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Abstract

This article explores the use of e-government services from the perspective of digital divides. First, it aims to find out which socio-demographic, economic and geographical factors predict the use of e-government services. Second, the article aims to show whether these factors moderate the way in which the time spent on the Internet is associated with the use of e-government services. The article is based on survey data (N=612) collected in Finland in May–June 2011 and is analysed by using a logistic regression modelling. Results show that gender and income moderate the link between the Internet and e-government service use. The more that women use the Internet, the more they use the government's electronic services. However, among men, the use of e-services does not increase similarly with the use of the Internet. Regarding income indicators, results imply that e-service use increases with Internet use but only among the respondents with low income levels. Additionally, the article shows that education, children, income and the size of the place of residence have major effects on the use of the government's e-services. Lastly, the empirical results are briefly discussed in relation to the digital divide discussion and some policy implications are presented.

Keywords

e-government, service, the Internet, users, adoption, Finland

1. Introduction

The future of the modern welfare state is subject to the successful digitisation of public services and administration. The term ‘e-government’ has been extensively applied to refer to the potential for information and communication technologies (ICTs) to help in network building and service delivery, and to increase the interactivity, transparency and efficiency of government (Yildiz, 2007). This potential is much needed in all industrialised countries, which have difficulties in providing a variety of public services (e.g. social benefits and tax counselling) in an economically suitable manner to their rapidly aging populations. In the face of these challenges, governments have been forced to close their offices and replace them with electronic service platforms. However, from the perspective of digital divide studies it remains unclear whether industrialised countries are able to combine a more balanced economy and socially equitable development of their respective information societies. *The technocratic approaches* to digital divides argue that social inequalities are temporary by nature and that time will level them out with the simultaneously increasing access to new ICTs. This approach is contrasted with three other perspectives. *The social structure approaches* see inequalities as structural and not conditional on technological development. *The information structure and exclusion approaches* acknowledge the connection between ICTs and growing social disparities. *The modernization and capitalism approach* takes a step further by arguing that inequalities are highly structural and that ICTs are not only sustaining them but also creating completely new ones (Sassi, 2005, p. 694). It is against this backcloth that the article aims to produce empirical-based information about the predictors of e-government service use and to

contribute to the digital divide studies from the perspective of the use government's electronic services.

These aims form the basis for the following two research questions. First, the article seeks answers to the question: 'To what extent are socio-demographic, economic and geographical factors associated with e-government service use?' Second, the article aims to find out: 'Do these factors moderate the way in which the time spent on the Internet is associated with the use of public e-services?' The study is premised on survey data (N=612) collected in Finland in 2011. The data is analysed by using logistic regression analysis. As the survey contains only information collected from citizens, this study is not able to look at e-government services targeted at enterprises. The chosen perspective, where citizens' interaction with government is explored, is also known as a 'demand perspective'. Many previous research projects have investigated the supply side by analysing the services that central and local governments provide over the Internet (Reddick, 2005).

The article begins with a literature review that is carried out to formulate the exact literature-based hypotheses for the study. Next, the research method, data and measurement instruments are described. After this, the findings of the study are reported one hypothesis at a time. Discussion and the limitations of the study are presented before the article ends with conclusions and policy implications.

2. Literature

2.1 Electronic government in Finland

Finland was one of the early-adopters of e-government. Its general atmosphere has been open to change, modernisation and technological innovations, as its citizens have been, on average, well-educated and technologically savvy (OECD, 2010). At the political level, investments in technological innovations have been considered as a way to sustain competitiveness in the economy. However, Finland has simultaneously suffered from the fragmented and multilayered structure of its e-government, where a set of central-government, regional and municipal actors have built incompatible platforms for state-citizen interaction (National Audit Office of Finland, 2008; Turkki, 2009).

Nevertheless, recent statistics show that Finland is still among the top European information societies, although, other Nordic countries in particular rank higher than Finland regarding e-government use and services. In 2010, 58 per cent of 16 to 74 year-old Finns had used the Internet in the last 3 months for interaction with public authorities¹ (60% men, 56% women), while in 2005 the same figure was 47 per cent (no gender differences). The corresponding figure in 2010 for the EU25 was 33 per cent (35% men, 31% women). It is also worth mentioning that the availability of e-government services² in Finland has increased between 2005 and 2010 from 69 to 95 per cent (EuroStat, 2011).

