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Factors influencing e-government use in non-urban areas

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Abstract Evidence suggests that citizens outside larger urban centers are less prone to use the various functionalities of e-government, while they are the most likely to benefit from these services. Few studies have been performed to understand rural citizens' attitudes. Our purpose was to identify factors that influence the use of e-government services in outlying regions in the Province of Quebec (Canada). Our study was based on a subset of attitude-related variables that were shown to be strong predictors in prior research. We performed a survey involving 1587 citizens living in four selected outlying regions of Quebec, and held two focus groups with users and non-users of e-government. Our results confirm that attitude is influenced by perceived usefulness; perceived ease of use, perceived risk and trust and that attitude is strongly related to the intention to use e-government services. These results may help to plan more effective strategies to increase use in non-urban areas.

Keywords E-government · Outlying regions · Attitude · Intention

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1 Introduction

Most governments make tremendous efforts to offer on-line services to citizens. These services, also known as e-government, are defined as "the production and the delivery of government services through IT applications" [1] and mainly consist of information access, communication and transaction services [2]. Their use is increasing [3], but citizens in outlying regions remain less likely to be regular users than their counterparts in larger cities. Since offering traditional government services to these outlying regions is generally more expensive and requires more resources, finding ways to increase e-government use outside urban areas is major preoccupation in Quebec, as it is worldwide. From the rural citizens' perspective, the ability to connect and transact online with government services holds greater benefits, particularly for those who are isolated, are aging, or are homebound. Also, benefits of online communication in the countryside may be relatively greater than in urban areas, due to barriers of distance to alternatives, and thus the caveat of non-adoption—the costs of digital exclusion—are much greater (see, for instance Hindman [4]; Malecki [5]). Non-users in rural areas are further disadvantaged as facilities and services which were previously available by conventional means are withdrawn in favour of online provision.

Very little research has examined rural citizens' adoption of e-government, which is surprising given that they are prime candidates to adopt online services in general. Understanding their specific needs and attitudes can lead to segment-specific introduction and adapted e-government marketing strategies.

In order to provide useful guidelines for government efforts in increasing rural online service use, this research project aimed to understand the underlying factors affecting non-urban residents' attitudes in regards to e-government. The study involved a survey performed with 1587 citizens, these including users and non-users of e-government services living in four selected outlying regions of the Province of Quebec (Canada). We also conducted two focus groups in each region to obtain qualitative data about attitudes. In the light of these results, we wished to formulate recommendations to ensure a better fit between the service offer and the citizens' needs, and suggest different strategies to influence attitude and use.

The paper is organized as follows: the next section reviews the literature regarding the main theoretical models on factors influencing attitudes and intention to use e-government and the third describes the research framework used in this study. Section 4 presents the methodology and Sect. 5, the results of the survey and the focus groups. Section 6 concludes with a discussion about the contributions and limitations of the study, some future avenues for research and suggests relevant e-government strategies.

2 Factors likely to influence the intention to use e-government

Factors affecting technology adoption, and more specifically e-government adoption, have been widely investigated in prior research [6]. Three theoretical models are mainly used to explain the cognitive determinants of technological use,

and more specifically e-government use: the Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), and the Theory of Planned Behaviour (TPB). According to the model of TAM, perceived usefulness and perceived ease of use are the two factors influencing one's intention to use e-government services [7]. However, the main limitations of this model are ignoring emotional choices and the focus on technology acceptance rather than on technology use. Moreover, TAM does not consider the influence of the attitude variable, which could have important effects on system use [8]. The model of UTAUT is a revised version of TAM, differentiating the intention to use from actual use [9]. In this model, intention to use is influenced by four factors: (a) effort estimation, (b) performance expectation, (c) social influence and (d) the conditions that facilitate use [10]. According to the model of TPB, three groups of factors influence intention to use e-government: (a) attitude towards the technology, (b) subjective norms, and (c) perceived control of one's behaviour [11, 12]. This model includes:

(a) Factors influencing attitude: perceived usefulness, perceived ease of use, perceived risk, training provided, trust, personal innovativeness, and compatibility (which relates to one's preceding experience with technologies, one's values, and one's current needs).
(b) Factors influencing the subjective norm: external influence (influence from information), interpersonal influence (normative influence), and social influence.
(c) Factors influencing perceived control of one's behaviour: one's self-efficacy and facilitating conditions (time and money).

