Do E-government Services 'Really' Make Life Easier? Analyzing Demographic Indicators of Turkish Citizens' E-government Perception Using Ordered Response Models

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Abstract

The evolution stages of e-government services should be well-established for more effective e-government services and more satisfied citizens. This study aims to determine factors affecting e-government services with an emphasis on demographic attributes in a developing country. Particularly, the study investigates the effectiveness of past e-government services in terms of their contribution to human life. For these purposes, the data obtained from 2011 Life Satisfaction Survey were analyzed using four distinctive ordered response models including ordered logit, generalized ordered logit, heterogeneous choice model and partial constrained generalized ordered logit models due to the natural ordering of the dependent variable. The results of this study show that there are significant relationships among the factors that influence perception of e-government, namely, current residence, educational level, and occupational sector for all models, additionally household size for heterogeneous choice model. Consequently, partial constrained generalized logit model was found to have more parsimonious than other models. This study was probably the first attempt to analyze e-government service quality using four different ordered response models in e-government research literature. The outcome of this study may provide valuable information and enable benchmarking options for future e-government policies.

Keywords: *e-government services; generalized ordered logit; heterogeneous choice model, partial constrained generalized ordered logit*

1. Introduction

In the contemporary era, information technology undertakes crucial strategic roles on transforming governance which is considered as one of the key elements for the strategies in the government modernization (Tseng *et al.*, 2008; Grand & Chau, 2005). The diffusion of personal computers in the 1980s enabled the public administrators with a personal information technology system opening a new period of information technology use in government (Yildiz, 2007). In fact, for better government services, both information technology and information systems behave as a catalyst in the overwhelmingly shift towards the emerging e-government form (Tseng *et al.*, 2008; Ho, 2002). Along with the successful deployment of e-government and given the central role of the Internet in current e-government trends, government modernization has been experiencing an ongoing evolution process from early interinstitutional efforts based on partnerships between government and private sector (Aldrich *et al.*, 2002) to much more modernized one-stop government services with an instant access. Since e-government is adopted as an evolutionary phenomenon, Layne and Lee (2001) proposed a four-stage model for the development of e-government including cataloguing, transaction, vertical, and horizontal integration for a fully functional e-government service. Particularly, vertical and horizontal integration stages clearly define the important relations between e-government service providers and citizens. DeBenedictis *et al.* (2002) have also divided e-government services into four categories and government-to-citizen services take their respectable place as an important e-government delivery agency. In terms of e-government evolution, two important dynamics should be addressed. First dynamic underlines the importance of the Internet on transactional and integrated applications of e-government services and their evolvement. Secondly, state and local governments have followed the evolution of national governments on technological and organizational adoption (Gil-Garcia & Martinez-Moyano, 2007). In essence, these stages should be understood and implemented carefully for more effective e-government services and more satisfied citizens.

As a developing country, e-government is also an essential element of Turkey's efforts for reorganizing its

administrative system and establishing a national information and communication system infrastructure (Kaya Bensghir & Yildiz, 2002). Turkey was connected to the Internet in 1993 and the number of Internet users in the country has reached to almost 38 million people, ranking the country to be one of the top five countries in Europe (Internet World Stats, 2013). The official e-government website of Turkey came into service on December, 2008 which provides an infrastructure whereby citizens can have secure access to the information and services and a joint structure is being established for development, provision, and improvement of e-government services by identifying the needs of the citizens and government agencies (TURKSAT, 2009; Naralan *et al.*, 2013). As of October, 30 2014, the Turkish e-government gateway has more than 19 million registered users and provides 1,026 services of 141 public institutions (The National E-government Official Website of Turkey, 2014). However, in order to improve quality of e-government services, citizens' responses on the success of e-government adoption should be monitored periodically. In that way, potential issues regarding the access of these services may be instantly overcomed and possible breakdowns on every stages of e-government development proposed by Layne and Lee (2001) may be successfully prevented. This paper aims to evaluate the usefulness of e-government services on citizens' daily life in a developing country. For this purpose, factors affecting the Turkish citizens' e-government perception would be a valuable information for the future implementation of e-government services. The dependent variable of this study has a natural hierarchical ordering with discrete outcomes, so the use of ordered response models will be convenient. The present paper intends to determine some of these potential indicators using four distinctive econometric models that may also satisfy benchmarking purposes. The rest of the paper proceeds as follows. Section 2 reviews the current e-government literature concerning the determination of potential factors affecting e-government services. Section 3 gives information about the research methodology and the sample of the study. Section 4 introduces the estimation results and their interpreation in detail with respect to the fitted models. Section 5 discusses the estimation results, limitations of the present work and make recommendations and suggestions for both future research and policy making.

