

The Elderly and the Electronic Government in Brazil

Gustavo H. S. M. MORAES¹

University of Campinas, School of Applied Science

Abstract. The use of information technology can increase the quality of life of senior citizens. The elderly tend to be more cautious and seek greater certitude before they act when compared to younger individuals. In Brazil, the elderly are already 13% of the population. The objective of this research was to study what factors influence the elderly in the use of e-government in Brazil. The focus of this study was to investigate an initiative of the Brazilian government to computerize fiscal control mechanisms. We interviewed 137 elderly individuals who have used the program. We used a quantitative methodology for the development of this research, through the multivariate analysis technique of structural equation modeling. The study presented a robust model with a high explanatory power, in which the influencing factors are: Performance Expectancy, Facilitating Conditions and Habit. The research assists in the participation and involvement of the elderly in the current e-government development phase in Brazil, exposing their perceptions.

Keywords: elderly, electronic government, Brazil

1. Introduction

Information and communication technology (ICT) permeates human actions, and the effects arising from this can be observed in various social segments. This intensive use of IT in all sectors has also been spread to the Public Administration, becoming indispensable in this area. The use of IT combined with the Internet as a public management tool is called electronic government and aims to better qualify the provision of services and maximize the Public Administration efficiency [5].

Theories on e-gov are in a process of definition, as it is a recent area of study, still in development [42]. The movement originated because the growing development and popularization of technologies has highlighted the need for understanding the adoption of both products and services that they provide [40]. This understanding would allow governments to benefit society through public policies of inclusion and services for the quality of life of their citizens, including the elderly. At the same time, individuals would accept and use such technologies [2], [18], [42].

In the e-government concept, IT is a tool by which, through e-Services, the interaction between citizen and government occurs. We can infer that the implementation of e-gov is linked to the desire of citizens [14], [42], with its accession

¹ Corresponding Author, University of Campinas, School of Applied Science, Pedro Zaccaria Street, 1300, Limeira, Brazil; E-mail: gustavo.salati@fca.unicamp.br

depending on the acceptance, dissemination and success of propositions and policies inherent to e-gov.

There are several studies in different countries studying the adoption of e-gov, as in Canada [42], the United States [4], Netherlands [25], Romania [9], Turkey [36] and Brazil [33], among others. Those studies have shown different results; however, all the suggested models are based or adapted from current theories of technology acceptance, such as the Technology Acceptance Model (TAM) and the UTAUT. These differences in the models indicate a difficulty in the generalization of one context to another, because of cultural differences and different stages of the development of e-gov in these countries. Thus, it is becoming more relevant to study specific contexts of adoption of e-government.

In the last years, the interest in the elderly (defined as adults aged 65 and older) has burgeoned because this demographic segment has expanded in size and spending power.

In Brazil, the population is estimated at 201.5 million individuals, and the tendency is the reduction in the number of children and the increase in the number of elderly individuals. The elderly are already 13% of population. The elderly tend to be more cautious and seek greater certitude before they act when compared to younger individuals [3], [50]. As consumers, older adults have been shown to be among the last to adopt an innovative product, service or idea [39]. Kerschner and Chelsvig found that age is related to attitudes toward and the adoption of technology: the older the consumer, the more negative the view towards technology and the lower the use of various technologies [28].

Therefore, the studying and researching of the resistance and adhesion of the elderly to e-government technologies in Brazil is an opportunity to collaborate on a model development for the reality of the country, and the identification of its factors can enable its more effective administration, thus increasing opportunities for positive results.

Thus, the objective of this work is to study what factors influence the elderly in the use of e-government in Brazil. The focus of the study is to investigate an initiative of the Brazilian government to computerize fiscal control mechanisms.

2. Literature Review

2.1 Models of technological adoption

Contemporary theorists have examined the study of the acceptance and adoption of technology by individuals, proposing theoretical models based on social psychology; the diversity of such models lies on determinants for such adoption. In order to explain and increase the acceptance of individuals with regard to the technologies, it is necessary to understand the reasons that lead them to adopt or reject information technology [12].

Models intending to predict the acceptance and use of technology have emerged with the Technology Acceptance Model (TAM) [11]. Several other researchers have conducted studies, using TAM as a main reference, deepening the knowledge on acceptance and technological adoption in some areas of knowledge related to information technology.

In 2003, some authors proposed a theory named Unified Theory of Acceptance and Use of Technology (UTAUT). It is the most highlighted article of technological adoption, which features one of the most widespread models in the literature on IT.

The model is based in eight prominent models in the area, and it empirically compares their dimensions, seeking convergence to its integrated model. Venkatesh's model was presented as a way for administrators to assess the probability of success in the introduction of new technologies, assisting in understanding the initiative.

