

Factors Influencing the Use of Electronic Government Services in Brazil

Marcelo Henrique de Araujo, Nicolau Reinhard

Business Administration Department
University of Sao Paulo
Av. Prof. Luciano Gualberto, 908
Sao Paulo, Brazil
marcelo.haraujo@usp.br
reinhard@usp.br

Abstract: This paper explores the data from the Brazilian “ICT in households and enterprises Survey” in order to understand how the individuals’ use of e-government services is related to the location of access to the internet and their usage capabilities. The research uses Amartya Sen’s Capability Approach, with results indicating that for all social classes the use of e-government is strongly related to users’ capabilities, expressed by their use of e-mail, e-commerce and e-finance and that its use is favored by home and workplace access to the internet over other alternatives, such as lan-houses and public telecentres. The paper also discusses its implications for public policy making.

1 Introduction

The development of the Information Society includes the risk of creating a new form of social exclusion: that of individuals deprived of digital resources. Although digital inclusion has been widely studied [Wi00], [Ca03], [Ca09], [SG05], [Wi05], [MA07], [Ma09] it cannot be reduced to providing physical access to the technological resources, but must consider user diversity and ability for the different uses (entertainment, communication, education, e-commerce, e-government, etc.).

The Brazilian Internet Steering Committee (CGI.br, in Portuguese) and other international institutions (UNO, OECD, World Bank and others) have developed indicators and metrics of the appropriation of ICTs, in order to understand the multiple dimensions of digital inclusion.

Since 2005 CGI has sponsored a yearly large nationwide survey of the access and use of ICT in households and enterprises. CGI.br designed its survey in accordance with OECD, Eurostat and Partnership on Measuring ICT for Development methodology, thus allowing international comparisons [Cg12]. The survey statistics and methodology are available in Portuguese and English in <http://www.cgi.br/publicacoes/index.htm>.

The access to the survey’s microdata allows the in-depth analysis of different aspects of internet users’ behavior. For the present paper, the research question chosen is: *How is*

the individuals' use of e-government services related to their preferred location of access to the internet and their usage capabilities?

Answers to these questions should help in evaluating the effectiveness of (usually very high cost of nation-wide) public policies related to promoting the provision of internet access in public locations or at home and the need for user information and training. In fact, many of the once ubiquitous lan-houses (estimated at 108,000 in 2009) are going out of business despite government support, while the demand falls for the about 20,000 public telecentres [AB13], [Cg12].

The paper is organized as follows: section 2 presents a brief literature review and the research reference model. Section 3 describes the research design and the methodology employed. Data Analysis and discussions, contributions are contained in section 4; final considerations are presented in section 5.

2 Literature Review

2.1 Digital Inclusion

Digital Exclusion is a major theme of Information Society research, dealing with the social, economic and cultural consequences of the unequal distribution of access to computers and the internet, thus Digital Exclusion is one facets of social exclusion [BP13]. There is the recognition that public policies are needed to overcome these problems through the dissemination of digital technology, such as the Brazilian Information Society Program [Ta00], also aiming at improving citizens' access to government services and democratic participation [Wi05].

Restricting the problem to the dichotomy between “having” or “not having” access to computers and the internet is an oversimplification. In fact, research focusing only on citizens' access to technological artifacts, according to [Av03] has a “technological determinism bias”.

This indicates that digital exclusion is a complex issue, requiring considering other dimensions beyond the dichotomy of included and excluded individuals [SG05].

In this line, the present paper will not focus on the access to digital resources, but on its qualified use, focusing on the factors contributing to the use of e-government services. Although E-government may have different definitions, our research considers the use of internet to improve the provision of government services to citizens, information and democratic participation.

2.2 Amartya Sen's Capability Approach

Amartya Sen proposed the Capability Approach as a reference for the human development paradigm [Se99b], [Re10], having been used as a basis for several

development indices, such as the Human Development Index and the ICT Development Index [It11].

The Capability Approach offers an objective basis for comparisons of differences of well-being between individuals [Pr05], thus overcoming the limitations of utilitarian approaches that do not allow this comparison, basic for well-being economics.