This more complex model provides more explanatory factors for the intention to use a technological application. Chuttur [13] argues that the TPB may be superior to the TAM because of its several independent variables that can capture various aspects of an individual's belief and it considers only beliefs that are specific to the given system. Moreover, Trust-based models have been proposed to further describe some facets of technology adoption. Research on trust was first conducted in studies on e-commerce [14]. "Trust" is considered an important use determinant at two levels: trust in technology and trust in the perceived integrity and reliability of the agent who collects and uses the data produced by the technology [15]. The importance of the concept of "trust" regarding the use of e-government services is justified by its relevance in the context of a political system, specific institutions or organizations, and political staff [16].

A broader analysis of research on adoption and diffusion of e-government [6] shows that although a large number of theories and theoretical constructs were borrowed from reference disciplines, their use by e-government researchers has been largely random. This meta-analysis of existing research on citizen adoption of e-government reports 37 different relationships between different factors and shows their degree of significance (and non-significance) and weight for each predictor They suggest that future studies analyzing the citizen's perspective of e-government adoption base the selection of variables on the strength of the meta-analysis cumulative findings.

Our research objective was to provide more detailed information in order to plan for productive government interventions to increase use. We therefore selected a subset of variables that appeared to have strong prediction capabilities, while excluding those that were either not relevant for citizen use ("training", "compatibility") or are uncontrollable ("subjective norms" and "perceived behavior control"). Our research variables are presented in the next section.

3 Research variables

Our research explored four variables affecting attitude. All these variables have previously been shown to play a significant role in technology adoption and e-government attitudes. We focussed our study mainly on the variables that can be influenced by government marketing, online service design or implementation strategies.

First, as was previously shown in previous studies (Table 1), we postulate that if usefulness of the new technology is reinforced in the mindset of potential users, this is likely to raise positive attitudes and consequently the intention to use it. Usefulness is assessed in terms of expected performance, productivity, effectiveness as well as effort and time savings. We also measured "perceived ease of use", which implies that when potential users perceive easiness in the use, the manipulation and the mastery of the different functionalities of a new technology, they would develop a more positive attitude towards it.

Factors such as trust and risk play a significant role as far as any e-government system is concerned [6]. Therefore we expect that as trust increases, attitude is expected to be higher. Trust is expressed towards the reliability of the technology even though no assistance is provided. It is also expected that higher levels of perceived risk could lower the attitude levels towards e-government. Risk is associated to any perceived loss or mistake due to the use of a new technology.

Table 1 Research variables

Variables	Supporting studies in e-government
Perceived usefulness → attitude	Aerschot and Rodousakis [26], Carter and Bélanger [7], Dimitrova and Yu-Che [27], Lean et al. [28], Orgeron [29]; Carter [30]; Lopez-Sisniega [31], Schaupp and Carter [32], Hu et al. [33], Horst et al. [34], Rana et al. [6]
Perceived ease of use → attitude	Aerschot and Rodousakis [26], Carter and Bélanger [7], Zhang et al. [35], Orgeron [29], Lee et al. [36]; Lean et al. [28]; Carter [30], Ojha et al. [37], Lopez-Sisniega [31], Rana et al. [6]
Trust → attitude	Carter and Bélanger [7], Carter and Weerakkody [10], Dimitrova and Yu-Che [27], Goldfinch et al. [38], Lean et al. [28], Lopez-Sisniega [31], McNeal et al. [39], Orgeron [29], Carter and Bélanger [7], Shapiro et al. [40], Tassabehji et al. [14], Park [41], Hung et al. [11, 12], Carter [30], Schaupp and Carter [32], Rana et al. [6]
Perceived risk → attitude	Bélanger and Carter [42], Bélanger et al. [15], Rana et al. [6]
Attitude → intention	Hung et al. [11, 12], Rana et al. [6]

Finally, we wished to verify the link between attitude and intention to use, given that both these variables have been previously shown to be strongly related, and in turn predict use [6].