The UTAUT has led to significant progress in understanding the adoption and use of technology, although its focus has been primarily on individual processes at a psychological level and contingencies that arise as related technology perceptions and situational factors, respectively. Some years later, other researchers developed the UTAUT2, extending the acceptance model and use of technology to the consumer context.

2.2 E-government in Brazil

The use of information by the Brazilian government started before the 1950s, but the use of the term e-government is from 1996, with e-services provided by the Brazilian federal government [17]. Services such as the delivery of income tax declaration, information on social security and government procurement are available on the Internet since 1998, and in 2000 the Electronic Government Policy was defined and established and the Information Society Program was launched, consolidating and spreading e-government and the social importance of digital inclusion strategies, as well as actions related to information technology in the country, implementing the e-government in the country through structures and legal guidelines [41].

The authors of e-gov in Brazil could prove the success of the e-government program until 2003, when there was the transition of the federal government and the program was no longer a priority, because of four factors: change in political leadership; absence of inter-bureaucratic coordination, with no individuals responsible for the program in several Ministries; problems in connecting with society, thus causing discontinuation of partnerships and withdrawal of companies that provided technological services; and, lack of resources for the e-gov program, with subsisting projects of specific sectors, yet isolated from an aligned policy development [37].

Brazil stands out in specific initiatives such as the Open Government and Open Data, mentioned in the UN report as an example of good practices for having a single goal of access to public data. Currently, the Brazilian government offers to its citizens several e-gov systems. Among the most important, we can highlight: a) IRS – income tax collection services; fiscal status of taxpayers; social security and national register of legal entities; statements; among others; b) Poupa Tempo (a state of São Paulo program) – access to public service information, such as documents request, and opening and closing of businesses; c) Federal Police – services such as passport application, statements of criminal records, support for international adoptions, among others; d) Public Digital Bookkeeping System (SPED, in Portuguese) – tax information, rationalization and standardization of ancillary obligations of taxpayers; e) Integrated System of Financial Administration of the Federal Government (SIAFI, in Portuguese) – interests linked to the national treasury, as availability of public spending; f) OntoJuris Project – provision of legislation information on intellectual property, consumer rights and electronic rights; g) Compras Net – shopping website of the federal government.

2.3 Technology acceptance by the elderly

Many researchers argue that elderly individuals are often more reluctant to accept technology [34], [50]. The use of IT can increase the quality of life of senior citizens [10], [32]. The elderly can reduce social isolation using IT, communicating with friends and family and having an active participation in an increasingly computerized healthcare system [10]. Elderly individuals are less likely to adopt the Internet [24], [30].

This age-related digital divide prevents many elderly individuals from using IT to enhance their quality of life through tools, such as egov and Internet-based service delivery.

In the case of the e-government program chosen for this study, the population can voluntarily use it. Thus, this study intends to increase the understanding about the perception of the elderly in this e-government initiative.

3. Proposed Model

The models present many generalization difficulties, because of cultural differences, phases of e-government implementation and the economic development of countries. Thus, we have decided to develop a model according to the Brazilian context.

The proposed model was based on the theories of IT adoption and e-gov.

The hypotheses of this study, with their theoretical bases: H1: Performance Expectancy positively influences the Intention to Use e-government by the elderly; H2: Effort Expectancy positively influences the Intention to Use e-government by the elderly; H3: Social Influence positively influences the Intention to Use e-government by the elderly; H4: Facilitating Conditions positively influence the Intention to Use e-government by the elderly; H5: Habit positively influences the Intention to Use e-government by the elderly; H6: Habit positively influences the Use of e-government by the elderly; H7: Intention to Use influences the Use of e-government by the elderly.

4. Methodological Aspects

For the development of this research, we used the quantitative methodology, through multivariate data analysis. Given the characteristics of this research, we chose to use the Partial Least Squares Path Modeling (PLS-SEM) [21]. We conducted interviews with elderly individuals to obtain data to use the PLS-SEM, using a survey for data collection according to the suggestions of authors [22]. We interviewed 137 elderly individuals who have used the program. The interviews were conducted in the city São Paulo, in public places. All questions were measured using a Likert scale of seven points, which is similar to studies that used similar models for IT adoption. For calculation and validation of statistical tests, we used the SmartPLS [38].

5. Descriptions and Analysis of Results

According to Hair et al. (2013), the evaluation criteria of reflective measurement models are: internal consistency (composite reliability), reliability of the indicator, convergent validity (average variance extracted) and discriminant validity [20].