For the Capability Approach, the properties or characteristics of goods or resources have to be seen in terms “what they do to human beings”. By taking possession of an object (a commodity), the owner is able to “command” these characteristics. However, [Se99b] cautions that these characteristics do not inform in advance how these goods will be utilized. Therefore, the possession of a good will not necessarily result in an increase in the person’s well-being because its use cannot be determined beforehand. The change will only be in the possibilities of achievements a person can obtain from these characteristics.

Therefore [Se99b] argues that the well-being of a person should consider its “functionings”, that is, “*what the person succeeds in doing with the commodities and characteristics at his or her command* [Se99a, p.6].

The achieved functioning will depend both on the possessed resource and on the way this resource is used. Thus, they have the freedom to choose among different functionings. This set of functionings persons can achieve is called their Capabilities.

According to [Se99b], the process of conversion of the goods’ characteristics into functionings depends on many factors, personal, cultural and social, that are called “conversion factors”. Different persons having access to the same resources can end up with quite different functionings.

3 Research Reference Model and Methodology

The present research is based on the Capability Approach, presented in section 2.2. Figure 1 is a schematic representation focusing on the specific variables of the paper’s reference model.

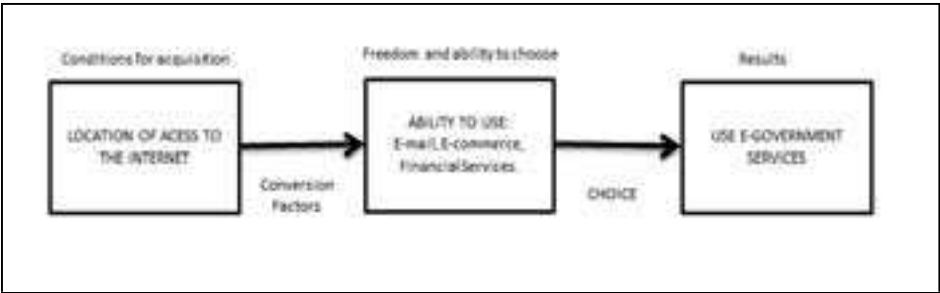


Figure 1: Reference Model

As research propositions we then present the following reasoning:

Starting with the comparison of preferred location of internet access and its influence on the user's capabilities (conversion factor), for which we propose as proxies the actual use of e-mail, e-commerce (search function) and e-financial services (checking accounts). These capabilities mediate the user ability to choose the functionings (in this case to use or not to use e-gov services). All conversion factors and subsequent choices are analyzed as mediated by social class and preferred location to access the internet.

The actual use of e-mail, e-commerce (search function) and financial services (checking accounts) are basic and frequent activities of internet users and bear some similarity with the competences needed to use e-gov services. We posit that these uses function as enabling factors to the not so frequent use of e-gov services, and can, therefore, be taken as indicators of competences permitting the use of e-gov services. Table 1 describes the variables analyzed in this paper.

The Capability Approach provides an appropriate framework to explore this chain of enabling factors evidenced by users' choices (location) and actions (use of resources), variables that are measured objectively in the survey, differently from models such as TAM [Da89] that focus on users' attitudes and beliefs. In this research we use the data presented in Table 1 from the microdata of the above mentioned CGI survey for the years 2007, 2009 and 2011.

Table 1. – Variables

Variable	Categories
Social Class	A and B (combined), C, D and E (combined)
Preferred Location for Internet Access	Home; Work; School; Other person's home; Lan House; Free Public Telecenter
Use of Electronic Government	Yes/No
Use of E-mail	Yes/No
E-commerce (search for products and prices)	Yes/No
Financial Services (Checking accounts)	Yes/No

The data refer to the respondents' demographic data, their access to ICT resources and usage characteristics (Use of e-mail, financial services, e-commerce and e-government services). The sample considers respondents over 15 years of age, residing in urban areas that have used the internet during the last three months (See Table 2). The survey, based on statistically valid samples, is representative of the Brazilian population, with the following sample sizes.

