Information Technology for Development
Vol. 18, No. 3, July 2012, 226–246

Routledge
Taylor & Francis Group

Channel choice and the digital divide in e-government: the case of Egypt

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This paper examines channel choice and the digital divide in Egyptian electronic government or e-government. Citizens have access to a variety of service delivery channels when they initiate contact with their government, ranging from e-government to more traditional channels such as the phone and in-person visits to a government office. This paper examines the extent of use of both contact channels for citizens and the impact of the digital divide on channel use. A public opinion survey of Egyptian citizens was analyzed, and the results showed that there was a digital divide in the use of e-government by citizens. The digital divide also extended to other contact channels such as the phone and when citizens used multiple contact channels for public service delivery. The results of this study imply that for the development of e-government, especially in the context of a developing country such as Egypt, policy-makers need to understand that e-government is one of many channels that citizens can use when they initiate contact with their government. The results of this study should encourage policy-makers to recognize the importance of public service delivery in a multichannel environment.

Keywords: e-government; information technology and public administration; survey research; Egypt

Introduction and background

This research compares electronic government or e-government use by citizens with the use of more traditional service delivery channels such as the phone and in-person visits to a government office. In order to understand the development of e-government, it is important to discern its use by citizens compared with the use of alternative service delivery channels. E-government is said to be one service channel, among many, that citizens can use when they initiate contact with their government (Ebbers, Pieterson, & Noordman, 2008; Teerling & Pieterson, 2010). This research examines the factors that promote and inhibit the adoption of e-government by citizens. This research is called the demand side of e-government adoption and has not been explored as much in the literature, compared with examining what governments supply online (Gauld, Goldfinch, & Horsburgh, 2010; Reddick, 2005). This paper examines the digital divide or the difference between individuals who have access to technology, such as the internet, and individuals who do not have access (Belanger & Carter, 2009; Helbig, Gil-Garcia, & Ferro, 2009). The digital divide research is related to the choice of channels that citizens make when they contact their government.

The purpose of this paper is to examine how factors of the digital divide explain channel choice made by citizens. There are two research questions examined in this paper. What is the current use of e-government compared with that of traditional service delivery channels?

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Shirin Madon is the accepting Associate Editor for this article.

ISSN 0268-1102 print/ISSN 1554-0170 online

http://dx.doi.org/10.1080/02681102.2011.643206
http://www.tandfonline.com

What digital divide factors such as access to the internet and socio-demographic factors explain the use of traditional channels, e-government, and a combination of channels? Both questions are important since policy-makers need to understand factors that promote, or inhibit, citizens' use of e-government.

This paper examines citizens and e-government in Egypt. There is literature that has examined the importance of e-government and public service delivery for developing countries (Chen, Chen, Cling, & Huang, 2007; Hamner & Qazi, 2009; Heeks, 2002). However, most of the existing research that has examined citizens and e-government has used public opinion data focussing on the USA (Reddick, 2005; Streib & Navarro, 2006; Thomas & Streib, 2003). There is little, if any, research that has examined public opinion data on citizens and e-government use in developing countries in Africa. In addition, this study examines channel choice and the digital divide through a public opinion survey, which is a relatively unexplored area of research (Pieterson & Ebbers, 2008; Reddick, 2010). In Africa, e-government is believed to provide for a greater degree of human development (Berman & Tettey, 2001; Fuchs & Horak, 2008; Maumbe, Owei, & Alexander, 2008; Peterson, 1998; Rorissa & Demissie, 2010; Schuppan, 2009).

E-government in Egypt is very important because of its bearing on economic and social development of the nation. E-government is said to be a tool to create increased trust and confidence in the government by citizens (Bertot, Jaeger, & Grimes, 2010; Tolbert & Mossberger, 2006; Welch, Hinnant, & Moon, 2004; West, 2004). However, increased trust in the government is not always achieved; this is evident with e-government in Russia where it is being used to conceal what the government is doing (McHenry & Borisov, 2006). But overall e-government for a developing country is thought to provide for a more accountable government (Chatfield & Alhujran, 2009).

Egypt is an important case study in the development of e-government. The 2010 United Nations E-Government Survey indicated that Egypt ranked third of the African countries with regard to e-government adoption, with Tunisia ranking first. E-government is said to be a way of promoting human development (Macueve, 2008). According to the 2010 Transparency International survey, Egypt ranked poorly for transparency among 98 of 178 countries. This shows that corruption is a major part of Egyptian society and was in part an explanation for the 25 January 2011 revolution.

There are vast differences between developed and developing countries and internet access (Blignaut, 2009). According to Internet World Stats, comparison of internet penetration in 2009 around the world shows that North America leads the way with 78.3% of the population being online. Europe had 58.3% of its population online. The Middle East had only 31.7% of its population online.

E-government is viewed as a catalyst for public sector reform in the case of developing countries, where governments cost more and deliver less and they are not sufficiently responsive and accountable to citizens (Gaunghua, 2009). E-government represents a way of solving these problems by creating a system that is more efficient, accountable, decentralized, and market driven (Bwalya, 2009; Ndou, 2004). However, the implementation of e-government in developing countries is curtailed because of the severe lack of resources needed for a detailed national plan on e-government (Ezz, Papazafeiropoulou, & Serrano, 2009; Warschauer, 2003).

In order to examine channel choice and digital divide in e-government, this paper is divided into several sections. The following two sections examine the digital divide and channel choice literatures. Following this, the conceptual framework of channel choice and the digital divide in e-government is examined. This paper then discusses several hypotheses derived from the literature on channel choice and the digital divide. The main body of the paper discusses the research methods, and the results of the study are presented. The conclusion examines some of the limitations of this research and suggests future research possibilities.

