use an e-voting website.	Internet use

30–39 years, 40–49 years, and ≥ 50 years). Education was measured using five categories (high school, college, bachelor’s degree, higher education, and other). Income was measured using four categories (< 100 Jordanian dinars [JD], 100–500 JD, 500–1000 JD, and > 1000 JD). Internet use was measured using four categories representing the number of hours per week that a citizen had used the internet (< 1 hour, 1–3 hours, 3–4 hours, and > 8 hours). Finally, the intention to use e-voting was measured with four items adapted from prior studies (Alomari et al., 2012; Carter & Bélanger, 2005), using a five-point Likert scale (interval scale) ranging from 1 (strongly agree) to 5 (strongly disagree). The questionnaire was translated into Arabic because English is not the first language of Jordan and most Jordanians are not fluent in English. Back-translation was used, with the questionnaire translated from English to Arabic first and then from Arabic to English.

Sample

Purposive sampling is followed in this study. Purposive sampling is considered to be the most convenient to collect data from a particular target group (Tashakkori & Teddlie, 2003). This sampling method is used when information is sought from specific target groups. It is appropriate for the current study which sought to gather information from Jordanian people who had access to the internet

and participated in the most recent parliamentary election in 2016. Cavana, Delahaye, and Sekaran (2001) identified two reasons for the viability of the selection of specific target groups: either these people alone had the information needed, or these people were the only ones relevant to the criteria specified by the researcher.

Therefore, questionnaires in paper form were administered to Jordanian citizens who had regular access to the internet and who had participated in the most recent parliamentary election in 2016. As indicated earlier in this paper, 1,492,400 people participated as voters in the 2016 parliamentary election. However, no official government statistics have recorded how many voters had regular access to the internet. The estimated size of the population (N) who had regular access to the internet and who participated in the 2016 parliamentary election would be less than one million. The current research, covering a sample of 267 respondents, is the first phase of data collection. This paper discusses the outcomes of the data from respondents in the current sample, the reliability of the collected data, data analysis, and the study's limitations. In the second phase of data collection, a comprehensive data collection will take place, considering random sampling, and utilizing the researchers' resources to reach the optimal sample size. The first phase of the current research with its sample size is helping the researchers to address issues highlighted in the study's limitations, challenges in data collection, and improvements needed in data reliability for the second phase of the research project. Therefore, survey responses from 267 people were used for the data analysis. Most respondents (65.2%) were female.

The highest percentage (53.6%) of respondents was in the age range of 20–29 years old while the lowest percentage (3.4%) was recorded for those aged 50 and above. Those aged less than 20 years comprised 19.1%, while those aged between 30 and 39 comprised 15%. Respondents with the age range 40–49 years comprised 9% of overall respondents (see Table 2).

Most respondents (59.9%) held a bachelor's degree, while 22.8% of respondents held a higher education certificate. In total, 13.1% of respondents held a college diploma or degree. Those who only completed high school recorded the low percentage of 3.4% (see Table 3).

In terms of monthly income, 46.1% of respondents earned from 100–500 Jordanian dinars (JD). The least percentage (10.9%) was recorded for respondents who earned a monthly income of more than 1000 Jordanian dinars (JD). Respondents who earned a monthly income less than 100 JD or from 500–1000 JD recorded relatively close percentages of 21% and 22.1%, respectively (see Table 4).

The amount of internet access time of respondents ranged from one hour to more than eight hours per week. The highest percentage (33.7%) of respondents spent more than eight hours a week on the internet, while the lowest percentage (12.7%) was recorded for respondents who accessed the internet less than one hour a week (see Table 5).

Table 2. Age distribution

Age Category	Frequency	Percentage %	Valid Percentage %	Cumulative Percentage %
< 20 years	51	19.1	19.1	19.1
20–29 years	143	53.6	53.6	72.7
30–39 years	40	15.0	15.0	87.6
40–49 years	24	9.0	9.0	96.6
≥ 50 years	9	3.4	3.4	100.0
Total	267	100.0	100.0	

Table 3. Education level distribution

Education Level	Frequency	Percentage %	Valid Percentage %	Cumulative Percentage %
High school	9	3.4	3.4	3.4
College	35	13.1	13.1	16.5
Bachelor	160	59.9	59.9	76.4
Higher education	61	22.8	22.8	99.3
Other	2	.7	.7	100.0
Total	267	100.0	100.0	3.4

Table 4. Monthly income level distribution

Monthly Income Level	Frequency	Percentage %	Valid Percentage %	Cumulative Percentage %
< 100 JD	56	21.0	21.0	21.0
100–500 JD	123	46.1	46.1	67.0
500–1000 JD	59	22.1	22.1	89.1
> 1000 JD	29	10.9	10.9	100.0
Total	267	100.0	100.0	

Note: JD = Jordanian dinar

Table 5. Internet use distribution

Internet Use: Number of Weekly Hours	Frequency	Percentage %	Valid Percentage %	Cumulative Percentage %
< 1 hour	34	12.7	12.7	12.7
1–3 hours	64	24.0	24.0	36.7
3–4 hours	79	29.6	29.6	66.3
> 8 hours	90	33.7	33.7	100.0
Total	267	100.0	100.0	

This section has reported the main demographic characteristics of study respondents. It has also briefly highlighted the items used in the survey. The following section reports the data analysis and results.