In recent years, several policy measures have been made to boost the development of e-government infrastructure in Finland. In 2010, a new information society strategy was published and it was compiled to be in line with the national innovation strategy and the European Union's digital strategy (Ministry of Transport and Communications, 2010, p. 8; COM, 2010). These strategies underline, among many other things, interoperable e-

¹ In EuroStat (2011) statistics, e-government is measured as a proportion of those who have used the Internet for one or more of the following activities: obtaining information from public authorities' web sites, downloading official forms, submitting completed forms.

² A proportion of 20 basic services which are fully available online (for more information see EuroStat 2011).

services, not only within nation states but also across their borders. In Finland, the one-stop citizens' portal (suomi.fi) has recently been improved to provide a variety of services through one portal and personal e-service accounts are due to be launched later in 2011 (Ministry of Finance, 2011).

2.2 Socio-demographic, economic and geographical predictors

Differences in the exploitation of the Internet in general have been often studied through three theoretical frameworks. The *Uses and Gratification Theory* considers that the Internet is used to gratify certain needs. This psychological theory has been contested by the *Social-cognitive Theory*, which explains the existing media usage by habits and behavioural incentives: expected positive usage experiences contribute to the further exploitation of the media. The *Technology Acceptance Model* is based on the idea that the perceived usefulness and ease of use would determine people's attitudes toward technologies (e.g. LaRose, Lin & Eastin 2003; LaRose & Eastin, 2004; van Dijk, Peters & Ebbers, 2008).

However, as the use of e-government services is perhaps not primarily guided by the principles of gratification, habit or usefulness, but a practical need to gain access to these services, the user's *capability* approach (Mante-Meijer & Klamer, 2005) appears more promising in this connection. People's skills and competences to use the Internet vary according to gender, age and education, while the place of residence, social position and family situation are linked to divergent service needs (e.g. Carter & Bélanger, 2005; Horst,

Kuttschreuter & Gutteling, 2007; van Dijk, Pieterse, van Deuren & Ebbens, 2007; Colesca & Dobrica, 2008; Colesca, 2008; Carter, 2008).

Earlier studies present some contradictory results on the effects of *gender* on public e-service use. Choudrie and Dwivedi (2005, p. 6) found that in the UK men were more likely users of the government's electronic services than women. The majority of studies, however, have not found gender differences in the use of and attitudes towards e-government services (Reddick, 2005, p. 52; van Dijk et al., 2007, p. 161; Colesca & Dobrica, 2008, p. 213; Bélanger & Carter, 2009, p. 134). *Age* is much more clearly associated with e-government service use as far as previous studies are concerned. Younger citizens are more likely to be users than older ones (Colesca & Dobrica, 2008, p. 213; Bélanger & Carter, 2009, p. 134). Two separate studies provide even more specific evidence arguing that the age of 55 is a dividing line in this respect (Choudrie & Dwivedi, 2005, p. 8; Reddick, 2005, p. 52).

There is also evidence that *education* is the most powerful single predictor for the use of and attitudes towards e-government services; adoption rates become higher and attitudes more positive with increased levels of education (van Dijk et al., 2007, p. 161; Colesca & Dobrica, 2008, p. 213; Bélanger & Carter, 2009, p. 134). Considerably less is known about household combinations and the ways they are related to the use of public e-services. Van Dijk et al. (2007, p. 164) conclude that, in the Netherlands, parents aged 30–45 years are likely to belong to group demonstrating high-use of e-government services. Also, the study by Hung, Chang and Yu (2006, p.106) hints that married people are more likely to be the adopters of the government's online tax filing and payments systems in Taiwan. On these grounds, it can be assumed that people living in a household with

children would also use more public e-services than those who live without children, as their needs for services and benefits are manifold.

There is also relatively little previous knowledge on the relationship between *social position* and public e-service use. Van Dijk et al. (2007, p. 164) found that employees, students, and the unemployed would use these services more, whereas pensioners, housewives/-husbands and disabled persons would use them only a little or not at all. Studies that have focused on employees, show that the higher the socio-economic status the higher the adoption rate (Choudrie & Dwivedi (2005, p. 1). Based on these findings, it can be anticipated that the unemployed and housewives/-husbands and the like, who are more dependent on the government's social benefits and services, also utilise e-government services more than employed persons and pensioners, whose life situations and sources of income are more steady.