2. Literature Review

There is a rapidly growing literature that determines possible factors affecting e-government use, adoption, and perception. Many earlier studies have mentioned the relationship between perception of e-government services and demographic factors. The contribution of age differences on e-government perception has been extensively highlighted (Choudrie & Dwivedi, 2005; Hamner & Al-Qahtani, 2009; Gauld *et al.*, 2010). However, a recent work (Aladwani, 2013) found no significant relationship between respondents' age and their e-government use. Some past studies (Jaeger, 2003; Akman *et al.*, 2005; Li *et al.*, 2005; Hamner & Al-Qahtani, 2009; Gauld *et al.*, 2010; Aladwani, 2013; Naralan *et al.*, 2013; Venkatesh *et al.*, 2014) found that intention to use e-government services increases with higher education levels. Not surprisingly, gender was a significant contributing factor of e-government perception in the literature. Some earlier studies found that males (Akman *et al.*, 2005; Liu *et al.*, 2014; Venkatesh *et al.*, 2014) were more likely to have positive perception about e-government services, in contrast with other research findings (Aladwani, 2013) whereas female citizens showed greater tendency to use these services. On the other hand, other studies (Li *et al.*, 2005; Gauld *et al.*, 2010) found no relationship between e-government use or support and respondents' gender. Some past research (Liu *et al.*, 2014) indicated that current residence was an important indicator of positive e-government perception, while another recent studies (Rey & Ozymy, 2011; Venkatesh *et al.*, 2014) found that income level was a predictor of e-government adoption.

Along with demographic characteristics, past applied research on e-government use or perception also addresses personal characterictics. A very great number of studies found that perceived ease of use (Hung *et al.*, 2006; AlAwadhi & Morris, 2009; Lean *et al.*, 2009; Alomari *et al.*, 2010; Verdegem & Verdeye, 2009; Susanto & Goodwin, 2010; Rufín *et al.*, 2012; Venkatesh *et al.*, 2012; Hung *et al.*, 2013; Mostafa & El-Masry, 2013; Liu *et al.*, 2014; Rufín *et al.*, 2014) of e-government services was one of the most significant influencing factors of e-government use or perception. Similarly, enourmous studies underline the crucial role of perceived trustworthiness (Hung *et al.*, 2006; Horst *et al.*, 2007; Lean *et al.*, 2009; Alomari *et al.*, 2010; Susanto & Goodwin, 2010; Ozkan & Kanat, 2011; Rufín *et al.*, 2012; Aladwani, 2013; Hung *et al.*, 2013; Mostafa & El-Masry, 2013; Weerakkody *et al.*, 2013) on the intention to use e-government services. Apart from these factors, perceived complexity (Lean *et al.*, 2009), perceived image (Lean *et al.*, 2009; Liu *et al.*, 2014), and other service quality dimensions (Bwalya, 2009; Hamner & Al-Qahtani, 2009; Al-Jaghoub *et al.*, 2010; Susanto & Goodwin, 2010; Ahmad *et al.,* 2013; Alawneh *et al.*, 2013; Al Hujran *et al.*, 2013; Weerakkody *et al.*, 2013; Liu *et al.*, 2014) greatly contribute to the existing e-government literature.