RESULTS

Multiple linear regression analysis was used to test the model. Assumptions about the multivariate normal distribution, independence of errors, and equality of variance were tested prior to model testing. The internal reliability of the main components of the dependent variable (e-voting adoption) was evaluated using Cronbach’s alpha. Table 6 presents the reliability analysis values of the dependent variable.

Pearson’s correlation coefficients revealed good correlations among the survey items used to measure the dependent variable (see Table 7).

Table 6. Reliability statistics of dependent variable

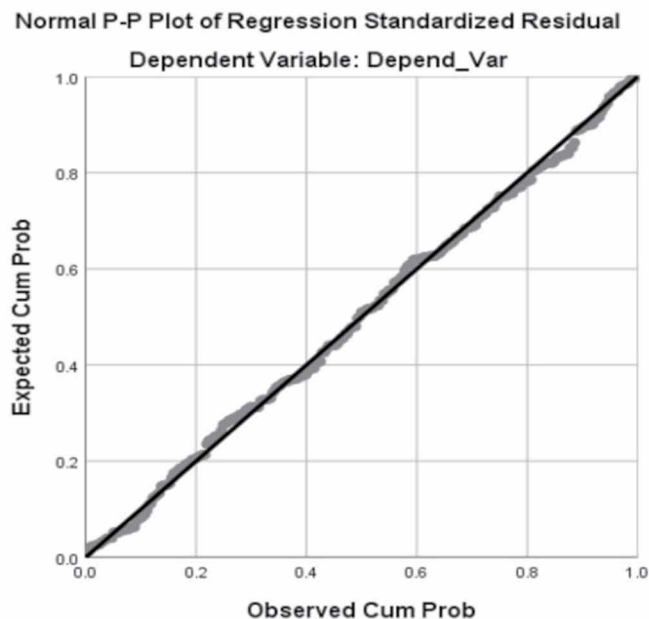
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
0.748	0.750	5

Table 7. Total statistics of dependent variable questionnaire items

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item: Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ADOP.1	9.4382	8.210	0.510	0.280	0.705
ADOP.2	9.5506	8.248	0.528	0.289	0.699
ADOP.3	9.6180	8.335	0.512	0.275	0.705
ADOP.4	9.3333	7.907	0.496	0.250	0.712
ADOP.5	9.5805	7.989	0.523	0.280	0.700

As the main purpose of this research was to determine the significance of the relationship between e-voting adoption (the dependent variable) and the digital divide factors (independent variables), multiple regression was deemed the most suitable analytical technique. Testing revealed no violations of the assumptions about multivariate normal distribution, independence of errors, and equality of variance. Influential outlier observations were identified with leverage, standardized residuals, and Cook's D-statistic (see Figure 2).

Figure 2. Regression standardized residual



No problems were indicated in the analysis with respect to influential outliers. The regression resulted in a model with an F-value of 4.439, resulting in a p -value of $p < 0.05$, thus indicating that at least one of the coefficients corresponding to an independent variable was not equal to zero (0) (see Table 8).

The R-squared value was 0.063, indicating that the digital divide factors identified in this research study accounted for 6.3% of the variance in intention to use e-voting (see Table 9). The significance of the current research model was proved by the overall results.

$$Y_0 = \beta_0 + \beta_1 \chi_1 + \beta_2 \chi_2 + \beta_3 \chi_3 + \beta_4 \chi_4 + E_0$$

where:

Y_0 = change in e-voting adoption (dependent variable)

β_0 = constant

β_1 = regression coefficient of education level (independent variable)

χ_1 = education level (independent variable)

β_2 = regression coefficient of age (independent variable)

χ_2 = age (independent variable)

β_3 = regression coefficient of monthly income level (independent variable)

χ_3 = monthly income level (independent variable)

β_4 = regression coefficient of weekly number of hours of internet use (independent variable)

χ_4 = weekly number of hours of internet use (independent variable)

E_0 = error of estimation

Based on the statistical calculation inputs from the above results in Tables 8 and 9, the regression model equation below has been created to indicate the significance of the current research model:

$$Y_0 = 2.531 + 0.081 c_1 + 0.035 c_2 - 0.011 c_3 - 0.159 c_4 + 0.67453$$

After presenting the significance of the current research model, the significant results from the multiple regression are reported in Table 10, with these relating to age ($H1$), income ($H2$), education