Earlier studies examining the effect of *income* on e-government service usage have produced slightly contradictory results which are also subject to country contexts. Colesca and Dobrica (2008, p. 213) found no indication that income would predict the adoption of e-government services in Romania. However, studies from the USA and the UK have shown that the higher the income, the more likely the people are to use public e-services and conduct online transactions with the government (Choudrie & Dwivedi, 2005, pp. 9–10; Reddick, 2005; Bélanger & Carter, 2009, p. 134). Earlier studies have also put forward an idea that there could be *geographical* variation in the use of e-government services (Reddick, 2004, 58). Typically, the early-adopters of new technology and digital services reside in urban and metropolitan areas (Strover, 2001; Tookey, Whalley & Howick, 2006; Rusten & Skerratt, 2008). In fact, this seems to be the case even where people in remote regions and smaller settlements would be the first to suffer from a decline in the set of

'offline' services and, as a result, would be more dependent on the provision of online services. Finally, in various studies conducted in the USA, citizens' ethnic backgrounds have been linked to the take up of public e-services (e.g. Reddick, 2004, p. 51, Bélanger & Carter, 2009, p. 134). Due to a lack of relevant measure and the fact that the target group of the exploited survey is still relatively homogeneous in terms of their ethnic backgrounds, this factor is not included in empirical analysis.

The above-reviewed literature shows that it is only the main effects of the numerous predicting variables that have been previously explored. Potential interaction effects between two or more predictors on e-government service use have so far remained largely unexplored. Based on the above-reviewed literature, the following hypotheses can, however, be set for the study:

H1a: Gender is not related to the use of e-government services.

H1b: Older persons are less likely to use e-government services than younger ones.

H1c: Highly educated people are more liable to use public e-services than less educated people.

H1d: Unemployed persons, housewives/-husbands use e-government services more than employed persons, students and pensioners.

H1e: Persons living with children use more government e-services than those living without children.

H1f: Persons with a high household income are more likely to use public e-services than those with a low household income.

H1g: Persons living in larger cities use public e-services more typically than those living in smaller towns and villages.

2.3 Interaction effects with Internet use

According to previous research (Bélanger & Carter, 2009, p. 134; Reddick, 2005, p. 52), the frequency of Internet use, like the amount of online experience (e.g. years of using), are also connected to e-government service usage. The more people spend time on the Internet and the longer people have been using the Internet, the more likely they are to deploy e-services supplied by the government. For instance, Reddick (2005, p. 51) has pointed out that e-citizens, those acquiring information from and conducting transactions with the government on the web, are likely to have a greater number of years of online experience and to be more frequent consumers of government web sites.

Further, there are reasons to believe that various background variables modify the way in which time spent on the Internet (hereafter referred to as 'online time') is associated with the use of e-government services. As the previous literature lacks an analysis of such interaction effects, a more pragmatic reasoning is needed to identify potential interaction effects. First, as the quality and nature of Internet use have remained heavily gendered (e.g. Selwyn, Gorard & Furlong, 2005, p. 20; Wasserman & Richmond-Abbott, 2005) – women's usage is characterised by their domestic responsibilities, such as online banking and communication between the home and schools (Waiser, 2000; Statistics Finland, 2011, p. 26), whereas men play more online games, and download and listen to music etc. (Jones, Johnson-Yale, Millermaier & Perez Jones, 2009, p. 246–47; Lucas & Sherry, 2004) – it can be expected that, with the increase in overall online time, the probability for women to be government e-service users will increase more than that of men. Second, as young people are, on an average, more technologically savvy than older people, they use e-government

services more actively, regardless of their overall online time. Among older people, the use of e-government services is more dependent on the time devoted to the Internet. Age-based differences in the use of public e-services could be expected to become smaller as the time spent on the Internet increases. Third, it is often the case that children add to the need for people to interact with the government in order to receive various forms of family benefits, services, and parental leave. With the growing scarcity of face-to-face service provision, people with children are more and more explicitly forced to use government e-services, even if they would prefer not to do so. Among heavy-users of the Internet, the difference between people with and without children can be expected to be smaller or non-existent. Fourth, it can be anticipated that the likelihood of being a government e-service user increases more substantially with the overall online time for people with low incomes compared to people with high incomes. This is related to their more versatile and regular need to interact with the government in order to obtain financial support and housing benefits. Lastly, here it is considered less likely that the online time would be differently linked to the use of public e-services according to respondents' levels of education, social positions or the size of the place of residence. Thus, only the following four hypotheses dealing with moderating effects are set for the study:

H2a: With the increase in online time, women are more likely to use e-government services than men.