Table 2. The survey household segment sample size for urban respondents over age 15

	2007	2009	2011
Respondents - total	5638	7158	8661
Class AB	2231	2992	4099
Class C	2751	3556	4022
Class DE	656	610	540
E-gov users	4046	4964	5879
E-mail users	4599	5969	7203
Product search for E-commerce	3244	4661	6143
Financial Services (checking accounts)	1051	1256	2491

The research uses the following selection of variables from the CGI survey: (1) Demographic variables: age, economic data, access to computers and internet, preferred location for internet access; (2) Social Class constructed by CGI from the respondents' demographic data, as defined by the Brazilian Census Bureau's (IBGE) methodology.

The category "Use of e-mail" refers to answers to the survey question "have you sent or received e-mail in the last 3 months?" The category "use of e-commerce" refers to answers to the question "have you searched the internet for availability or prices of products or services in the last 3 months?" The category "use of financial services" refers to answers to the question "have you used Internet Banking for consultation in the last 3 months?" These variables are used as proxies for user competencies that will be considered as antecedents to e-gov usage.

The category "use of e-government" considers the use, in the last 12 months, of any of a series of common e-government services offered to citizens (requesting documents or personal information, paying taxes or service fees, registering for educational or health services, etc).

Binary Logistic Regressions are used to analyze the relationships between the (dichotomous) variables [Ha09]. The multicollinearity in the data set is analysed through VIF and tolerance statistical tests.

According to the research model (Figure 1) the first set of tested relationships (posited as influences) considered the variables "preferred location of access to the internet" (this categorical variable was transformed into *dummies variables*) and proxies for use competencies (E-commerce, E-mail and Financial Services). The next set of logistic regressions aimed at assessing the relationships between competencies and the use of e-gov services, followed by a logistic regression of the use of e-gov services against the preferred location of access to the internet.

The software Stata was used for the stepwise logistic regressions. For data analysis, we considered only the odds ratio values that are statistically significant at the 95% confidence level.

4 Data Analysis

Table 3 shows the location of preferred access to the Internet. Percentages are calculated over the total population of internet users in a social class. Classes A and B and also D and E are combined for convenience of analysis.

Table 3. – Preferred location of access to the Internet of E-gov users’ (percentage)

	AB			C			DE		
	2007	2009	2011	2007	2009	2011	2007	2009	2011
At Home	53.0	63.0	72.7	29.3	36.4	58.5	9.3	16.2	27.2
At Work	26.5	22.6	20.4	21.2	17.3	16.1	8.9	5.3	10.9
At school	2.8	1.2	0.5	3.6	3.5	1.4	4.4	4.8	2.5
At someone else’s home	4.1	4.8	1.6	11.5	10.0	6.8	14.2	17.4	15.5
Telecenter	0.6	0.7	0.3	1.9	1.2	0.4	2.2	1.1	2.9
Lan-House	12.8	7.4	3.2	31.8	31.0	14.7	58.1	54.1	34.7

The data show a general increase in access to the internet at home, especially in the lower classes. The Country’s favorable economic situation during the period (growth of household income) and public policies for the reduction of hardware and connection cost allowed the increased affordance of ICT resources at home, leading to the corresponding reduction of access in other locations. Especially noteworthy is the dwindling demand for the once ubiquitous Lan-houses (many of them already going out of business). Table 4 shows the frequencies of E-mail, E-commerce (search) and Financial Services usage.

Table 4. – Use competences by social class (percentage)

	AB			C			DE		
	2007	2009	2011	2007	2009	2011	2007	2009	2011
uses E-mail	88.1	89.8	90.1	78.3	80.1	78.4	73.3	71.2	65.5
uses E-commerce (search)	71.2	77.1	80.6	50.5	59.2	64.3	40.4	40.7	47.2
use Financial Services (checking accounts)	27.9	27.1	37.7	13.7	11.6	21.8	8.1	5.4	12.5

The “Functionings” [Se99b] (usage of electronic government services) in Table 5.