The previous studies on these different determinants of attitudes and intention to use are presented in Table 1 and research variables are described in Table 2.

To our knowledge, only one study was designed to investigate the particularities of e-government attitudes and adoption factors in rural areas [2]. The distinction between urban and rural citizens is relatively absent in past research. This probably indicates that e-government access and use is still a challenge in urban areas, particularly in specific socio-demographic groups such as the unemployed, uneducated, new immigrants, or seniors.

Because of the lack of prior research on e-government attitudes in rural areas, we thought the exploratory nature of our study would benefit from qualitative data, i.e. interviews and discussions, along with the quantitative data. As explained by Jick [17], the use of triangulation can be traced back to Campbell and Fiske [18]. Defined as "the combination of methodologies in the study of the same phenomenon" [17], triangulation helps capture a more complete and contextual portrayal of the phenomenon under study. According to Bryman [19], such a practice is used in the search for corroboration and convergence as well as by the desire for enhancement and clarification of the results. A richer understanding of the determinants of attitudes can also provide more insight onto the specific strategies that governments can put into place to improve citizens' attitudes towards their online services.

4 Methodology

Our multi-method approach combined a quantitative and a qualitative data collection: a survey and focus groups. Two modes of surveys were used within each of the four selected outlying regions: a telephone random digit dialing (RDD) survey and a Web survey where participants were randomly selected from the

Table 2 Operational definition of variables

Variable	Operational definitions
Usefulness	Usefulness of e-government is assessed in terms of time-savings, effectiveness and general usefulness when dealing with government
Ease of use	The concept is based on three dimensions, i.e. ease of learning, ease of use and the ease of developing an expertise when using e-government
Risk	Risk is associated with expected problems, negative consequences, and general perceived risk related to e-government use
Trust	Trust was measured through the willingness to experiment e-government services even when no assistance is provided, general trust, and the extent to which e-government inspires trust
Attitude	Attitude refers to people's opinions regarding e-government, i.e. a positive attitude means that e-government use is perceived as being a good idea. People with a positive attitude appreciate using these online services to carry out transactions with government

appropriate regional strata of a nationwide database. The size of each sample was proportional to the regional census population. Participants were Quebecers 18 years of age and over and users of the Internet. Within each survey a quota was fixed to roughly balance the number of users and non-users of e-government services; the overall response rate was 40 %. The data set used here combines the observations collected through the phone and the online surveys for a total of 1587 citizens (810 users and 777 non-users of e-government services).

Data collection lasted from January through May 2011. Participants were living in four selected outlying regions of the Province of Quebec (Canada): (A) Bas-Saint-Laurent, (B) Saguenay-Lac-St-Jean, (C) Abitibi-Témiscamingue, and (D) Côte Nord.

Following the survey, eight focus groups were conducted consisting of two sessions held in each region with 12 participants in each group (one group with users of e-government and one group with internet users yet non-users of e-government). Participants in focus groups were recruited from the pool of people who participated to the surveys and they were given a stipend of $60CAD. They were asked about their internet skills and use, and about the electronic government services that they know and/or they master. User groups were also asked to provide examples of their use of electronic services in order to highlight their past experience or their perceptions about e-government services. The groups were also questioned about their opinions for each research variable.

The survey questionnaire was a French translation of the one previously used by Hung et al. [11]. All items were measured using a seven-point Likert-type scale, with anchors ranging from "strongly agree" to "strongly disagree." These measures have been validated several times in prior research.

5 Results

The following pages present the descriptive statistics of the respondents in the four regional surveys, the results of the tests conducted to validate the determinants of attitude regarding e-government services, the link between attitude and intention to use and finally the qualitative results of the focus groups.