H2b: The difference in the use of e-government services between younger and older people becomes smaller with the increase in online time.

H2c: People living with children probably use more e-government services than those living without children but this difference becomes smaller with the increase in online time.

H2d: With the increase in online time, people with a low household income use more e-services than those with a high household income

3. Method

3.1 Procedure

The article is premised on a logistic regression analysis (LRA). LRA was conducted with a hierarchical procedure at five steps, where the use of e-government services worked as a dependent variable (see Section 3.1.1). At the first step, personal background variables (gender, age, education, and social position) were entered in the model. At the second step, household level variables (income and children) were added to the analysis. Then, the size of the place of residence was included in the model at the third step, and a variable measuring online time was added at the fourth step. Lastly, two-way interaction effect terms were incorporated into the LRA model.

All predicting variables were standardised for the regression analysis to ensure that the interaction terms could be appropriately tested and illustrated. The Hosmer-Lemeshow test was used to indicate the goodness-of-fit of the LRA model. To identify the overall proportion of the variance explained by the model, Nagelkerke-statistics were referred to (Tabachnick & Fidell, 2007, pp. 459–461). Furthermore, the total percentages of correctly predicted cases were analysed to assess the predicting capacity of the model.

3.2 Data

The data (N=612) was collected from Finland in May–June 2011. The mode of data collection was a structured postal survey. The nationally representative sampling was carried out by the Population Register Centre of Finland. The sampling frame consisted of 15–65 year-old Finnish speaking citizens covering all geographical regions of the country. The survey was pre-tested with ten persons.

The design of the questionnaire benefited from two earlier survey studies. The majority of the questions was adopted from the ‘Telecommunication and Society in Europe’ telephone survey that was carried out in Italy, Spain, Germany, France and the UK in 2009. This survey is a partial replica of another survey conducted in the same countries in 1996 (Fortunati & Manganelli, 1998). Another survey exploited was ‘On the Move: The Role of Cellular Communications in American Life’, that was conducted at the University of Michigan in 2005 by Mike Traugott, Thomas Wheeler and Richard Ling (On the Move, 2006).

The main characteristics of the data are presented in Table 1. It shows that women are overrepresented in the data. Furthermore, the table shows that lowly educated respondents are more likely to be non-users of e-government services than the highly educated. Regarding respondents’ social positions, pensioners seem to stand out from the rest, being more typically non-users. The data characteristics also indicate that, on the one hand, the respondents living in the smallest settlements and, on the other, the respondents, who spend one hour or less per a day on the Internet, would be more typically non-users than others.

– Insert Table 1 here –

3.3 Measurement instruments

3.3.1 Dependent variable

The use of e-government services was measured by the responses ‘yes’ (81%) or ‘no’ (19%) to the following question: ‘When using the Internet from home, which of the following activities do you practice at least sometimes?’ The question was followed by a list of 25 activities of which one was ‘e-government services’. This activity was accompanied with two prompts: ‘Kela, Vero.fi’. The first refers to the online platform of the Social Insurance Institution of Finland and the latter to the web portal of the Finnish Tax Administration. These are two major e-government service platforms in Finland.

3.3.2 Independent variables

To measure *gender*, fixed answering categories, 1 = ‘Man’ and 2 = ‘Woman’, were supplied. *Age* was ascertained by asking for the year of birth, which was then recoded into full years ($M=44.45$, $SD=15.07$, $Range=15-74^3$). *Education level* was measured as the highest completed level of education in accordance with The International Standard Classification of Education (ISCED97). The ISCED scale was recoded in three new categories to ensure the sufficient number of cases in each category: 1 = ‘Low education’ (ISCED levels 1–2), 2 = ‘Medium education’ (ISCED levels 3, 4 and 5b), and 3 = ‘High education’ (ISCED levels 5a and 6). The indicator for *social position* was recoded from the

³ Descriptive statistics (range, mean and standard deviation) are provided only for continuous variables. Table 1 provides descriptive information about the categorical and ordinal scale variables exploited in the study.

question ‘What describes your current situation best?’: 1 = ‘Employee’, 2 = ‘Housewife/-husband’, 3 = ‘Unemployed’, 4 = ‘Pensioner’, 5 = ‘Student’ or 6 = ‘Other’.