Digital divide in e-government

A broad definition of the digital divide in the context of developing countries is the gap that exists between those who have and those who do not have access to modern information and communication technology (ICT) such as telephones, computers, internet, and related services (Ani, Uchendu, & Atseye, 2007). The digital divide is often described more generally as the difference in internet access between the have and have-nots (White, 2007). More precisely, it is the gap between those individuals and communities that own, access, and effectively use ICT and those that do not (Hill, Beynon-Davies, & Williams, 2008). The digital divide represents a barrier for the development of e-government in developing countries. There is a lack of consensus on what factors explain the digital divide; this is especially the case for developing countries where there is less research compared with developed countries (Pick & Azari, 2008).

There are four barriers to access technology, such as the internet, noted in the digital divide literature, which are the mental access, material access, skills access, and usage access (van Dijk & Hacker, 2003). E-government is a way of bridging the digital divide by providing an improvement in the quality and efficiency of government services, especially in developing countries where resources are scarce and geography may be an obstacle to access (Pascual, 2003).

Research shows that the digital divide and e-government research has evolved in parallel with little interaction between them (Helbig, Gil-Garcia, & Ferro, 2009). E-government is hindered by the digital divide and e-government can also contribute to the digital divide since it represents another technological advancement that certain members of society can be excluded from (Belanger & Carter, 2006). In developing countries, the digital divide is a symptom of more important divides in income, development, and literacy. More directly, a computer is not of much use if the individual has neither food nor electricity and cannot read (Martin, 2005). Therefore, it is not only a question of access, but broader issues such as human development that need to be addressed along with technology implementation.

Channel choice and e-government

Citizens can use different types of channels for contacting government agencies for information or services (Ebbers, Pieterson, & Noordman, 2008). Traditional channels are, for example, the front desk and the telephone. Mail has been the traditional channel since the beginning of modern times. However, during the 1980s and 1990s with the rise of ICT, new channels emerged such as the web and email. Table 1 provides an illustration of the major contact channels that citizens can use and some of the issues confronted with each of them. The last column examines accessibility and inclusion, showing the extent of the digital divide in channel choice.

Existing research on developed countries shows that citizens use traditional channels more than electronic channels (Pieterson & Ebbers, 2008). Contacting the government for online services does not even rank in the top three channels. Citizens tend to use the phone most, followed by in-person visits and written letters (Pieterson & Ebbers, 2008). As mentioned, there is little research that has examined developing countries and channel choice as this study does.

Citizens contact the government for various reasons such as to try to influence public policy, to address personal concerns that they have, to conduct government transactions, and to obtain information on benefits and services that the government offers (Pieterson & Ebbers, 2008). Internet advocates have long raised expectations about the ease, convenience, and effectiveness of using the internet. However, issues of satisfaction with the government through internet contacts are not typically erased through this channel (Cohen, 2006).

Table 1. Channel choice determinates and the digital divide.

Channel used	Why chosen?	Tasks	Situations	Accessibility and inclusion
Website	Ease of use	Simple and standard tasks	To reduce low levels of uncertainty	Medium/low
	High contact speed	Need much background information	When emotions play minor role	
Email	Ease of use	Simple and standard tasks	To reduce medium levels of uncertainty	Medium/low
	Gives closure	Need much background information		
In-person visits	Out of habit	Ambiguous and highly complex tasks	To reduce high levels of uncertainty	High
	Gives closure		When matters are of high importance	
	Is personal		When emotions play a major role	
	Offers high level of service			
Telephone	High contact speed	Ambiguous tasks	To reduce high levels of uncertainty	High
	High immediacy of feedback		When emotions play a major role	
	Gives closure		When people are in a rush	

Note: Adapted from Pieterson (2010) and European Commission (2004).

Conceptual framework of the digital divide impacting channel choice

Figure 1 provides the conceptual framework of this study, showing the relationship between the digital divide and channel choice. This is a complex relationship between access by citizens to the internet and socio-demographic factors. Figure 1 shows that people use different channels of e-government, traditional and multiple channels, according to their internet access and socio-demographic factors. Both these factors explain the impact of the digital divide on the use of different service channels for citizens to initiate contact with their government for a service, information, or problem-solving.

There are different channels that citizens can use to initiate contact with their government (Singh & Sahu, 2008). The well-known channels are the traditional ones such as the phone, mail, and in-person visits to a government office. These channels essentially predate the internet. The relatively newer channels are e-government, which are email and the government website. Figure 1 also shows that citizens may use a combination of channels to initiate contact with their government. This is especially possible with smart phone technology, which enables citizens to use both phone and e-government functions on the same platform (Singh & Sahu, 2008). Research also shows that citizens may use different channels depending on the task at hand (Estabrook, Witt, & Rainie, 2007; Horrigan, 2004). Some channels such as the phone are well suited for solving problems that need immediate attention, while other channels such as a government website would be better suited for information searches (Chen, Huang, & Hsiao, 2006; Cohen, 2006; Ebbers, Pieterson, & Noordman, 2008; Ong & Wang, 2009; Reddick, 2010). Research shows that citizens use the phone and front desk for more complex and ambiguous problems and use the internet for information searches (Pieterson & van Dijk, 2007).