Table 8. ANOVA test

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	8.079	4	2.020	4.439	0.002b
Residual	119.208	262	0.455		
Total	127.287	266			

Note: ANOVA = analysis of variance; df = degrees of frequency; Sig. = significance

Table 9. Model summary

Model	R	R-Squared	Adjusted R-Squared	Std. Error (SE) of Estimate	Change Statistics				
					R-Squared Change	F Change	df1	df2	Sig. F Change
1	0.252a	0.063	0.049	0.67453	0.063	4.439	4	262	0.002

Table 10. Hypothesis testing

Hypotheses	Variable	Coefficient	t-value	Significance	Support
H1	Age	.049	.744	.457	No
H2	Income	-.015	-.223	.823	No
H3	Education	.084	1.352	.177	No
H4	Internet Use	-.237	-3.885	.000	Yes

(H3), and internet use (H4). The results highlight the significance of one factor, internet use (H4). Therefore, H4 is supported. Interestingly, H1, H2, and H3 are not supported.

After having analyzed the data, the following section discusses the significance of the digital divide e-voting adoption model proposed in the current study and its research implications.

DISCUSSION AND RESEARCH IMPLICATIONS

This paper presents a study that proposes a significant model for addressing the digital divide in e-voting adoption. Prior research has highlighted the necessity for a model or framework that could study the way in which digital divide factors influence technological innovations, including e-government and e-voting (Bélanger & Carter, 2010b; Mensah & Mi, 2018a; Carter & Weerakkody, 2008). The studied digital divide factors were age, education, income, and internet use. Previous research has indicated the importance of incorporating these factors when discussing the digital divide's influence on the adoption of technological innovations, such as e-government and e-voting (Bélanger & Carter, 2010b; Mensah & Mi, 2018a).

Conversely, the review of prior studies showed the lack of research conducted in the field of e-voting and specifically in examining the impact of the digital divide on e-voting system adoption, with most conducted studies in the field of e-government. Therefore, the current research contributes to the literature by specifically exploring digital divide factors in relation to e-voting adoption. Additionally, based on the review of prior research, studies were grouped into two categories: those that examined the direct impact of digital divide factors (Bélanger & Carter, 2010b; Mensah & Mi, 2018a) and those that examined the indirect impact of digital divide factors on e-voting adoption (Sipior et al., 2011). The current study, through its digital divide e-voting adoption model, examined the direct impact of four digital divide factors (age, education, income, and internet use) on voters' intention to use an e-voting system.

The current research has successfully provided a significant digital divide model that can study the adoption of e-technological innovations such as e-voting in a developing country, in this case, Jordan. Previous research has indicated that "e-voting, as with some other technological innovations, has been implemented and designed by developed and Western countries. It has been implemented to suit the social cohesion of these communities" (Alomari, 2014). This research paper therefore contributes to the literature by adding a study conducted in a society with social and cultural cohesion that differs from that of developed countries.

This research study has demonstrated the necessity of examining the impact of digital divide factors on the adoption of an e-voting system in Jordan, a developing country. The study identified four different digital divide factors that could explain voters' intentions to use (or adopt) an e-voting system as a new approach for choosing their parliamentary representatives. These factors in the current study were age, income, education, and internet use. One hypothesis is proposed for each one of these factors: H1, H2, H3, H4 respectively.

As shown in the multiple regression results, H4 is supported. Use of the internet will directly and positively predict users' adoption of an e-voting website in Jordan. This finding indicates that

citizens will be more willing to adopt e-voting if they regularly use the internet. One reason for this result may be that respondents were regular users of the internet. As claimed by Alomari et al. (2012), “internet-literate people are more able to assess to what extent Web-based services help them to conduct their transactions efficiently compared to those who are not internet literate” (p. 225). This research finding is consistent with some previous work in which internet use was a significant predictor of e-voting adoption (Bélanger & Carter, 2010b). However, it is not in line with prior research results in the e-government context that confirmed the non-significant impact of internet use on citizens’ intentions to use e-government services (Carter & Weerakkody, 2008; Sipior et al., 2011).