The *children* measurement was developed from a question with ten fixed answering categories measuring the type of household. By combining the answering categories, a dummy variable was created where 0 = ‘no children’ and 1 = ‘children’ (one or more). It is worth noting that children are not inevitably the respondent’s own, but belong to the same household. *Household income* was measured by asking ‘What is the total annual income of your household, that is, the approximate total of all salaries, pensions and other revenues?’ Answering categories ranging from 1 = ‘Less than 20 000 Euros’ to 8 = ‘More than 80 000 Euros’ were supplied (M=4.32, SD=2.32, Range=1–8).

City size was ascertained by asking ‘How many inhabitants has your city/town/village?’ and by providing eight answering categories. The answering categories were reduced to the following five to increase the number of cases involved in each category: 1 = ‘Less than 5 000’, 2 = ‘5 001–30 000’, 3 = ‘30 001–100 000’, 4 = ‘100 001–250 000’ and 5 = ‘250 000 or more inhabitants’.

For *online time* the question was: ‘How often, and how much, do you personally use the Internet from home?’ The question involved nine answering choices ranging from 1 = ‘Every/nearly every day, 4 hours or more’ to 9 = ‘Rarely’. Recoding was undertaken to reduce the scale and to present the scale in reverse order. In the recoded variable – that is treated as a continuous measure in the LRA – values correspond to the following statements: 1 = ‘About one hour a day or less’, 2 = ‘Everyday, about 2 hours’ and 3 = ‘Everyday, about 3 hours or more’ (Range=1–3, M=1.88, SD=.87).

4. Results

The results of the LRA testing of the hypotheses are presented in Table 2. The table shows that the full regression model, which involves 418 valid cases, is able to predict correctly 82 per cent of all cases with Nagelkerke's pseudo R squared of 26 per cent. The model also passed the Hosmer-Lemeshow test for goodness-of-fit.

First, the LRA model provides support for *H1a* as no differences were found between men and women regarding the use of e-government services when the main effect of gender was tested. Second, the model elicits results contradictory to *H1b*, which argued that older people would be less likely to use these services. In fact, the results indicate that age does not play a role in the use of public e-services in Finland. Third, the LRA model gives support to *H1c* as highly educated people are much more likely to use public e-services than their less educated counterparts. Compared with lowly educated respondents, the highly educated and respondents with a medium level education are about six times and 3.5 times, respectively, as likely to use the e-services in question. Fourth, the regression analysis does not provide support for the anticipated (*H1d*) relation that unemployed people and housewives/-husbands would more typically use e-government services than employed persons, students and pensioners. Fifth, the results give weak support for *H1e*, dealing with the effect of children on the use of e-government services. According to the analysis, it appears that respondents who live in a household with children are more likely to use e-government services than those living in households with no children. Sixth, the LRA model provides opposite results (albeit relatively weak) to *H1f*, concerning the effect of income. Contrary to the presumption, it seems that respondents with a low household

income would be more likely to use government e-services than respondents from high income families. Seventh, *H1g*, concerning the effect of city size on the use of public e-services, receives support from the data: it really seems that people living in bigger cities more typically use public e-services than those residing in smaller settlements. For instance, respondents living in cities of 250 000 or more inhabitants are four times as likely as respondents from the smallest villages (less than 5 000 inhabitants) to exploit public e-services. Nevertheless, the probability of increased e-government use is perhaps not completely straightforward as those who live in settlements of 30 001–100 000 inhabitants use services slightly more often than the residents of cities with 100 001–250 000 inhabitants. This might reflect the fact that families made up of well-trained adults, with children and middle or low income levels, and who are thus heavy users of government services, are also forced to move from big cities to surrounding middle-size and small municipalities in a search of lower-priced houses and larger properties. This finding suggests that digital equalities should be understood more as digital continuums or spectrums than as dualistic phenomena (e.g. the rural-urban distinction) (Lenhart & Horrigan, 2003).

– Insert Table 2 here –

As Table 2 shows, the LRA model produces statistically significant results with regard to the interaction effects as well. First, the model shows that *H2b* and *H2c* are rejected as the interaction effect between online time and age and that between online time and children are not significant. Second, the table reveals a significant interaction effect

between online time and gender and that between online time and household income. Fig.1 and 2 were created to illustrate these interactions.