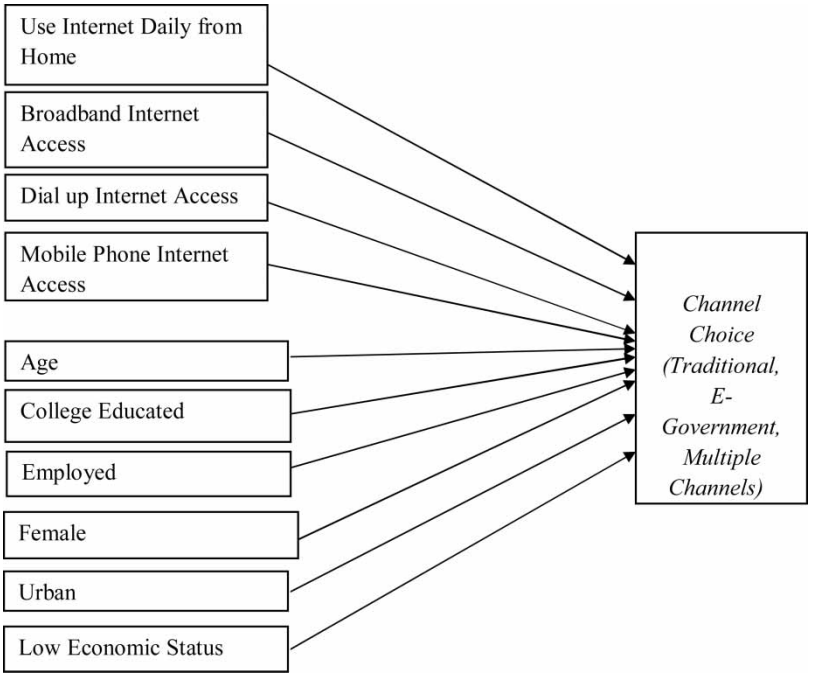

Figure 1. Conceptual framework of the influence of the digital divide on channel choice.

A multichannel environment for public service delivery is increasingly being viewed as important given some of the limitations of e-government (Pieterson & Ebbers, 2008). The most important limitation is that citizens have different tasks that may be better suited for traditional service delivery channels. For instance, a citizen filing a government form may first use the website to find out what general information is needed. If the citizen discovers a problem with his or her application, he or she may phone the government office for clarification. Finally, the individual may mail the form or take it directly to the government office. Therefore, e-government may be one initial step, among many steps, in public service delivery.

Key literature and hypotheses

There are several hypotheses which are used to examine channel choice and the digital divide. By examining all the channels, it is found that there are two areas which are viewed as important. These areas correspond to access to the internet and socio-demographic factors (Belanger & Carter, 2006, 2009). The prediction is that each of these areas will have similar influence in the direction of impact, regardless of the service channel being used (Reddick, 2010). Access to public services is not just a technological issue, social and economic forces come into play as well.

This study examines two important aspects of the digital divide to determine whether it has an impact on channel choice. The first one is the access digital divide (Belanger & Carter, 2006). This examines whether citizens have access to internet technology that enables them to go online. The second digital divide is related to the socio-demographic status of the citizens and their use of e-government (Belanger & Carter, 2009). Many of the factors that are present in the digital divide literature are applicable to other contact channels, not just to e-government, especially in the context of a developing country such as Egypt. In addition, there is a blurring

of the lines as mentioned with the use of mobile phone technology, which is playing an increasing role in Egyptian society. Channel choice is defined as citizens' use of the following channels: website and email (for e-government contacts), phone, in-person visits, and mail (for traditional contacts) and multiple channels. The literature is presented first followed by the hypothesis for each independent variable studied.

Access digital divide

With regard to the access digital divide, there are four components examined in this study, that is, the daily use of the internet from home, broadband internet access, dial-up internet access, and mobile phone internet access.

Use of internet daily from home

Research shows the importance of skills such as internet experience that explains internet use (van Deursen & van Dijk, 2009). Hypothesis 1a indicates that citizens who use the internet daily would have a greater ability to go online and would be more willing to visit a government website or use email (Belanger & Carter, 2006; van Deursen & van Dijk, 2009). Greater use of the internet is said to indicate greater technical sophistication of the user and more use of e-government services. Daily use of the internet represents a frequent internet user; therefore, this person would be more likely to be comfortable with this technology and go online to access e-government.

> *Hypothesis 1a:* The use of the internet daily from home will have a positive impact on the channel choice variables.

Broadband and dial-up internet access

Research has shown that there is a positive relationship between greater broadband availability in a community and increased implementation of e-government services by local governments (Ferro, Leonardis, & Dadayan, 2007). This empirical research has shown that a widespread availability of broadband connections increased access to online public services for citizens, while communities that had more narrowband connections offered fewer e-government services. Research has also shown the relationship between access to broadband internet and the economic prosperity of a nation (Jakopin & Klein, 2011). Hypothesis 1b examines whether a citizen has broadband internet access. Citizens who have this type of high-speed internet access would be more likely to contact the government through a website or email, since greater use demands more sophisticated technology, compared with dial-up users (Reddick, 2010). As shown in Hypothesis 1b, broadband internet access will have a positive impact on channel choice since citizens who have high-speed internet access will most likely demand more government services. Hypothesis 1c shows that citizens who have dial-up internet access would be less likely to contact the government and have a negative impact on channel choice.

> *Hypothesis 1b*: Broadband internet access will have a positive impact on the channel choice variables.
>
> *Hypothesis 1c*: Dial-up internet access will have a negative impact on channel choice variables.