3. Research Methodology

3.1 Ordered Response Models

Ordered categorical variables are frequently used in many social science applications. In principle, these type of variables denote the rank order of a particular attribute whilst such rankings do not necessarily represent the actual magnitudes on a substantive scale (Powers & Xie, 2000). When the outcomes are naturally ordered, the researcher should notice the fact that the dependent variable is considered as both discrete and ordinal. In other words, if the dependent variable has three categories, a linear regression would recognize the difference between category 3 and 2 identically to the difference between category 2 and 1 (Borooah, 2002).

The probability of an observed outcome such as *y* = *m* for given values of *x*'s designates to the region of the distribution where y^* between τ_{m-1} and τ_m as

$$\Pr(y = m \mid x) = \Pr(\tau_{m-1} \le y^* < \tau_m \mid x) \quad (1)$$

where τ's are thresholds and y^* is the latent variable. When y^* is substituted with $x\beta + \varepsilon$, Equation (1) can be rewritten as

$$\Pr(y = m \mid x) = F(\tau_m - x\beta) - F(\tau_{m-1} - x\beta) \quad (2)$$

where *F* denotes the cumulative function for ε. Further, the ordered models can be developed as a nonlinear probability model without the idea of latent variables. For $m = 1, J-1$, the odds that an outcome is then or equal to *m* versus greater than *m* given *x* are as follows:

$$\Omega_{\le m \mid > m}(x) \equiv \frac{\Pr(y \le m \mid x)}{\Pr(y > m \mid x)} \quad (3)$$

For instance, assuming the logs of the odds is equal to

$$\ln \Omega_{\le m \mid > m}(x) = \tau_m - x\beta \quad (4)$$

the odds of $m \le 2$ versus *m* > 2 can be computed. For a simple three-category, the odds will be as the following (Long & Freese, 2001):

$$\ln \frac{\Pr(y \le 1 \mid x)}{\Pr(y > 1 \mid x)} = \tau_1 - \beta_1 x_1 \quad (5)$$

$$\ln \frac{\Pr(y \le 2 \mid x)}{\Pr(y > 2 \mid x)} = \tau_2 - \beta_1 x_1 \quad (6)$$

Generalized ordered logit model can simply be defined as

$$P(Y_i > j) = g(X\beta_j) = \frac{\exp(\alpha_j + X_i\beta_j)}{1 + [\exp(\alpha_j + X_i\beta_j]}, j = 1, 2, ..., M-1 \quad (7)$$

where *M* is the number of categories of the ordinal dependent variable. Moreover, the parallel lines model estimated by ordered logit model is a special case of the generalized ordered logit model that can be written as

$$P(Y_i > j) = g(X\beta) = \frac{\exp(\alpha_j + X_i\beta_j)}{1 + [\exp(\alpha_j + X_i\beta_j]}, j = 1, 2, ..., M-1 \quad (8)$$

It can be easily noticed that the parallel lines model differs from the standard generalized logit model except for the Betas that are the same for all categories. For instance, when there are four categories, first category (*J* = 1) is contrasted with category 2, 3, and 4 (Williams, 2006). Whilst the generalized model is frequently preferred, most researchers disregard the parallel lines assumption that is often violated (Fu, 1998). In that context, to overcome the limitations of parallel lines restrictions, partial proportional odds model is introduced as a special case of generalized logit model, whereas some of the Beta coefficients can differ. For instance, Equation (9) illustrates a partial proportional odds model which enables the Betas for *X3* to differ (Williams, 2006):

$$P(Y_i > j) = g(X\beta_j) = \frac{\exp(\alpha_j + X1_i\beta 1 + X2_i\beta 2 + X3_i\beta 3_j)}{1 + [\exp(\alpha_j + X1_i\beta 1 + X2_i\beta 2 + X3_i\beta 3_j)]}, j = 1, 2, ..., M-1 \quad (9)$$