In response to *H2a*, Fig. 1 shows that, with the increase in online time, women are more likely to use e-government services than men. Even if this finding provides support for the hypothesis, Fig. 1 also shows that among those who spend only a little time on the Internet, men are actually slightly ahead of women as the users of e-services. Among those who spend a lot of time on the web, women are clearly more likely to use these than men. The probability of men using these services does not increase at all with the increase in their daily online time.

Fig. 2 is illustrative of the interaction between online time and household income. As was anticipated in *H2d*, the respondents with a low household income use more e-services than those with a high income level when the overall online time is high. However, when only a little time is devoted to the Internet, there is basically no difference at all between people with low and high household incomes in the probability of using e-government services.

– Insert Fig. 1 and 2 here –

Figure titles:

Fig. 1. The interaction effect of online time and gender

Fig. 2. The interaction effect of online time and household income

5. Discussion

5.1 Interpreting unexpected results

As Bélanger and Carter (2009, p.134) write, citizens have often no choice than to interact with government, and must do so in specific time frames. The findings of this study, indicating that age does not predict the use of e-government services in Finland, unlike in some other countries, can be interpreted through this comment. During the last decade or so, a substantial number of tax offices and government offices providing social security benefits have been closed in the name of improving the public sector's productivity. These closures have hit the small and remote municipalities the hardest. Consequently today, people, who have historically been less technologically savvy, such as elderly, have less and less choice than to exploit online services. The other finding concerning the absence of differences between the unemployed, employees, pensioners, students and housewives/-husbands, can also be at least partially understood by this development.

The third unforeseen result relates to the negative relationship between household income and e-government use. Previous studies from the UK and the USA have registered the opposite connection, which can be explained, par excellence, by differences in welfare provision systems. Whereas the UK represents liberal welfare with moderate or minimal support for families and the unemployed, having some similarities to the US model of minimal welfare provision, Finland provides comparatively extensive and flexible social security benefits to compensate for the risks related to unemployment, illness, disability or being a student (e.g. Esping-Andersen, 1990; Kovacheva, Doorne-Huiskes & Anttila,

2011). In fact, a low income level is typically a consequence of the realisation of these risks, and, to access the benefit, low income people are increasingly dependent on government e-services in Finland. The results dealing with the interaction effects also show that if a person with a low household income is already an active Internet user in Finland, that person is already likely to be a user of e-government services. But among those who have a low household income and who use the Internet only occasionally, e-government service use is also at a low level.

Lastly, interaction effects also revealed that even if gender does not directly predict e-government service use in Finland, it modifies the way in which online time is linked to usage. In fact, this outcome seems to be in line with the traditional division of labour in the domestic sphere of life. It seems that the online time of women is also more strongly connected to the domestic responsibilities such as handling of social benefits and services on the web than that of men. In general, the discovered interaction effects support the idea of multidimensional and complexly shaped digital inequalities as opposed to digital divides as clear distinctions, for example, between men and women or the youth and the elderly.

Actually, the situation looks quite hopeless in terms of digital inequalities. Rural people who would benefit most from government e-services are not using them, while in cities that have been able to maintain office services people use also e-services. Education that adds to people's *capability* to cope in an ever more technology-mediated society seems to be a key to increase the use of government's e-services, although the most educated people already live in the largest cities. All in all, the results of this study are clearly against the technocratic approaches to digital divides. The results speak for opposite theories which argue that existing educational and geographical disparities cannot be easily solved by

introducing new technology, and that new ICTs may, in the worst case, end up to serve those who already are in an advanced position.

5.2 Limitations of the study

First, it is also possible that the odd ratios are slightly overestimated owing to the modest size of the data (Nemes, Jonasson, Genell & Steineck, 2009). A larger data might have had confirmed the statistical significance of certain effects, especially those of age and gender. Second, the study was built upon the analysis of only one dependent variable that was used as an indicator for the overall utilisation of public e-services. A larger variety of indicators, separately measuring different e-services, would have made a more meticulous picture of e-government service use possible. Third, as the study produced some findings that departed from previous research projects conducted in other countries, cross-national data would be needed to clarify these differences in the future.