5.1 Description of respondents

Table 3 shows that the use of electronic government services increases with education level. People attending or having graduated from universities are the most important users of e-government services. The proportion of users decreases for college level and for primary/secondary levels of education. Furthermore, the age group of 35–54 years has the highest proportion of users, with a percentage of 61 %, followed by those under 34 (47 %) and those over 55 years (42 %). The proportion of users of electronic government services increases as income rises. More specifically, the majority of e-government users are participants who earn an annual income over $80,000CAD (64 %). Finally, there are more users among job holders (60 %) than jobless respondents (40 %). These socio-demographic differences were observed in previous studies on e-government use [6, 20]. Since non-urban areas are

Table 3 Distribution of survey participants

	Non-users	Users
Education level		
Primary/high school	403 (52 %)	263 (32 %)
College	225 (29 %)	282 (35 %)
University	147 (19 %)	267 (33 %)
Age		
Less than 34	217 (28 %)	190 (23 %)
35-54	252 (32 %)	395 (49 %)
55+	308 (40 %)	225 (28 %)
Income		
Less than 39K$	250 (41 %)	202 (28 %)
40K–79K	249 (40 %)	309 (43 %)
80K+	117 (19 %)	209 (29 %)
Employment		
Employed	343 (40 %)	523 (60 %)
Unemployed	423 (60 %)	281 (40 %)

usually less populated by typical users than urban areas, socio-demographics can, in and of themselves, explain the lower usage rates.

5.2 Validation of the determinants of Attitude

Multiple regression analysis was used analyse the determinants of attitude. Statistical analyses were performed using the entire sample of 1587 respondents. Pearson correlations (r) were calculated in order to study the relationship between attitude and the independent variables, i.e. perceived usefulness, perceived ease of use, perceived risk and trust. The correlations are presented in Table 4, and are all significant at the 0.01 level. There are positive correlations between attitude and perceived usefulness; perceived ease of use and trust while the correlation between attitude and perceived risk is negative.

The following regression model was adjusted to the data:

$$\text{Attitude}_i = \beta_0 + \beta_1(\text{usefulness})_i + \beta_2(\text{ease of use})_i + \beta_3(\text{risk})_i + \beta_4(\text{trust})_i + \epsilon_i$$

where $\epsilon_i \sim \text{N}(0, \sigma^2)$ and $i = 1\text{--}1587$.

Table 5 provides the estimations of β parameters for each independent variable. All variables were significant. Thus, the research hypotheses were supported.

Table 4 Pearson correlation coefficients

	Attitude
Perceived usefulness	0.596
Perceived ease of use	0.584
Perceived risk	−0.586
Trust	0.618

Table 5 Determinants of attitude: estimation of regression parameters

Variable	Estimation of parameters	t value	p value
β_0	1.850	15.43	<0.0001
Perceived usefulness (β_1)	0.259	10.87	<0.0001
Perceived ease of use (β_2)	0.227	10.46	<0.0001
Perceived risk (β_3)	−0.314	−14.91	<0.0001
Trust (β_4)	0.180	7.16	<0.0001

The R^2 at 0.569, indicate that 56.9 % of the variability of attitude is explained by the independent variables of the model. Residual analysis shows that the homogeneity assumption underlying the model was met but the Shapiro–Wilk test for normality applied on the residual was rejected. Given the large sample size, the normality test is very powerful. However, the coefficients of skewness and kurtosis were very close to those of a normal distribution, and regression analysis is robust enough for non-normality. In fact, we adjust the model using the robustreg procedure of the SAS [21] program and obtain similar results. Therefore, we can consider that our results are valid. No problems of multicolinearity and influential observations were detected.

5.3 Validation of Attitude-Intention to use link

In the second step of our analysis, a student t test was conducted to compare the score of attitude between citizens who intend to use e-government and those who do not intend to use e-government. Table 6 shows the mean score of the variable Attitude among those two groups. The score is significantly higher than the mean score obtained for citizens with no intention to use this technology (2.81 vs. 3.89).

5.4 Qualitative results

The focus groups allowed us to further investigate the variables underlying citizen's attitude towards e-government services in outlying regions of Quebec from two perspectives: users and non-users. Tables 7, 8, 9 and 10 emphasize positive (+) and negative (−) points of view regarding each research factor expressed by users as well as by non-users of e-government services at some point in the focus group. Generally, participants formulated more positive than negative comments. "Perceived ease of use" generated more negative comments than other factors, while "Perceived usefulness" received mostly positive comments.