To examine the convergent and discriminant validity of the constructs used in the structural model, we performed the Confirmatory Factor Analysis [19]. All constructs showed indicators with high loads in their latent variables, above 0.70, and low loads in the other latent variables, indicating reasonable discriminant and convergent validity [6].

A key measure used to assess the measurement model, in addition to the tests for each indicator, is the composite reliability of each construct [19,20]. The composite reliability describes the degree to which the indicators represent the latent construct in common. A standard commonly used for acceptable trust is 0.70. For the convergent validity of the model, another indicator used is the average variance extracted (AVE), value that, as a criterion for validation, should have a value greater than 0.5 [21]. The verification of the internal consistency was another indicator used to analyze the convergent validity. A high internal consistency value in the construct indicates that all variables represent the same latent construct. The internal consistency is evaluated by means of Cronbach's alpha, ranging from 0 to 1, with higher values indicating a high consistency level. For exploratory studies, values between 0.60 and 0.70 are considered acceptable [20], [35].

To verify the discriminant validity between constructs, we used: the estimated correlation matrix and the square root of the average variance extracted (AVE) of the constructs. The square root of the AVE of the constructs should be greater than the correlation between the latent variables; this is displayed prominently on the diagonal [20].

The values of all indicators are within those established by the authors.

The analysis of the indicators of significance was carried out with the values calculated by the bootstrapping technique [13]. The use of the bootstrapping technique to analyze the load significance obtained for the observable variables is not based only on one model estimation; nevertheless, it calculates parameter estimates and their confidence intervals based on multiple estimates [19,20].

In this research, there was a resampling of 5,000 samples, with replacement of 137 cases, according to recommendations [20].

Student's t-test analyzes the hypothesis that the correlation coefficients are equal to zero. If the results of this test show values higher than 1.96, the hypothesis is rejected and the correlation is significant [13,20].

The values were estimated by the bootstrapping technique. All relation values, except for Effort Expectancy and Social Influence regarding Intention to Use, presented Student's t-test higher than 1.96 (significance level = 5%). The t-test value for Effort Expectancy with Intention to Use was 0.677, with a p-value of 0.498, and the t-test value for Social Influence with Intention to Use was 0,854, with p-value of 0.393. These values mean that the constructs of Effort Expectancy and Social Influence do not influence the Intent for Adoption of the program by the elderly, thus not confirming Hypothesis 2 and 3.

Analyzing the coefficient of determination (r^2), according to Cohen's scale, the model has high value for both Intention to Use and Effective Use of the Nota Fiscal Paulista, and the amounts are 0.599 and 0.639, respectively [7]. However, according to the scale of others authors, the values are considered moderate, though adequate [21], [23], [20].

All hypotheses were confirmed, except the cases 2 and 3.

6. Conclusions

This study presented a robust model with a high explanatory power ($r^2 = 63.9\%$) in which the influencing factors are: Performance Expectancy; Effort Expectancy; Social Influence; Facilitating Conditions and Habit.

The model has unique characteristics because it was developed in an unexplored area with the elderly. However, the results are at the convergence of several other models developed by IT researchers related to the individual use.

The results contribute to IT research studies, with a model that reinforces and extends previous studies on technological adoption and e-government, adding a model in a new context yet to be explored.

There are no studies on the adoption of e-government in Brazil for the elderly and the existing models in the literature cannot represent all the dimensions addressed in the model presented in this study.

According to this research, the main factors for Intention to Use are Habit and Performance Expectancy, positively influencing the Intention to Use.

In relation to the effective Use, the selected and tested factors were: Intention to Use and Habit. In this case, both constructs showed positive results and positively influence the Use of the program. According to the model, Effort Expectancy and Social Influence have no influence on Intention to Use. Effort Expectancy is related to the ability to use technology to access the necessary information available. As respondents were elderly individuals who have used the program before, they were probably elderly individuals that had no difficulty in using technology. Regarding Social Influence, we have observed that individuals who are important in the social circle of the elderly person do not exert influence on the use of the e-gov program.

In practical terms, the research assists in the participation and involvement of elderly individuals in the current e-government development phase in Brazil, exposing their perceptions. Such participation is important in order to maximize the potential benefits for the government and for the elderly population that is growing in Brazil.

By understanding the factors that positively influence the adoption of this e-government program and clarifying the influence of this technology in the personal and professional lives of elderly individuals it is possible to improve the quality of service to meet the demands of the society. Thus, they can also allow an increase in the adoption of Brazilian e-government initiatives. The findings also support the faster implementation of the program in other administrative contexts for e-government, generating useful information for the main points to be considered in order to increase the use by the elderly and the chances of successful implementation.

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