6. Conclusions and policy implications

In conclusion, the study provided answers to both research questions. With regard to the first question, it was revealed that not only the level of education, but also two household level indicators, children and income, and city size, predict the use of e-government services in Finland. Age and social position had no main effects on the usage. In response to the second question, it was shown that gender and income moderate the

effect of online time on e-government service use, while other background variables had no moderating effects. These and others findings reported in the article also have policy implications of which the most important are as follows:

1. Practical measures are required to encourage people with a low income to use the Internet more as this is likely to increase their interaction with the government.
2. To promote gender equity in the handling of domestic responsibilities over the Internet, it is pivotal to encourage males who are heavy users of the Internet to undertake a larger share of these tasks.
3. Raising awareness and developing skills related to the use of e-government services should be targeted especially at people who reside in remote regions and have a low level of education. This target group also includes older citizens, who would likewise benefit from these targeted measures to alleviate digital inequalities.

References

Belanger, F., & Carter, L. (2009). The impact of the digital divide on e-government use.

Communications of the AC, 52(4), 132–135.

Carter, L., & Belanger, F. (2005). The utilization of e-government services: Citizens trust, innovation and acceptance factors. *Information Systems*, 15, 5–25.

Carter, L. (2008). E-government diffusion: A comparison of adoption constructs.

Transforming Government: People, Process and Policy, 2, 147–161.

- Chourdie, J., & Dwivedi, Y. (2005). A survey of citizens' awareness and adoption of e-government initiatives, the 'Government Gateway': A United Kingdom perspective. In Z. Irani, T. Elliman & O. D. Sarikas (Eds.), *Proceedings of the eGovernment Workshop '05 (eGOV05)* (pp. 1–13) London: Brunel University.
- Colesca, S.E., & Dobrica, L. (2008). Adoption and use of e-government services: The case of Romania. *Journal of Applied Research and Technology*, 6(2), 204–217.
- Colesca, S. E. (2008). Increasing e-trust: A solution to minimize risk in e-government adoption. *Journal of Applied Quantitative Methods*, 4(1), 31–44.
- COM (2011). A digital agenda for Europe. Retrieved September 27, 2011, from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0245:FIN:EN:PDF>.
- Esping-Anderssen, G. (1990). *The three worlds of welfare capitalism*. Cambridge: Polity Press.
- EuroStat. (2011). Information society statistics. Retrieved September 23, 2011, from http://epp.eurostat.ec.europa.eu/portal/page/portal/information_society/data/main_tables
- Fortunati, L., & Manganelli, A.-M. (1998). La comunicazione tecnologica: comportamenti, opinioni ed emozioni degli Europei [Technological communication behaviour, opinions and emotions in Europe]. In L. Fortunati (Ed.), *Telecomunicando in Europa* (pp. 125–94). Milan: Angeli.
- Horst, M., Kuttschreuter, M., & Gutteling, J. M. (2007). Perceived usefulness, personal experiences, risk perception and trust as determinants of adoption of e-government services in the Netherlands. *Computers in Human Behavior*, 23, 1838–1852.

- Hung, S.-Y., Chang, C.-M., & Yu, T.-J. (2006). Determinants of user acceptance of the e-Government services: The case of online tax filing and payment system. *Government Information Quarterly*, 23, 97–122.
- Jones, S., Johnson-Yale, C., Millermaier, S., & Seoane Perez, F. (2009). U.S. college students' internet use: Race, gender and digital divides. *Journal of Computer-Mediated Communication*, 14, 244–264.
- Kovacheva, S., Doorne-Huiskes, A., & Anttila, T. (2011). The institutional context of the quality of life. In M. Bäck-Wiklund, T. van der Lippe, L. den Dulk, & A. Doorne-Huiskes (Eds.). *Quality of life and work in Europe* (pp. 32–54). Houndmills: Palgrave Macmillan.
- LaRose, R., Lin, C., & Eastin, M. (2003). Unregulated internet usage: Addiction, habit, or deficient self-regulation? *Media Psychology*, 5, 225–253.
- LaRose, R., & Eastin, M. (2004). A social cognitive theory of internet uses and gratifications: Towards a new model of media attendance. *Journal of Broadcasting & Electronic Media*, 48, 358–377.
- Lenhart, A. & Horrigan, J. B. (2003). Re-visualizing the digital divide as a digital spectrum. *IT & Society*, 1(5), 23–39.
- Lucas, K., & Sherry J. L. (2004). Sex differences in video game play: A communication-based explanation. *Communication Research*, 31, 499–523.
- Mante-Meijer, E., & Klamer, L. (Eds.). (2005). *ICT capabilities in action: What people do*. Luxemburg: Office for Official Publications of the European Communities.
- Ministry of Finance. (2010). One-stop public administration services online: Ministry of Finance and State Treasury announce launch of upgraded citizens' portal Suomi.fi. Retrieved September 26, 2011, from

http://www.vm.fi/vm/en/03_press_releases_and_speeches/01_press_releases/20101027Onesto/name.jsp