Heterogeneous choice model provides the researchers to examine determinants of the conditional variance. For an ordered variable *y* with *M* categories, the full heterogeneous choice model can be written as

$$P(y_i > m) = \text{invlogit}\left\{\frac{\sum_k x_{ik}\beta_k - \kappa_m}{\exp\left(\sum_j z_{ij}\gamma_j\right)}\right\} = \text{invlogit}\left(\frac{\sum_k x_{ik}\beta_k - \kappa_m}{\sigma_i}\right), m = 1,2,...,M-1 \quad (10)$$

where variance equation σ_i can be defined as

$$\sigma_i = \exp\left(\sum_j z_{ij}\gamma_j\right) \quad (11)$$

For any given response, the full heterogeneous choice model in Equation (10) presents how the choice and variance equations are combined to put forward the probability (Williams, 2010).

Though regression parameters yield information about the sensitivity of a dependent variable regarding changes in several independent variables, in some circumstances, it may be more appropriate to measure these sensitivities in terms of percentages, where elasticities are also preferred. However, standard elasticity calculation is not considered as a valid measurement for indicator variables which were defined as dummies (1 for success and 0 for failure). For these types of variables a pseudo-elasticity measure given by

$$E_{x_{ki}}^{P(i)} = \frac{\exp[\Delta(\beta_i x_i)]\sum_{\forall I}\exp(\beta_{kI}x_{kI})}{\exp[\Delta(\beta_i x_i)]\sum_{\forall I}\exp(\beta_{kI}x_{kI}) + \sum_{\forall I \neq I_n}\exp(\beta_{kI}x_{kI})} - 1 \quad (12)$$

can be used, where I_n denotes the set of alternate outcomes with x_k in the function determining the outcome, and *I* denotes the set of all possible outcomes. These elasticities capture the potential effect that a change in a variable determining the likelihood of alternative outcome *i* has on the probability this outcome will be selected, which are also called as direct elasticities (Washington *et al.*, 2003).

3.2 Study Design, Sample and Data Collection

The present study utilized the data from 2011 Life Satisfaction Survey contucted by Turkish Statistical Institute among 2,052 Turkish citizens after excluding the non-users of e-government services and respondents who did not have any idea. The corresponding survey involved detailed questions about respondents' demographic characteristics and satisfaction levels regarding a number of government services. The dependent variable of this study for the fitted models investigates whether government services make life easier. This question was involved in the survey only in 2011, so the data of this year were used in the model. The independent variable of this study had four ordinal categories, namely, 1 accounts for 'e-government services do not make life easier'; 2 accounts for 'e-government services somewhat make life easier'; 3 accounts for 'e-government services make life easier'; and finally 4 accounts for 'e-government services definitely make life easier'. Due to the ordinal and discrete nature of the dependent variable, four distinctive ordered responses models were fitted, separately, such as ordered logit model, generalized ordered logit model, partial constrained generalized ordered model, and heterogeneous choice model. For simplicity, only seven independent variables were involved in the final model including current residence, gender, age, household size, marital status, educational level, and occupational sector. The estimation results may also test the consistency of four models and provide the policy makers a benchmarking facility to decide on which model fits well.

4. Estimation Results

4.1 Descriptive Statistics

Table 1 indicates the descriptive statistics of variables used in the fitted modelds. As outlined in Table 1, a majority of the respondents (55.5%) believe that e-government services make life easier in the sample year. More than half of the respondents (56.8%) were men and very most of them (85.0%) had currently urban lives. More than 70% of the respondents (70.8%) were married and more than half of them (56.3%) were secondary- or higher-educated. Nearly 45% of the respondents (44.74%) were working at the private sector. Finally, the average age of the respondents was 37.61 and the average household size for the respondents was nearly four (3.75) people.