Table 5. – Percentages of E-gov users' (percentage)

	2007	2009	2011
Classes A and B	78.4	77.5	77.7
Class C	69.3	65.4	61.0
Classes D and E	59.4	52.3	44.3

Tables 6 to 10 present the results of the logistic regressions. The “odds ratios” presented in these tables should be interpreted as follows: the coefficient 2.5 in Table 6 (Class C, “at Home and Work” in 2007) means that the probability to be a user of e-gov services of a user that has access to the internet from home or work is 2.5 times more likely than that of a user that accesses the internet from another location. Similarly, the coefficient 0.7, being lower than 1, indicates that a user that accesses the internet from a lan-house is less likely to use e-gov, as compared to a user from another location. Blank cells indicate that the corresponding coefficients are not statistically significant.

Our focus in the analyses is on the usage of e-gov services in Social Classes C and DE, since these classes are the main target of public policies for digital inclusion and also because in these classes there is a larger variation in the overall level of e-gov services adoption and therefore the larger interest and implications of an explanatory model.

Table 6. – Contribution of access location to e-commerce usage (odds ratios)

	C			DE		
	2007	2009	2011	2007	2009	2011
At Home and Work	2.5	2.5	2.1	5.3	2.8	3.4
At someone else's home				1.9		
Telecenter				4.9		
Lan House	0.7					

Table 7. – Contribution of access location to e-mail usage (odds ratios)

	C			DE		
	2007	2009	2011	2007	2009	2011
At Home and Work	3.4	4.7	2.8	7.1	3.8	
At someone else's home		1.8	1.6	5.7		0.5
Telecenter	3.2	0.5				
Lan House	1.8	2.5		3.8		

Table 8. – Contribution of access location to e-finance usage (odds ratios)

	C			DE		
	2007	2009	2011	2007	2009	2011
At Home and Work	2.3	3.8	2.2	2.2	3.3	4.0
At someone else's home		2.7				
Telecenter						
Lan House			0.7			

Coefficients for “At Home and Work” access to the internet in tables 6, 7 and 8, being significantly larger than 1, show that access from these locations is significantly related to an increase in internet usage competencies (as represented by the proxies e-mail, e-commerce and e-finance usage), therefore supporting the first set of propositions of the paper (access location being influencing the capability conversion factor).

Tables 6 and 7 show also some larger than 1 coefficients for the other access locations. In these cases, however, the value of the coefficients falls over time, indicating a reduction of importance of these locations, leading to values less than 1 or non-significant in the last year 2011, thus supporting the proposition that the eventual users of e-gov services from these locations may have migrated to more the convenient access locations (at home and work).

Table 9 shows that the use of all three services (e-mail, e-commerce and e-finance) contributes significantly to increase the probability of their users being also users of e-government services, with a special weight for e-finance services.

These findings thus support the second part of our research propositions: the developed capabilities influencing the choice for the functioning (use of e-gov services).

Table 9. – Contribution of Capabilities to Functionings (usage of e-gov) (odds ratios)

	C			DE		
	2007	2009	2011	2007	2009	2011
uses E-commerce (search)	3.3	2.0	2.2	2.4	1.9	1.9
uses E-mail	2.0	1.4	2.7		3.1	7.1
uses Financial Services (checks)	5.2	4.1	3.2	3.1		5.9

Table 10. – Contribution of the Location of Access to the Internet to the use of E-gov services (odds ratios)

	C			DE		
	2007	2009	2011	2007	2009	2011
At Home and Work	3.5	1.7	1.8	3.4	2.0	
At someone else's home	1.7			2.4	2.4	0.4
Telecenter	3.4	2.9		0.3		
Lan House						0.5

Lastly, the coefficients of Table 10 show that Access Location alone, although consistent with the previous results, is a much weaker predictor of e-gov services usage than the process mediated by the usage competencies, indicating the contribution of the “mediating chain” proposed by the Capability Approach, which concludes our analysis.

5 Conclusions and Managerial Implications

The data analyses support our propositions of the positive contribution of internet access from home or work to the development of internet usage competencies and the contribution of these factors to e-government services usage, as answers to the paper's initial research question.