Mobile phone internet access

Mobile government or m-government involves the use of wireless and mobile technology to access e-government information and services. The use of mobile phones in developing

countries is one potential way of bridging the digital divide. Unlike computers which are expensive, mobile phones are more evenly distributed in developing countries and are not restricted to just those at higher socio-economic levels (Singh & Sahu, 2008). There is a relationship between mobile phone use and development for developing countries (Baliamoune-Lutz, 2003). Boyera (2007) argued that one way of possibly bridging the digital divide is to use the 2.4 billion-plus mobile phones across the world and provide them with web access. However, low-end phones that are aimed at developing countries do not support web-browsing capabilities; this becomes an issue as web content becomes richer (Boyera, 2007). When examining mobile devices that offer third-generation networks that enable these customers to access a variety of services on the internet, there is a lag between developing countries and developed countries (Bar & Galperin, 2005). Research shows that socio-demographic factors, such as income and education, enhance mobile adoption in developing countries in Africa (Chabossou, Stork, Stork, & Zahonogo, 2008).

Hypothesis 1d: Mobile phones used for internet access will have a positive impact on the channel choice variables.

Socio-demographic digital divide

The second group of factors that are predicted to impact channel choice and the digital divide is the socio-economic status of citizens. In developed countries, the digital divide is related to ethnicity, income, education, age, and gender according to existing research (Belanger & Carter, 2009). The African countries have the lowest rate of internet access compared with many other developing countries. This inequality in internet access is correlated with many common socio-demographic factors such as education and income (Fuchs & Horak, 2008).

Age

Research shows that older citizens are less likely to use the internet compared with the younger generation (Dimitrova & Chen, 2006; Morgeson, VanAmburg, & Mithas, 2011). The likelihood of internet engagement is shown to rapidly decrease with age, and the level of disengagement is most pronounced for those belonging to the oldest generation aged 60 and above (Hill, Beynon-Davies, & Williams, 2008). Computer systems have been designed in a way that has not been user friendly to the elderly (McMurtrey, McGaughey, & Downey, 2008). The current technology in the market is more targeted at younger generations. As a result, age is one of the factors creating a digital divide as shown by the existing survey research.

Hypothesis 2a: As age increases, it will have a negative impact on the channel choice variables.

College education

Research also shows that citizens who are college educated are more likely to go online to engage in e-government (McNeal, Hale, & Dotterweich, 2008). This implies that citizens who are college educated would have more knowledge of the internet and be able to navigate and get what they want on a government website. This was found in Canada, where education had a strong and significant impact on internet use (Noce & McKeown, 2008). More highly educated individuals are able to keep up with technological advances and are able to be leaders in technology adoption such as the internet (van Deursen & van Dijk, 2010).

Hypothesis 2b: College education will have a positive impact on the channel choice variables.

Employed full time

Research shows that citizens who are employed full time will show a greater likelihood of using e-government (Ferro, Helbig, & Gil-Garcia, 2011). They may have a need to use the internet to

contact the government because of their job. Citizens who work full time should also have greater income and might be able to afford internet access. Empirical research does show a relationship between someone working full time and the digital divide (Ferro, Helbig, & Gil-Garcia, 2011).

Hypothesis 2c: Being employed full time will have a positive impact on the channel choice variables.

Females

Female citizens would be less likely to go online and access e-government. Research shows that there is a closing of the gap with gender and e-government access, but there is little research that has examined developing countries to determine whether gender has an impact (Al-Rababah & Abu-Shanab, 2010). Research discusses the issue of gender equality in the use of e-government, with e-government projects needing to start incorporating a gender analysis to avoid marginalizing access by women (Al-Rababah & Abu-Shanab, 2010). Women in developing countries have limitations in accessing e-government, since they are less likely than men to use the internet because of access issues (Chabossou, Stork, Stork, & Zahonogo, 2008). This research shows that men's decision to use technology is more strongly influenced by the perception of its usefulness, while for women the decision is based on the technology's ease of use. A study of the digital divide in Nigeria indicated that the digital divide between males and females could be explained by the fact that males dominated the science-related fields which could influence ICT adoption (Ani, Uchendu, & Atseye, 2007).

Hypothesis 2d: Females will have a negative impact on the channel choice variables.

Urban

There is research that has examined the urban and rural digital divide as shown in Hypothesis 2e (Noce & McKeown, 2008). This is the difference in access between the urban settings that have more access to the internet and rural areas, where internet access might be a challenge because of a lack of infrastructure. In a study of Canadian internet adoption, statistical results indicated that rural areas lacked the infrastructure to support broadband internet, thus making it difficult for residents to use the internet (Noce & McKeown, 2008). In rural areas, telecommunications is not capable of expanding as rapidly as in the urban areas because of the lack of infrastructure and demand, which has an impact on the digital divide (Malecki, 2003). The rural digital divide is much more severe in developing countries. For instance, research shows that in China the uneven economic development has led to inferior development of ICT infrastructure, causing a rural digital divide (Chen, Lin, & Lai, 2010). In many other developing countries, it is not uncommon for rural villagers to travel long distances to a government district to request copies of public records, submit applications, meet officials, and seek general information on government services. Therefore, physical distance is a challenge for the rural poor and a challenge for e-government projects (Cecchini & Raina, 2005).

Hypothesis 2e: Urban dwelling will have a positive impact on the channel choice variables.

Low economic status

Cross-national research shows that income inequality is a good predictor of internet use for a country (Martin & Robinson, 2007). Research shows that there are two groupings with regard to access to e-government when comparing developing and developed countries. The top 10 countries with e-governments are more highly clustered as having high income per capita, while the bottom 10 e-government-readiness countries have the lowest income per capita

(Chatfield & Alhujran, 2009). Therefore, individuals who have a lower economic status are less likely to have access to the internet (Martin & Robinson, 2007). This may imply that they do not have a high enough income to afford internet access to contact the government.