Table 1. Descriptive Statistics of Variables

Variable	Freq.	Percent	Variable	Freq.	Percent
Current residence			**Perception of e-government services**		
Rural	307	14.96	Do not make life easier	34	1.66
Urban[a]	1745	85.04	Somewhat make life easier	560	27.29
Gender			Make life easier	1138	55.46
Female	885	43.13	Definitely make life easier[a]	320	15.59
Male[a]	1167	56.87	**Occupational sector**		
Marital status			Public sector	296	14.42
Married	1452	70.76	Private sector	918	44.74
Single[a]	600	29.24	Retired	195	9.50
Education level			Unemployed[a]	643	31.34
Illiterate	77	3.75	**Average age =** 37.61 (13.46)[b]		
Literate/Primary education	820	39.96	**Average household size =** 3.75 (1.66)[b]		
Secondary education	597	29.10			
Higher education[a]	558	27.19			

Notes: [a] reference category; [b] standard deviation

4.2 Estimation Results

The econometric models were fitted by two similar user-written programs in Stata (Williams, 2006, 2010). Table 2 follows a similar design by Quddus *et al*. (2010) which presents the estimation results for four fitted ordered response models and provides a comparison of each models. The parallel lines assumption test proposed by Brant (1990) was carried out to determine whether the corresponding assumption was violated for the data used in the analysis, when a significant test statistic confirms the assumption violation. It was found that current residence; literate or primary education; public and private sector variables did not meet the assumption since their coefficients differed across different thresholds. These findings suggest that ordered logit model is a misspecified model and other three models were more convenient for interpretation. It can be noticed that variables which did not meet the parallel lines assumption were also used as factors affecting the error variance for heterogeneous choice model in Table 2. In addition, whilst the log-likehood values at convergence for four models were quiet similar, partial generalized logit model has the smallest AIC value which implies that this model fits better than other three models. As all of the independent variables used in the final fitted models except for age and household size were indicator variables, direct pseudo-elasticities were calculated in Table 3 to increase sensitivity of the results. The possible effects of the independent variables on Turkish citizens' perception regarding e-government services were interpreted using direct pseudo-elasticities.

As outlined in Table 3, for heterogeneous choice model, respondents who were living in urban areas were 19.8% more likely to think that e-government services make life somewhat easier and 36.9% less likely to think e-government services definitely make life easier than respondents living in rural areas. Respondents' educational level was found as a possible indicator for Turkish citizens' perception of e-government services. Accordingly, literate or primary-educated respondents 13.3% were less likely think that e-government services definitely make life easier than higher-educated counterparts. Respondents' occupational sector was another influencer of e-government perception. Respondents who work in public sector were 48.2% less likely to think that e-government services do not make life easier than unemployed respondents. Interestingly, respondents who work in private sector were 132.7% less likely to think that e-government services do not make life easier. Respondents who work in public and private sector were 25.2% and 72.0% less likely to think that e-government services had moderate contribution to human life, respectively. Respondents who work in public and private sector were 6.7% and 18.5% more likely to think that e-government services make life easier. Finally, respondents who work in public and private sector were 20.6% and 62.5% more likely to think that e-government services definitely make life easier, respectively.

For generalized ordered logit model, respondents who live in urban areas were 8.8% more likely to think that e-government services make life easier. In contrast, respondents who live in urban areas were 51.2% less likely to think that e-government services definitely make life easier than respondents who live in rural areas. Household size was statistically significant for only generalized ordered logit model. Accordingly, household size increases the probability of respondents who think e-government services make life easier by 7.2%, while household size decreases the probability of respondents who think e-government services definitely make life easier by 36.5%. Educational level was another potential indicator of citizens' perception of e-government services. Literate or primary-educated respondents were 39.6% more likely think e-government services do not make life easier. Interestingly, these respondents were also 5.3% more likely to think that e-government services make life easier than higher-educated counterparts. Occupational sector was a statistically significant indicator for the perception of e-government services. Respondents working in private sector were

43.2% more llikely to think that e-government services do not make life easier than unemployed respondents. Respondents working in public sector were 33.0% less likely to think that e-government services had moderate contribution to human life. In contrast, respondents working in private sector were 99.8% less likely to think that e-government services somewhat make life easier. Respondents working in public and private sector were 8.3% and 24.7% more likely to think that e-government services make life easier, respectively. Finally, respondents who work in public and private sector were 11.0% and 31.3% more likely to think that e-government services definitely make life easier.