5.4.1 Perceived usefulness

On perceived usefulness, users mostly commented on positive elements they find in e-government services, while non-users made more nuanced comments, namely in regards to public services access. The closeness of counter services and absence of traffic in the neighbourhood make some participants favour direct contact with government agencies.

Table 6 Attitude and intention

Intention	N	Mean score of attitude	Standard deviation	t value	p value
No	708	2.81	0.889	–	–
Yes	820	3.89	0.826	–	–
Diff (Yes − No)	–	−1.079	0.856	−24.45	<0.0001

Table 7 Comments on perceived usefulness

Users	
Flexibility (+)	E-government services accommodate those with atypical time schedules
Mobility (+)	It offers access from mobile electronic devices
Time (+)	Shorter time for transaction processing, communication and access to information
Information access (+)	The volume of information available on the Internet is larger compared to other media. It is an effective way to obtain information
Learning (+)	Online government information is likely to improve self-learning about public policies
Improved communication (+)	It helps users to get around the problem of encumbered phone services
Accuracy (+)	Information obtained by email from governmental bodies is more accurate and can be archived
Facilitates follow-up (+)	Online transactions with government are well-structured with the possibility to follow up on orders
Payment flexibility (+)	Variety of payment modes offered
Non-users	
Time flexibility and time saving (+)	Online services facilitate the organization of their documentation with the government
Access to public services (−)	Due to closeness and absence of traffic in the neighbourhood, some participants favour face-to-face contact with government agencies

5.4.2 Perceived ease of use

Perceived ease of use received many negative comments from users as well as from non-users. Participants formulated critiques towards content as well as towards the interface quality of websites. It appears that e-government services are viewed as relatively burdensome to use as the specificity of the task increases. Comments relate to information overload (e.g. use of appropriate keywords, complex texts) and time to get answers (delay for e-mail requests, time to find specific information).

5.4.3 Perceived risk

Participants appear to wonder about the quality of the infrastructure of the e-government infrastructure. Discussions reveal that users and non-users alike are

Table 8 Comments on ease of use

Users	
Ease of use (+)	Easiness of personal data transmission and user-friendliness of government websites
Ease of use (−)	More complex situations are difficult to handle online. The phone is viewed as more favorable for this purpose
Complexity of texts (−)	Density and lack of a suitable structure of text
Time to obtain answers (−)	Length of obtaining responses through email is a drawback to online communication with public administration
Non-adapted information (−)	Use of the phone rather than accessing online services helps to obtain more adapted information about specific requests
Difficulty to find information (−)	Difficulty to find information on specific topics on the government websites
Limited keywords (−)	Limitation related to the necessity to use specific keywords for a conclusive search
Complex registration procedure (−)	Lengthiness and complexity of the registration procedure as well as the difficulty and burden to memorize various passwords
Non-users	
Time (−)	Significant loss of time trying to grasp long and complicated information provided on public websites
Lengthiness of different texts (−)	Participants expressed the need for more adapted text load and visual attractiveness

Table 9 Comments on perceived risk

Users	
Privacy (±)	The general perception regarding security of online transactions with the government is positive. However, some participants expressed concerns about the privacy of their personal information following revelations in the media about piracy in public servers
Security (−)	Phone communication is generally viewed as a more secure since you know to who the information is delivered to
Infrastructure security (−)	Perceived risk is more related to the security of the government's databases
Non-users	
Security (−)	Potential risks related to the necessity to download specific applications and to memorize different passwords
Bugsand viruses (−)	The unavailability of some web pages as well as bugs and viruses are some concerns

preoccupied by issues related to piracy, viruses and general protection of their personal information. These comments seem to confirm prior results stating that many customers are unwilling to engage in e-commerce because of uncertainty regarding issues of security and privacy of the data transaction [22]. Past research has also shown that the perception of system security was the biggest fear for the online users while threat of data interception by the third party follows [23].