Hypothesis 2f: Lower economic status will have a negative impact on the channel choice variables.

Research methods

The results reported in this paper are based on a public opinion survey of adult citizens (18 years old and above) in Egyptian households having landline phones nationwide. The respondents answered for themselves and not for their households. There were a total of 4999 dialed calls made, of which 1191 were actual responses, representing a response rate of 24%. The sampling method is provided in Appendix. This is a response rate that is similar to that obtained for a Pew Internet and American Life survey of online government completed in the USA (Estabrook, Witt, & Rainie, 2007).

The data were collected using the telephone during the months of November 2010 to January 2011. The data were collected before the 25 January 2011 Egyptian Revolution. The survey was administered by a contracted public opinion polling firm. The poll was conducted using an electronic polling management system including the questionnaire design, execution, and production of the SPSS data file. The questions were based on some of the questions used in the Pew Internet and American Life poll of online government (Estabrook, Witt, & Rainie, 2007). The survey was administered at different times of the day and in the evening hours in order to reach more individuals who may work during the day. The sampling error was estimated with 95% degree of confidence, and thus the value of the sampling error in this poll was equal to $\pm 2.8\%$.[1] Therefore, we are confident that the responses to the survey broadly represent Egyptian households that have landline telephones. The method of data analysis used descriptive statistics to determine the extent of citizens' use of each channel. This was followed by logistic regression and linear regression to examine the impact of the digital divide variables on channel choice. The regression analysis is a good method of data analysis, since we are trying to determine the direct impact of the digital divide on channel choice.

Results

Here, the results of this study are used to examine the descriptive statistics of the choice of channels used by citizens in Egypt. This is followed by an examination of the access and socio-demographic digital divide factors that are used to explain channel choice.

Descriptive statistics of channel choice

Table 2 provides the descriptive statistics of the choice of channels that citizens would use when they contact the government. In the survey, the citizens were asked as to what channel(s) they used to contact the government when they needed information and services or to get a problem solved in the last 12 months. To determine if the citizen was a government website user, the following question was used: "Did you visit one of the following websites in the last 12 months?," with a listing of ministries, governorates, local council, any other government entity, and never visited any of these websites as options. The respondents could choose multiple responses to this question. The use of the government website and mails sent to government officials represented the e-government channels. In the survey, 13.4% of the respondents represented citizens who made contact using the government website. An interesting comparison is that based on the Pew Internet & American Life (www.pewinternet.org) data on government website use in

Table 2. Descriptive statistics of the choice of channel variables.

	Frequency	Percent
E-government channels		
Website	160	13.4
Email	19	1.6
Traditional channels		
Phone	205	17.2
In-person visits	1106	92.9
Mail	54	4.5
Multiple channels[a]		
0 Channel (no contact with the government)	53	4.5
1 Channel	828	69.5
2 Channels	230	19.3
3 Channels	64	5.4
4 Channels	16	1.3

Note: $N = 1191$.
[a]Mean service channels offered were 1.30.

America, which was much higher at 59% in 2009. There were a very small percentage of individuals who contacted government officials by email at only 1.6%.

Contacting the government through traditional channels such as the phone and in-person visits and via the mail is the most frequently used method in Egypt. In the survey, the major contact channel was the in-person visit to a government office, with 92.9% of the citizens using it. The second most commonly used channel was the phone, with 17.2% of the respondents using it. Only 4.5% of the survey sample used mail contacts. Overall, and not surprisingly, the findings showed that in-person visit was the most common method of contacting the government in Egypt.

Citizens often use multiple means when initiating contact with their government and some do not contact the government at all. The combination of channels given in Table 2 is the summation of each of the channels that citizens in Egypt used to contact their government in the last 12 months. There were 4.5% of Egyptian citizens surveyed who did not use any of the five channels to contact the government. The majority at 69.5% used one channel to contact the government. However, using two channels was not uncommon, with 19.3% of citizens using more than one channel. For citizens who responded to the survey, the average number of channels used was 1.3.

Digital divide predictor variables

Table 3 provides information on the predictor variables used to explain the choice of channels made by Egyptian citizens. With regard to internet access and the digital divide, the mean values showed that only 10% of Egyptian citizens used the internet daily from home. There were 19% of citizens who had broadband internet access. Only 5% of Egyptian citizens used a dial-up internet connection. Finally, only 6% of the respondents used the mobile phone to access the internet.

Table 3 also provides the socio-demographic digital divide variables tested in this study. The average age range of the respondents in the survey was 40–50 years. Among those surveyed, 37% were college-educated individuals. In the sample, 43% were employed full time. In the survey, 59% of the sample was represented by females. Egyptians who lived in urban areas represented 70% of the sample. The survey sample showed that 23% of the respondents had a low economic status.[2]

Table 3. Descriptive statistics of the digital divide predictor variables.

	N	Minimum	Maximum	Mean
Access digital divide				
Use internet daily from home	1191	0	1	0.10
Broadband internet access	1191	0	1	0.19
Dial-up internet access	1191	0	1	0.05
Mobile phone internet access	1191	0	1	0.06
Socio-demographic digital divide				
Age[a]	1189	1	5	2.98
College educated	1191	0	1	0.37
Employed	1191	0	1	0.43
Female	1191	0	1	0.59
Urban	1191	0	1	0.70
Low economic status	1191	0	1	0.23

[a]1: 18–29 years old; 2: 30–39 years old; 3: 40–49 years old; 4: 50–59 years old; 5: 60 years and above.