As also shown in analysis of the multiple regression results, *H1*, *H2*, and *H3* are not supported. The results indicate that age (*H1*), income (*H2*), and education (*H3*) are not significant digital divide elements for e-voting adoption. The reason could be that survey respondents are well educated, young, and they may still receive financial support from their families as they are young. In the literature review, the impact of these three demographic factors was discussed and reviewed jointly as the “access to technology” component of the digital divide. This component has also been discussed in relation to e-government and e-voting research conducted in both developed and developing countries. Although the current study is conducted in a developing country, this finding is inconsistent with some previous work in Ghana, another developing country, in which age, income, and education were significant predictors of e-government adoption (Mensah & Mi, 2018b). This inconsistency could occur due to the cultural differences between Africa and the Middle East. In the USA, a developed country, researchers found that age and income were significant predictors of I-voting; however, education was not (Bélanger & Carter, 2010b). In contrast, other previous research work found that income and education were significant determinants of e-government usage, although age was not (Sipior et al., 2011). Prior studies have also shown discrepancies in results related to these three constructs: age, income, and education. However, the current research presents a new shape to previous findings by confirming that these three constructs are not a concern when discussing the topic of the digital divide in relation to e-voting adoption.

In light of the above discussion, this research paper fulfills three main functions. Firstly, by articulating the factors for and obstacles to e-voting adoption that require further exploration, it acts as a research facilitator. Secondly, it prompts the government of Jordan to consider the necessity of increasing voter turnout at elections by implementing an e-voting system. Thirdly, the paper invites the government of Jordan to consider digital divide issues when developing and implementing the phases of an e-voting system.

The study highlights e-voting as one of the main initiatives that would enable the government of Jordan to ensure a high voter turnout at elections, and especially at the parliamentary election, thus enhancing the democratic process. This research paper assists the government of Jordan by presenting preliminary ideas about what would deter Jordanian voters from participating in an e-voting election process to choose their parliamentary representatives. As this paper has articulated the digital divide factors in relation to e-voting, the government of Jordan would be in a position to consider the centrality of its citizens in the implementation stage of an e-voting system.

As an e-government application, e-voting has a definite impact on government–citizen interaction (Alomari, 2016; Khan, Bankole, & Alomari, 2018; Schaupp & Carter, 2005). Therefore, the government of Jordan should use the advantages of an e-voting system in its approach to enhance its interaction and communication with Jordanian citizens, sustaining their trust, not only in e-government and e-voting systems, but also in the government itself. The government of Jordan would need to find appropriate methods to resolve the issues influencing citizens’ intentions to vote through an e-voting system, including digital divide issues, the main focus of this paper. These methods could include providing an easy to use e-voting systems, increase awareness of people about importance of the internet use in their life, inexpensive access to technology and increasing older people’s technology awareness.

The current research paper is a valuable resource for researchers and practitioners with an interest in studying the impact of the digital divide on the adoption of e-government, and specifically of e-voting, as well as other technological innovations, in general, such as e-health systems.

LIMITATIONS AND SUGGESTION FOR FUTURE STUDIES

This research collected data from highly educated people (around 82.7% of respondents held either a bachelor's degree or a higher education certificate). Future studies should seek to collect data from voters with different education backgrounds by including more of those who had a high school certificate than of those who did not. This study, through the selected survey items, did not focus on specific elections such as parliamentary elections or municipal elections. By being specific in the survey items and seeking perceptions in relation to a specific type of election (either parliamentary elections or municipal elections), the researcher would have the opportunity to know if there is any difference. Furthermore, this research has surveyed people with regular access to the internet. This focuses attention on the necessity of conducting another study to consider citizens without regular access to the internet as this would increase the generalizability of the results. Finally, this research has obtained respondents' perceptions of e-voting adoption in which a website was considered as the main channel through which the voting process would be conducted. Consequently, further research should be carried out to test e-voting adoption by focusing on other channels such as mobile voting. Cybercrime is a concern for both the government and citizens when implementing and adopting a new information and communications technology (ICT) such as e-voting. On the one hand, the digital divide "... has consequences for the effective global enforcement of cyber-crimes ..." (Broadhurst, 2006); therefore, further research is being conducted to explore this issue. The current research has focused mainly on four digital divide factors in its study of e-voting adoption. Further research will be conducted, utilizing different research methods (qualitative and quantitative), to explore the effect of other factors such as culture, information technology (IT) infrastructure, equity of access, religion, and the geographic distribution of Jordanian citizens and refugees on Jordanian land.

CONCLUSION

In summary, this research paper offers a framework for addressing the digital divide in e-voting adoption. The paper first shows the necessity of developing a significant framework that would be capable of studying the impact of digital divide factors on e-voting adoption by the main users, that is, voters. Subsequently, the study offered a significant model to reconnoiter the effect of digital divide factors on voters' intentions to use e-voting systems, with these factors being age, education, income, and internet use. An in-depth exploration of these specific factors was conducted by examining the direct relationships of these factors (the independent variables) on the dependent variable (e-voting adoption). The overall analysis showed the significance of the proposed model introduced through the current study. Finally, the research model offers governments in developing countries, in general, and Middle Eastern countries, in particular (with Jordan the example), a resource to assist them to take a step toward their citizens by enhancing governments' political and non-political interaction with their citizens and achieving what is called 'e-democracy.'

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