Managerial and public policy implications: These results show that public policies promoting home access to the internet, such as reducing sales taxes on computers and internet access and low-interest financing for home computers are more effective in leading to an increase in the use of e-government than the effort to reorient lan-houses and telecenters to become e-gov access points.

Home access to the internet contributes to the increase of citizens' e-literacy, also in the lower social classes and has also an impact on their e-gov use. Nevertheless, the lower percentage of e-government services use among lower social classes indicates the need for additional research to better understand the reasons for them not to use these services, even among users that have internet access at home.

In the beginning of the last decade there was a nation-wide boom of private lan-house (most of them very small family-run businesses). Many of them have since closed due to the rapidly falling demand, as shown in Table 3. The results of our study do not support government policies to provide incentives for the still large number of lan-houses and telecenters to become access and support points for e-government services.

References

- [AB13] ABCID portal, available from: <http://www.abcid.org.br/>, accessed 06/07/2013.
- [Av03] Avgerou, C.: The link between ICT and economic growth in the discourse of development. In: Korpela, M., Montealegre, R., Poulymenakou, A. (eds) *Organizational Information Systems in the Context of Globalization*, Boston, Kluwer, 2003; pp 373-386.
- [BP13] Broadbent, R.; Papadopoulos, T.: Impact and benefits of digital inclusion for social housing residents. *Community Development*, 44, 1, 2013; pp. 55-67
- [Ca03] Castells, M.: *The Internet Galaxy: Reflections on the Internet, Business, and Society*. Oxford University Press, New York, 2003.
- [Ca09] Castells, M. *The Rise of the Network Society: The Information Age: Economy, Society, and Culture*. 2nd edition. Wiley-Blackwell, Oxford, 2009.
- [Cg12] CGI. *ICT Households and Enterprises 2011: Survey of use of ICT in Brazil*. CGI.br, São Paulo, 2012.
- [Da89] Davis, F. D.: "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly*, 13, 3, 1989; pp. 319-340.
- [Ha09] Hamilton, L. C.: *Statistics with Stata: Update for version 10*. Cengage Learnin, Belmony, 2009.
- [It11] ITU. *Measuring the Information Society*. 1-174, 2011.
- [Ma09] Madon, S. et al.: Digital inclusion projects in developing countries: Processes of institutionalization. *Information Technology for Development*, 15, 2009; pp. 319-340

- [MA07] Mori, C. K., Assumpção, R. O.: Brazilian Digital Inclusion Public Policy : achievements and challenges. *The Journal of Community Informatics*, 3, 3, 2007; pp. 1–6,.
- [Pr05] Prendergast, R.: The concept of freedom and its relation to economic development: a critical appreciation of the work of Amartya Sen. *Cambridge Journal of Economics*. 29, 6, 2005; pp. 1145-1170,
- [Re10] Reinhard, N.: The Challenges of Universal Access: Models and Management – an invitation research. In: *Survey the Use of Information and Communication Technologies in Brazil 2005-2009*. CGI.br, São Paulo, 2010; pp. 189-198
- [Se99a] Sen, A. K.: *Commodities and capabilities*. Oxford University Press, New Delhi, 1999.
- [Se99b] Sen, A. K.: *Development as freedom*. Oxford University Press, Oxford, 1999.
- [SG05] Sorj, B.; Guedes, L. E.: Exclusão Digital: Problemas conceituais, evidências empíricas e políticas públicas. *Novos Estudos*, 72, 2005; pp. 101-117
- [Ta00] Takahashi, T.: (Org.) *Sociedade da Informação no Brasil: Livro Verde*. Ministério da Ciência e Tecnologia, Brasília, 2000.
- [Wi00] Wilhelm, A. G.: *Democracy in the Digital Age: Challenges to Political Life in cyberspace*. Routledge, New York, 2000.
- [Wi05] Winkler, I. A.: *Implementação de políticas públicas brasileiras de Inclusão Digital*. 2005. Dissertação (Master's Thesis in Portuguese) – Universidade Federal da Bahia – Núcleo de Pós-Graduação em Administração, Bahia.