Logistic regressions of traditional contact channels

Table 4 presents the logistic regression of the traditional methods of contacting the government for a problem, information, or service. The dependent variable for the logistic regression is binary, with "1" representing if the citizen used a specific channel and "0" otherwise. The odds ratios (ORs) can be calculated in a logistic regression to show the likelihood of a predictor variable impacting the dependent variable. By examining the phone as a contact channel, the logistic regression showed some interesting results. The results indicated that if someone had broadband internet access, he or she was, according to the ORs, 1.86 times more likely to use the phone to contact the government. The results also indicated that college-educated individuals were 1.94 times more likely to use the phone. The citizens who lived in urban areas were 1.61 times more likely to use the phone. Those individuals who have a low economic status were 0.34 times less likely to use the phone to contact the government. Overall, the results showed that for contacts by the phone, 5 of the 10 digital divide hypotheses were supported.

When examining other methods of contact such as in-person visits to a government office, a significant variable was that if someone was employed full time (indicating a higher socio-economic status), he or she was 2.28 times more likely to go in person to a government office. Females were 0.48 times less likely to visit a government office. The results for the in-person contacts indicated that only 2 of the 10 digital divide hypotheses were supported. For mail contacts with the government, only age had an impact, indicating that with an increase in age, the individual was more likely to use mail to contact the government.

Logistic regression of e-government contact channels

Table 5 provides the logistic regression examining channel choice and the use of e-government. The data given in this table show that there is a digital divide in access by Egyptian citizens to e-government. There was an access digital divide, with those individuals having broadband internet access being 13.2 times more likely to use an e-government website. The individuals having dial-up and mobile phone internet access were more likely to access a government website. With regard to the socio-demographic variables, someone who was college educated was 2.08 times more likely to use an e-government website. An employed individual was 2.59 times more likely to go online to a government website. The results for website contacts indicated that 5 of the 10 digital divide hypotheses were supported.

Table 4. Logistic regressions of traditional methods of contact through phone, in-person visits, and mail.

	Phone				In-person visits				Mail			
	Beta coefficient	Wald statistic	Prob. sign.	OR	Beta coefficient	Wald statistic	Prob. sign.	OR	Beta coefficient	Wald statistic	Prob. sign.	OR
Access digital divide												
Use internet daily from home	0.00	0.00	1.00	1.00	−0.21	0.16	0.69	0.81	0.08	0.03	0.86	1.08
Broadband internet access	0.62	8.02**	0.01	1.86	−0.44	1.08	0.30	0.65	0.07	0.03	0.86	1.08
Dial-up internet access	0.45	2.18	0.14	1.57	−0.09	0.02	0.89	0.91	0.41	0.68	0.41	1.51
Mobile phone internet access	0.53	3.05	0.08	1.70	−0.57	0.91	0.34	0.57	0.67	1.64	0.20	1.94
Socio-demographic digital divide												
Age	0.12	2.98	0.08	1.12	−0.15	2.80	0.09	0.86	0.29	5.64*	0.02	1.33
College educated	0.66	12.77**	0.00	1.94	0.55	2.74	0.10	1.73	0.55	2.80	0.09	1.73
Employed	0.11	0.37	0.54	1.12	0.83	6.57**	0.01	2.28	0.43	1.79	0.18	1.54
Female	0.02	0.01	0.93	1.02	−0.74	5.54*	0.02	0.48	0.10	0.09	0.77	1.10
Urban	0.48	4.41*	0.04	1.61	0.15	0.29	0.59	1.16	0.81	3.04	0.08	2.24
Low economic status	−1.09	11.32**	0.00	0.34	−0.26	0.85	0.36	0.77	−0.73	1.72	0.19	0.48
Constant	−2.73	56.95**	0.00	0.07	3.24	40.82**	0.00	25.43	−5.13	51.66**	0.00	0.01
Nagelkerke R^2	0.15	0.08	0.08									
Classification rate	82.7%				92.9%				95.5%			
χ^2	117.12**				36.80**				29.99**			

*Significant at the 0.05 level.
**Significant at the 0.01 level.

Table 5. Logistic regressions of channel choice and e-government, using the website and email channels.

	Website				Email			
	Beta coefficient	Wald statistic	Prob. sign.	OR	Beta coefficient	Wald statistic	Prob. sign.	OR
Access digital divide								
Use internet daily from home	0.32	1.34	0.25	1.38	0.64	1.37	0.24	1.89
Broadband internet access	2.58	85.06**	0.00	13.20	2.92	14.27**	0.00	18.62
Dial-up internet access	1.75	21.52**	0.00	5.73	1.24	2.77	0.10	3.47
Mobile phone internet access	1.56	18.87**	0.00	4.74	0.62	0.86	0.35	1.87
Socio-demographic digital divide								
Age	−0.16	2.79	0.10	0.85	0.34	2.65	0.10	1.41
College educated	0.73	7.57**	0.01	2.08	−0.01	0.00	0.99	0.99
Employed	0.95	13.26**	0.00	2.59	1.24	3.26	0.07	3.44
Female	−0.30	1.40	0.24	0.74	−0.36	0.39	0.53	0.70
Urban	0.07	0.05	0.83	1.07	0.53	0.38	0.54	1.70
Low economic status	−0.31	0.41	0.52	0.73	0.51	0.17	0.68	1.67
Constant	−3.67	53.57**	0.00	0.03	−8.18	32.38**	0.00	0.00
Nagelkerke R^2	0.52				0.29			
Classification rate	89.5%				98.4%			
χ^2	398.35**				53.43**			

**Significant at the 0.01 level.

Table 5 also provides contacts by email, indicating that those Egyptian citizens who had broadband internet access were 18.62 times more likely to use email to contact the government. The results for email access showed very little support for the digital divide variables. This is an interesting finding, since an 18.62 OR is the highest in the study. This result could be explained by the very low percentage of citizens who actually used this channel to contact the government at 1.6%, the lowest in the study. In addition, of these email users, a very high percentage were broadband users (84.2%).