For partial constrained generalized ordered logit model, respondents who were living in urban areas were 8.0% more likely to think that e-government services make life easier. Respondents who were living in rural areas were 49.4% less likely to think that e-government services definitely make life easier. Educational level was an indicator of e-government service perception. Literate or primary educated respondents were 22.9% more likely to think that e-government services do not make life easier. Literate or primary educated respondents were 4.9% more likely to think that e-government services make life easier. These respondents were 18.9% less likely to think that e-government services definitely make life easier. Occupational sector was the indicator of e-government service perception. Respondents who work in private sector was 35.3% more likely to think that e-government services do not make life easier. In contrast, respondents who work in public sector were 31.6% less likely to think that e-government services somewhat make life easier. Respondents who work in private sector were 97.7% less likely to think that e-government services somewhat make life easier. Respondents who work in public and private sector were 7.6% and 23.6% more likely to think that e-government services make life easier than unemployed respondents, respectively. Respondents who work in public and private sector were 12.1% and 33.0% more likely to think that e-government services definitely make life easier.

Table 2. Model Estimation Results for Ordered Logit, Heterogeneous Choice, Generalized Ordered Logit and Partial Constrained Generalized Ordered Logit Models

Do e-government services make life easier?		Ordered Logit	Heterogeneous Choice Model	Generalized Ordered Logit			Partial Constrained Generalized Ordered Logit			
		Coefficient	Coefficient	Threshold between 1 and 2	Threshold between 2 and 3	Threshold between 3 and 4	Coefficients not varying by threshold	Threshold between 1 and 2	Threshold between 2 and 3	Threshold between 3 and 4
Factors affecting the ordinal dependent variable	**Current residence**									
	Urban	–0.3685[a]	–0.3206[a]	–1.5327	–0.9987	–0.6986	—	–1.3362	–0.1215	–0.6749[a]
	Household size	–0.0417	–0.0361	–0.0184	–0.0068	–0.1129	–0.0423	—	—	—
	Gender									
	Male	0.0573	0.0468	0.0741	0.0362	0.1055	0.0831	—	—	—
	Age	–0.0062	–0.0049	–0.0165	–0.0090	–0.0237	–0.0681	—	—	—
	Marital status									
	Single	–0.1703	–0.1463	–0.4935	–0.0655	–0.2265	–0.1736	—	—	—
	Educational level									
	Illiterate	–0.4140	–0.3559	–1.2717	–0.2657	–0.2420	–0.3076	—	—	—
	Literate/Primary	–0.1756	–0.1584	–1.0029[b]	0.1171	–0.5461[a]	—	–0.5797[c]	0.0748	–0.5484[a]
	Secondary	–0.1616	–0.1148	–0.7762	–0.1308	–0.1479	–0.1538	—	—	—
	Occupational sector									
	Public sector	2.1430[a]	1.8177[a]	–0.1718	2.7517[a]	0.8812[a]	—	0.1279	2.6461[a]	0.9744[a]
	Private sector	2.0181[a]	1.7114[a]	–0.9787[b]	2.6209[a]	0.8109[a]	—	–0.8002[b]	2.5647[a]	0.8585[a]
	Retired	–0.1740	–0.1673	–0.1553	–0.0125	–0.4273	–0.1756	—	—	—
	Constant	—	—	7.5818[a]	0.1471	–0.8814[b]		6.4867[a]	0.3006	–1.0554[a]
Factors affecting the error variance	**Current residence**									
	Urban	—	–0.0508	—	—	—	—		—	—
	Educational level									
	Literate/primary	—	0.0232	—	—	—	—		—	—
	Occupational sector									
	Public sector	—	–0.2119[a]	—	—	—	—		—	—
	Private sector	—	–0.1976[a]	—	—	—	—		—	—
	Cut point 1	–4.3167[a]	–3.8457[a]	—	—	—	—		—	—
	Cut point 2	–0.7712[a]	–0.6207[b]	—	—	—	—		—	—
	Cut point 3	2.4298[a]	2.0384[a]	—	—	—	—		—	—
Statistics	Number of observations	2,052	2,052		2,052				2,052	
	Log-likelihood	–1,868.44	–1,860.44		–1,763.52				–1,769.87	
	LR Chi-square (df)	527.5 (11)	543.5 (15)		737.3(33)				724.6 (19)	
	McFadden pseudo ρ^2	0.1237	0.1274		0.1729				0.1699	
	AIC	3,764.87	3,753.08		3,599.036				3,583.75	