Ministry of Transport and Communications. (2010). Productive and inventive Finland: Digital agenda for 2011–2020. Retrieved March 10, 2011, from http://www.arjentietoyhteiskunta.fi/files/322/Digitaalinen_agenda_eng.pdf.

National Audit Office of Finland. (2008). Alueellisten tietoyhteiskuntahankkeiden toteutus [Implementation of Regional Information Society Projects]. Retrieved March 3, 2011, from http://www.vtv.fi/files/130/1582008_Alueellisten_tietoyhteiskuntahankkeiden_toteutus_NETTI.pdf

Nemes, S., Jonasson, J., Genell, A., & Steineck, G. (2009). Bias in odds ratios by logistic regression modelling and sample size. *BMC Medical Research Methodology*, 9, 56–61.

OECD. (2010). Finland: Working together to sustain success. Paris: OECD.

On the Move: The Role of Cellular Communications in American Life. (2006). Michigan: University of Michigan, Department of Communication Studies. Retrieved August 9, 2011, from <http://itudcmc.files.wordpress.com/2010/03/onthemove1.pdf>

Reddick, C. G. (2004). A two stage model of e-government growth: Theories and empirical evidence for U.S. cities. *Government Information Quarterly*, 21, 51–64.

Reddick, C. G. (2005). Citizens interaction with e-government: From the streets to server? *Government Information Quarterly*, 22, 38–57.

Rusten, G., & Skerratt, S. (Eds.). (2008). *Information and communication technologies in rural society: Being rural in a digital age*. Oxford: Routledge.

- Sassi, S. (2005) Cultural differentiation or social segregation? Four approaches to the digital divide. *New Media & Society*, 7, 684–700.
- Selwyn, N., Gorard, S., & Furlong, J. (2005). Whose Internet is it anyway? Exploring adults' (non)use of the Internet in everyday life. *European Journal of Communication*, 20, 5–26.
- Statistics Finland. (2011). Ajankäyttötutkimus 2009 [Time use survey 2009]. Helsinki: Statistics Finland.
- Strover, S. (2001). Rural internet connectivity. *Telecommunications Policy*, 25, 331–347.
- Tabachnick, B., & Fidell, L. (2007). *Using multivariate statistics* (5th ed). Boston, MA: Pearson.
- Tookey, A., Whalley, J., & Howick, S. (2006). Broadband diffusion in remote and rural Scotland. *Telecommunications Policy*, 30, 481–495.
- Turkki, T. (2009). Nykyaikaa etsimässä: Suomen digitaalinen tulevaisuus [In search of modern times: The digital future of Finland]. Retrieved March 13, 2010, from http://www.eva.fi/wp-content/uploads/files/2573_nykyaikaa_etsimassa.pdf
- van Dijk, J., Pieterse, W., van Deuren, A., & Ebbers, W. (2007). Services for citizens: The Dutch usage case. In M.A. Wimmer, H.J. Scholl, & A. Grönlund (Eds.), *International Conference on Electronic Government* (pp. 155–166). Berlin Heidelberg: Springer-Verlag.
- van Dijk, J., Peters, O., & Ebbers, W. (2008). Explaining the acceptance and use of government internet services: a multivariate analysis of 2006 survey data in Netherlands. *Government Information Quarterly*, 25, 379–399.
- Wasserman, I. M., & Richmond-Abbott, M. (2005). Gender and the Internet: Causes of variation in access, level, and scope of use. *Social Science Quarterly*, 86, 252–270.

- Weiser, E. B. (2000). Gender differences in internet use patterns and internet application preferences: A two-sample comparison. *CyberPsychology & Behavior*, 3, 167–178.
- Yildiz, M. (2007). E-government research: Reviewing the literature, limitations and ways forward. *Government Information Quarterly*, 24, 646–665.