No contact with the government

Table 6 shows the impact of the digital divide factors on individuals who did not contact the government at all in the last 12 months. The logistic regression revealed that someone employed full time was less likely to not contact the government at all. Females were more likely to not contact the government. An individual living in an urban setting was less likely to not contact the government at all.

Regressions of the combination of channels

The final model presented in Table 7 provides an ordinary least squares (OLS) regression using the dependent variable of the combination of channels. Dealing with many independent variables that may be related to one another, we tested for multicollinearity between them using tolerance and variance inflation factors (VIFs). These statistical tests can only be calculated with the OLS regression, but the results will be the same for the logistic regression, since we are looking only

Table 6. Logistic regression of channel choice and no contact with the government.

	No contact with the government			
	Beta coefficient	Wald statistic	Prob. sign.	OR
Access digital divide				
Use internet daily from home	−15.95	0.00	1.00	0.00
Broadband internet access	−1.03	0.92	0.34	0.36
Dial-up internet access	−16.88	0.00	1.00	0.00
Mobile phone internet access	1.21	1.10	0.30	3.34
Socio-demographic digital divide				
Age	0.09	0.57	0.45	1.09
College educated	−0.55	1.11	0.29	0.58
Employed	−2.91	7.93**	0.01	0.05
Female	1.13	4.63*	0.03	3.09
Urban	−0.66	4.01*	0.05	0.52
Low economic status	0.46	2.04	0.15	1.58
Constant	−3.35	21.98**	0.00	0.04
Nagelkerke R^2	0.23			
Classification rate	95.6%			
χ^2	83.96**			

*Significant at the 0.05 level.
**Significant at the 0.01 level.

Table 7. OLSs regression of combination of channels.

	Combination of channels					
	Beta coefficient	Standard error	*t*-Statistic	Prob. sign.	Tolerance	VIF
Access digital divide						
Use internet daily from home	0.04	0.07	1.28	0.20	0.71	1.40
Broadband internet access	0.29	0.05	9.42**	0.00	0.63	1.60
Dial-up internet access	0.11	0.08	4.34**	0.00	0.92	1.09
Mobile phone internet access	0.14	0.08	5.25**	0.00	0.86	1.17
Socio-demographic digital divide						
Age	0.04	0.01	1.33	0.18	0.84	1.19
College educated	0.14	0.04	4.73**	0.00	0.72	1.40
Employed	0.11	0.04	3.87**	0.00	0.73	1.37
Female	−0.03	0.04	−1.09	0.27	0.71	1.40
Urban	0.05	0.04	1.96*	0.05	0.81	1.23
Low economic status	−0.06	0.05	−2.35*	0.02	0.79	1.26
Constant	–	0.07	13.33**	0.00	–	–
Adjusted R^2	0.30					
F-statistic	51.23**					

*Significant at the 0.05 level.
**Significant at the 0.01 level.

at collinearity between the independent variables. Multicollinearity is generally viewed as a problem when there is a tolerance of less than 0.20 and a VIF that is greater than 5. The examination of both the statistics given in Table 7 did not indicate that multicollinearity was an issue.

As shown in Table 2, there were many citizens who used more than one channel to contact their government. The results given in this table indicate that those who had access to the internet

Table 8. Summary of significant results.

		No contact with the government	Website	Email	Phone	In-person visits	Mail	Multiple channels
N		53	160	19	205	1106	54	1138
Percent yes		4.5	13.4	1.6	17.2	92.9	4.5	95.5
Use internet daily from home	10%							
Broadband internet access	19%		13.20	18.62	1.86			0.29
Dial-up internet access	5%		5.73					0.11
Mobile phone internet access	6%		4.74					0.14
Age (average)	30–40 years						1.33	
College educated	37%		2.08		1.94			0.14
Employed	43%	0.05	2.59			2.28		0.11
Female	59%	3.09				0.48		
Urban	70%	0.52			1.61			0.05
Low economic status	23%				0.34			−0.06

Notes: $N = 1191$; ORs are reported for all contacts except for multiple channels where beta coefficients are reported.

daily from home, broadband internet access, and dial-up internet access were more likely to use a combination of channels. It appears as though an access digital divide was also present in the regression results for the combination of channels model. On examining the socio-demographic variables, individuals who were college educated, those who were employed full time, and those who lived in an urban area were more likely to use a combination of channels. Finally, citizens having a lower socio-economic status were less likely to use a combination of channels. The results for the multichannel model indicated support for 7 of the 10 hypotheses for most of the models.

Discussion of the results

Table 8 provides a summary of the significant results found in this study. The results of this study showed the impact of the digital divide on e-government use for Egyptian citizens. In-person visits to government offices were the dominate methods for citizens to initiate contact with their government. This is different from the case in developed countries in that the phone takes on more of a commanding role. However, government website and email contracts were used by 13.4% and 1.6% of Egyptian citizens, respectively. Citizens used more than one channel to contact their government. This implies that understanding channel choice is complex, and citizens will rely on different channels depending on their individual preferences and circumstances that they face, which is consistent with the literature (Reddick, 2010; Teerling & Pieterson, 2010).