Notes: [a] significant at 99%; [b] significant at 95%; [c] significant at 90%

Table 3. Average Direct Pseudo-elasticity of variables

Independent variables	Pseudo-elasticities			
	Ordered Logit Model	Heterogeneous Choice Model	Generalized Logit Model	Partial Generalized Logit Model
Current residence; urban [1]	0.3105[a]			
Current residence; urban [2]	0.2329[a]	0.1983[b]		
Current residence; urban [3]	–0.0431[a]		0.0879[b]	0.0803[b]
Current residence; urban [4]	–0.2789[a]	–0.3694[a]	–0.5118[a]	–0.4936[a]
Household size [3]			0.0720[c]	
Household size [4]			–0.3651[b]	
Educational level; literate/primary education [1]			0.3956[b]	0.2285[c]
Educational level; literate/primary education [3]			0.0532[a]	0.0493[a]
Educational level; literate/primary education [4]		–0.1330[b]		–0.1885[a]
Occupational sector; public sector [1]	–0.3062[a]	–0.4815[a]		
Occupational sector; private sector [1]	–0.8944[a]	–1.3274[a]	0.4322[b]	0.3531[b]
Occupational sector; public sector [2]	–0.2297[a]	–0.2515[a]	–0.3303[a]	–0.3160[a]
Occupational sector; private sector [2]	–0.6708[a]	–0.7203[a]	–0.9981[a]	–0.9766[a]
Occupational sector; public sector [3]	0.0425[a]	0.0671[a]	0.0827[a]	0.0760[a]
Occupational sector; private sector [3]	0.1242[a]	0.1852[a]	0.2465[a]	0.2356[a]
Occupational sector; public sector [4]	0.2751[a]	0.2059[a]	0.1095[a]	0.1209[a]
Occupational sector; private sector [4]	0.8035[a]	0.6248[a]	0.3126[a]	0.3303[a]

Notes: [1] E-government services do not make life easier;
[2] E-government services somewhat make life easier;
[3] E-government services make life easier;
[4] E-government services definitely make life easier
[a] significant at 99%; [b] significant at 95%; [c] significant at 90%

4.3 Model Specification

Before estimating any models using the data, a multicollinearity test among the independent variables was carried out. Table 4 exhibits the variance inflation factor (VIF) values of the relevant independent variables included in the four fitted models. Practically, variables which have VIF values more than 10 are considered as they lead to multicollinearity problem and biased results. As shown in Table 4, none of the independent variables had VIF values more than 10 confirming the absence of multicollinearity in the data.