Table 10 Comments on trust

Users	
Credibility (+)	Online information is perceived as more credible
Accuracy (+)	Information on the website is more accurate. Civil servants responding on the phone may provide false or incomplete information
Staff understanding (−)	Government staff misunderstands the citizen's information needs
Control (+)	Internet is a more controllable channel of information than the phone or face to face
Trust (+)	Information on the public websites is perceived as more explicit and valid, which raises trust towards online public services
Non-users	
Precision (−)	Ambiguity of information delivered in some public websites triggers confusion and frustration. To fulfill information requests, some human interaction is required
Trust (−)	Human presence enables trust in e-government services
Bonuses of information (−)	Human assistance on the phone helps to obtain "bonuses" of information, such as specific advantages of fiscal regulations
Deeper information (−)	Talking with civil servants in person or on the phone allows for additional questions on the subject of interest

5.4.4 Trust

There appears to be some significant trust discrepancies between users and non-users. Although the information provided on government websites is perceived to be trustworthy in general, more specific requests may be misunderstood if they are not given verbally. In other words, direct contact with government staff provides a richer channel of communication, either to properly explain a request or to get clear and more relevant answers.

These focus group observations provide interesting and richer information about outlying citizens' perceptions of e-government services. We will further discuss the implications of these findings in the next section.

6 Conclusion

In order to answer the question "What are citizens' in outlying regions impediments to use online government services?" we conducted large scale survey with 1587 citizens users and non-users of e-government services (810 users and 777 non-users) living in four selected outlying regions of the Province of Quebec (Canada). We also conducted two focus groups in each region.

This study is original because of its focus on rural residents (users and non-users). The results provide more evidence to the fact that four factors determine users' attitudes towards e-government online services: perceived usefulness, perceived ease of use, perceived risk, and trust. Furthermore, focus group results helped deepen our understanding of the phenomenon by exploring the meaning behind the

concepts. Usefulness of public online services is perceived in terms of availability, flexibility, celerity, mobility, learning and a better follow-up of communications and transactions with government. Ease of use is expressed in terms of comprehensibility and readability of the content as well as with the proper organization of the information. Perceived risk is related to the security of online transactions with public administration along with the imperfections of the technology (bugs and viruses). Finally, trust in e-government services seems to increase as the technology provides more reliable information to users. These results indicate that if governments wish to develop strategies to increase e-services use in outlying regions, they must focus on changing the citizens' perceptions along these four variables. These strategies could be, for instance, communication plans to explain the safety of online services, or interface redesign to improve ease of use [24].

Our focus groups discussions about "trust", "ease of use" and "perceived risk" all show an underlying need for relevance and specificity in some interactions with the government. Ebbers et al. [25] previously argued that, in their interactions with governmental agencies, citizens use different channels (Web site, telephone and front desk) alongside each other. For the conversation mode (which facilitates treating ambiguous problems) citizens still prefer traditional channels. Pieterson and van Dijk [24] also found that channel choice is based on task complexity and ambiguity. These authors suggest that governments rethink their channel management strategies in order to take these needs into account, i.e. use Web site and front desk as preferred channel types for consultation while using the phone and front desk for conversation.

As is typical of correlational studies, a causal relationship between the independent and dependent variables cannot be proven, and it is possible that attitudes are established once the intention to use or not is decided. However, based on the extensive number of previous studies on the relationship between attitudes, intentions, and technology adoption factors, we can be relatively confident in concluding that governments (the Quebec government in particular) can impact user intentions with strategies that change citizens' attitudes and perceptions.

Our main purpose in this study was to confirm factors underlying attitudes and intention to use e-government and provide a deeper understanding of these factors, rather than to provide more evidence to the theories of technology adoption. Our knowledge of e-government use in non-urban areas may benefit from additional studies to assess the influence of other groups of factors stemming from the TPB model, namely those related to subjective norms and perceived control of behavior. It is possible, for instance, that social norms in rural areas differ from those in urban areas, and that these have more of an impact on people's intention to use online services.

Of course, all questions to citizens were based on their perceptions of e-government services and not on actual use. More research is therefore needed to confirm that the implementation of the different government strategies we propose do in fact have a positive impact on online services adoption.

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