The results given in Table 8 indicate that the strongest support was given for the digital divide impacting channel choice through website and multiple channel contacts. The results of this study showed that website contacts supported 5 of the 10 hypotheses. This paper also found evidence that multiple channels supported 7 of the 10 digital divide hypotheses. Individuals having broadband internet access provided the greatest support for the access divide. For the socio-demographic divide, significant support was found in being employed full time and being college educated. What is interesting to observe from these results is that there is no definitive

answer for the access and socio-demographic determinates of the divide. This can be observed through email contacts, which had only one significant variable of broadband internet access. Equally interesting is that the multiple channel contacts explained most of the digital divide variables. This result shows that, as existing research indicates, technology adoption is related to human development. In addition, socio-economic issues are related to citizens' access to public service delivery regardless of the channel choice. This confirms that service delivery is an overall access to government issue, technology has its part to play, but it is a broader issue for developing countries.

Perhaps, the most interesting finding of this study is the consistency in the direction of the impact of the digital divide on channel choice, regardless of the channel or combination of channels being used. For example, comparison of phone use with website use showed consistent digital divide impacts for both channels. This was similarly the case for using a combination of channels.

Conclusions, limitations, and future research

This paper examined channel choice with a particular focus on how the digital divide impacted the choices that citizens made when they initiated contact with their government. The results revealed that a digital divide was present across different service channels. This paper showed the limitations of viewing e-government as a single discrete channel choice, when citizens contact their government for information, services, or problem-solving. Citizens tend to use more than one channel, and governments need to be aware of this when they devote resources to one channel as they may be restricting access to another channel. Governments should recognize this and create e-government systems that better reflect this multichannel environment. For instance, mobile phones are readily available in Egypt, with 72.6% of the respondents in the survey having this device. The advances in smart phone technology will enable more citizens in developing countries, such as Egypt, to combine phone and internet contact channels. With advances in customer relationship management technology in governments, citizens can use multiple channels to contact the government and this information can be stored and accessed, representing a unique opportunity for service delivery (King, 2007; Schwester, Carrizales, & Holzer, 2009).

Research has shown that a combination of internet, phone, and call centers can provide the benefits of e-government, but not exclude a significant portion of the population (Singh & Sahu, 2008). Digital inclusion is one way of addressing the digital divide, by finding ways to include those left out of the technology and get them involved in the government (Fonseca, 2010).

Digital inclusion projects are necessary to provide access and promote social inclusion in a digital society (Madon, Reinhard, Roode, & Walsham, 2009). This paper argues that the key for the future development of e-government is to understand where it fits into complementing, rather than replacing, other public service delivery channels (Reddick, 2010).

One important policy implication of this study is that digital divide is not exclusive to the internet. Research on the digital divide has developed because of the adoption of the internet. However, there are broader human development factors at play that should be more thoroughly researched. As shown in this study, the digital divide is also applicable to other channels, an issue that existing research does not address. This indicates at least for developing counties that technology use impacts development. Therefore, those individuals who have access to technology are more readily able to receive public service delivery. Governments can use the socio-demographic and access factors found in this study and create e-government projects that promote digital inclusion.

There are important limitations of this study worth mentioning that may lead to future research possibilities. This study is limited in that we used a public opinion survey. The channels chosen by individuals will be influenced by the types of actual services available and demand at a particular point in time for a service. This survey did not address the quality of the service channels and the information available online. Another limitation of the study is that women were overrepresented in the sample. This is explained by the survey sample being composed of households having landlines. As a result of this limitation, future research could conduct focus groups examining channels and provide for broader demographic group representation in the sample. This study is also limited in that we did not deal with the degree of satisfaction that citizens have with each of the contact channels. This is important in that satisfaction with channels could promote use. Therefore, future research could possibly conduct a survey examining citizens' satisfaction with channel choices in developing countries.

Acknowledgements

This work is part of a research project financed by a grant from the *International Development Research Centre* (IDRC, Canada). The authors express their gratitude to Dr H.E. Ahmed Darwish, Minister of State for Administrative Development, for his support of the research.

Notes

1. In order to ensure greater representation of the sample, the economic level index of the families of the respondents was calculated using factor analysis. This index gives each family a value that determines its economic level compared with the rest of the families in the sample, according to the ownership of mobile phone, satellite dish, car, air-conditioner, computer, video, automatic washing machine, deep freezer, dishwasher, water heater, and the type of housing. Then, the sample households are divided into three categories corresponding to three levels of living: the first category includes families, similar to less than 40% of households in terms of standard of living in Egypt as a whole (including families that do not have a home phone), while the second category includes families similar to the proportion of 20% of households that have a standard of living for the average level of Egypt as a whole (including families that do not have a home phone), and third category includes families similar to the top 40% of households in terms of standard of living in Egypt as a whole (including the families that do not have a home phone).
2. Low economic status includes families, similar to less than 40% of households in terms of standard of living in Egypt as a whole.

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Appendix. Sampling method.

Number of responses	1191
Refused to respond	88
Incomplete interview	44
Total sample	1323
Out of service	356
Not in service	1329
No answer	1194
Number busy	62
Unqualified	7
Not qualified for this poll	3
Target gender or age group is inaccessible	654
Not a household	71
Total number of dialed phone numbers	4999