Table 4. Multicollinearity Test

Independent variable	VIF	1/VIF
Current residence		
Urban	1.94	0.514
Household size	1.93	0.518
Gender		
Male	1.82	0.548
Age	1.76	0.569
Marital status		
Single	1.73	0.577
Educational level		
Illiterate	1.66	0.602
Literate/Primary education	1.43	0.701
Secondary education	1.33	0.751
Occupational sector		
Public sector	1.30	0.769
Private sector	1.16	0.860
Retired	1.07	0.934
Mean VIF	1.56	

5. Discussion

A very recent prior work (Aldawani, 2013) argues that lack of emphasis on actual e-government users is one the most important shortcomings of previous studies. In this respect, the present study used actual e-government users' data for the fitted models which may contribute to the existing e-government research. Recent studies (Verdegem & Verleye, 2009; Osman *et al.*, 2014) suggest that shortlist of satisfaction determinants for e-government services may employ to get a clear view on e-government perception. The main objective of the present study was to determine potential demographic attributes of e-government perception in a developing country where the citizens use the Internet intensively. For this purpose, the data were analyzed using four different ordered response models to provide a benchmarking. The results of all models were generally showed consensus, and although there was no important difference among all models, partial constrained generalized model was more parsimonious than other three models. Results reveal that current residence, educational level and occupational sector were the potential indicators of e-government perception regarding whether e-government services make life easier. Specifically, household size was the additional indicator for heterogeneous choice model. Many earlier studies (Jaeger, 2003; Akman *et al.*, 2005; Li *et al.*, 2005; Hamner & Al-Qahtani, 2009; Gauld *et al.*, 2010; Aladwani, 2013; Naralan *et al.*, 2013; Venkatesh *et al.*, 2014) found that educational level was a significant indicator that was consistent with the results of the present study. Results of this study also shows consensus with other past work (Liu *et al.*, 2014), in which current residence was a statistically significant indicator.

Past research suggests that achieving a significant level of flexibility and efficiency of instant interaction with government is much more challenging for developing countries. The success depends on tendency of the government in developing countries to decentralize responsibility and process and use electronic means (Basu, 2004). Similarly, developing countries may experience poor citizen utilization of their e-government initiatives and thus, the adoption of certain criteria may positively contribute in improving effective factors (Alshawi & Alalwany, 2009). Results of this study revealed that respondents who live in urban areas were less satisfied citizens than rural counterparts. Results also indicated that household size decreased the probability of respondents who think e-government services definitely make life easier. Policy makers may consider improved e-government initiatives which substantially capture citizens' dissatisfaction. As e-government users living in urban territories possess higher percentages than other groups, their satisfaction should be increased for better e-government implementation. Another previous research (Rodríguez-Domínguez *et al.*, 2011) underlines the linkage between e-government and a degree of economic development to enable citizens a certain standard of living and more efficient public services. Recent work (Gallego-Álvarez *et al.*, 2010) confirms that authorized parties substantially attempt to promote the development of a dynamic and participatory e-government. In this respect, increasing the satisfaction of urban groups may also contribute to the standard of living and economic development. Household size may be also considered for e-government improvement since satisfaction of larger families may facilitate to successful e-government implementation. According to estimation results, private sector was more satisfied than public sector. The dissatisfaction of public sector should be recognized because, no doubtly, more satisfied public workers would definitely contribute to the success of future e-government implementation.

This study had some limitations. The present study considers only demographic attributes and one selected year. As stated above, a great number of earlier studies (Hung *et al.*, 2006; AlAwadhi & Morris, 2009; Lean *et al.*, 2009; Alomari *et al.*, 2010; Verdegem & Verdeye, 2009; Susanto & Goodwin, 2010; Rufín *et al.*, 2012; Venkatesh *et al.*, 2012; Hung *et al.*, 2013; Mostafa & El-Masry, 2013; Liu *et al.*, 2014; Rufín *et al.*, 2014) specifically considered perceived ease of use as a significant indicator. Turkish Statistical Institute or other authorized institutions in Turkey should examine e-government services in detail with more specific questions or surveys including future years. In addition, this study was probably the first attempt to compare several ordered response models in a study concerning e-government research. Future studies may also intend to make a comparison of more parsimonious models and they may also provide information about a benchmark between ordered and unordered models.

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